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**THE CONSTRUCTION OF OSTEOPOROSIS AS A  
TWENTIETH CENTURY DISEASE**

by

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A Thesis Submitted to the Department of History  
in conformity with the requirements for  
the degree of Master of Arts

**Queen's University**

**Kingston, Ontario, Canada**

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## Abstract

### The Construction of Osteoporosis as A Twentieth-Century Disease

This essay describes the medical and social influences which have resulted in the construction of osteoporosis as a twentieth century epidemic disease. Traditionally, osteoporosis was viewed as a natural part of the aging process. The term "osteoporosis" originated in France during the 1820's as a physiological description of porous bone. It first appeared in English-language medical publications during the final quarter of the 19<sup>th</sup> century. In 1940, a substantial change occurred when Boston endocrinologist Dr. Fuller Albright (1900-1969) linked the decline of estrogen with the loss of bone mass in postmenopausal women. Osteoporosis was subsequently defined as both a bone and joint disease and a menopausal disorder.

In this thesis, discoveries in diagnostics and therapeutics pertaining to osteoporosis are analysed in conjunction with the medicalization of aging and of female physiology. Strategies for prevention, screening and treatment of osteoporosis, however, remain controversial both within and without medical circles. The criteria for the disease have shifted with advances in several biomedical disciplines, but the import of these technological and scientific changes has been conditioned by social factors.

Late twentieth century North American demographic, attitudinal, economic, and socio-political factors have contributed to contemporary conceptions about osteoporosis. Construction of osteoporosis as a disease rather than a risk factor has been crucial for attracting research dollars and establishing pay policies for medical expertise. The epidemic has been a bonanza for the pharmaceutical, dairy, and imaging industries, which benefit from widely touted interventions. Ideological challenges to the medical model and professional and commercial beneficiaries have come from the new social movements of the 1960's-1980's. Incentives for clinical medicine, academe and industry to view osteoporosis as a disease were sometimes justified and promoted by the patient advocacy and women's health movements.

Feminist analysis has provided the most sustained criticism of the medical definitions, bioscientific interpretations of research, and other aspects of the disease: yet feminists do not share a single view of osteoporosis. Some think of it as a disease of affluence, while others believe its extent is exaggerated. Most recognize that some people suffer significantly from this condition, whether it is a disease or a natural aging process.

## Acknowledgements

I am most grateful to my adviser Professor Jacalyn Duffin for enticing me back into academic endeavours after a long hiatus. Her intellectual rigour, verve, and energy have been inspirational; moreover, her faith in my ability to tackle this ambitious topic as a master's thesis enabled me to stay on track despite the inevitable set-backs and computer crises. The cheerful and wise advice of Ms Cherrilyn Yalin in the History of Medicine office has been likewise invaluable. In addition, I am thankful for the support received from fellow graduate students, faculty and staff members of the Department of History at Queen's University, and in particular, Ms Yvonne Place and Professor Paul Christianson.

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## Chapter 1: Osteoporosis in the History of Disease

The Nature of Disease: We are accustomed to speak of "disease entities" as though they had an independent, individual existence and could be recognized as friends--or better, perhaps, as enemies. This is obviously one of those abstractions that do violence to the reality of the concrete situation, for there is no disease apart from the patient. Thomas Addis (1881-1949), nephrologist.<sup>1</sup>

Diseases as explanations for various phenomena have lifecycles or swings in popularity, but diseases can also be seen as biological events which are independent of their context. Medical experts define individual diseases in our culture, where "the existence of a disease as a *specific* entity is a fundamental aspect of its intellectual and moral legitimacy."<sup>2</sup> The recognition of specific disease entities has been credited with the acquisition of knowledge which allowed the development of the nineteenth and twentieth century's "spectacular therapeutic triumphs."<sup>3</sup> Osteoporosis is a new disease identified in the mid-twentieth century.

I propose to study the ways in which mid-to-late-twentieth-century North Americans have understood the disease entity called osteoporosis. Few authors have attempted historical or epistemological analyses of osteoporosis, despite a recent avalanche of medical, academic and lay writings about this disease.<sup>4</sup> Osteoporosis has been transformed in the scientific mind

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<sup>1</sup>Canadian Medical Association Journal Vol. 134 (April 1, 1986), p. 738.

<sup>2</sup>Charles E. Rosenberg, "Introduction in Framing Disease: Illness, Society and History" in Framing Disease: Studies in Cultural History, Charles E. Rosenberg and Janet Golden, eds. (New Brunswick, N. J.: Rutgers University Press, 1992), p. xviii. A rich literature exists on the construction of modern disease entities. In addition to the previously cited essay by Rosenberg, I am deeply indebted to: Guenter Risse, "Health and Disease: History of the Concepts," in Encyclopaedia of Bioethics, 4<sup>th</sup> Edition, Vol. 2, Warren T. Reich, ed. (New York: Free Press, 1978), pp. 583-84; Robert P. Hudson, Disease and its Control: The Shaping of Modern Thought (Westport, Conn.: Praeger, 1987), pp. ix -20; Charles E. Rosenberg, Explaining Epidemics and Other Studies in the History of Medicine (New York: Cambridge University Press, 1992).

<sup>3</sup>Risse (1978), p. 584.

<sup>4</sup>Two exceptions are Sol Epstein, "New Concepts in the Etiology of Osteoporosis," Transactions & Studies of the College of Physicians of Philadelphia Vol. 7 (3) (1985), pp. 177-187; and Daniel and Charlotte Schapira, "Osteoporosis: The Evolution of a Scientific Term," Osteoporosis International Vol. 2 (1992), pp. 164-167.

from its nineteenth-century origins as a description for porous bone to the late twentieth-century's most common metabolic bone disease, portrayed as a veritable epidemic in aging populations, especially women. Moreover, I will show that the disease was not recognized in the popular imagination until the third quarter of the century and I will explore the forces that led to this change.

### **Theoretical Background to the History of Disease**

Disease can be seen either as a biological reality (the medical model of illness)<sup>5</sup> or as a social construct. Neither interpretation of disease can, by itself, adequately account for the complex dimensions of the osteoporosis phenomenon, because they are complementary.<sup>6</sup> I have therefore examined both the "internalist" intellectual history of science and medicine which tracks scientific ideas about the disease, as well as the "externalist" view which investigates the interaction of science and medicine with social, political, philosophical and economic factors within the larger society.<sup>7</sup>

Diseases are ideas about human pain and suffering. They are constructed according to

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<sup>5</sup>For discussion of the biomedical perspective see: George Engel, "The Need for a New Medical Model: A Challenge for Biomedicine," in Concepts of Health and Disease: Interdisciplinary Perspectives, Arthur L. Caplan, H. Tristram Englehardt, Jr., and James J. McCartney, eds. (Reading, Mass.: Addison-Wesley Publishing Co. 1981), pp. 589-607; Lester S. King, "What is Disease," in Medical Thinking: A Historical Preface (Princeton: Princeton University Press, 1982), pp. 175-183.; S. E. D. Shortt, "Antiquarians and Amateurs: Reflections on the Writing of Medical History in Canada," in Medicine in Canadian Society: Historical Perspectives, S. E. D. Shortt, ed. (Montreal: McGill-Queen's University Press, 1981), pp. 1-17; Rosenberg, "Introduction," Framing Disease, pp. xiii- xiv; Jacalyn Duffin, "Tethering in Space: How I do My Research in the History of Medicine," Prairie Medical Journal Vol. 64 ( 3) (1994), pp. 101-103.

<sup>6</sup>For a critique of over-reliance on social constructivism and under-appreciation of the natural world, see Meera Nanda, "Against Social De(con)struction of Science: Cautionary Tales from the Third World," in In Defense of History: Marxism and the Postmodern Agenda, Ellen Meiksins Wood and John Bellamy Foster, eds. (New York: Monthly Review Press, 1997), pp. 74-96.

<sup>7</sup>For explanations of the terms internalist and externalist, see Richard Shryock, "The Interplay of Social and Internal Factors in Modern Medicine: An Historical Analysis," in Medicine in America (Baltimore: Johns Hopkins Press, 1966), pp. 307-332; Garland Allen, Life Sciences in the Twentieth Century (New York: Wiley & Sons, 1975), p. xii.

the conditions of biological existence as well as medical, cultural, and social beliefs of particular eras.<sup>8</sup> Diseases continue to evolve to keep up with differences in ideas about pain and suffering. Such shifting concepts about illness become changing discourses.<sup>9</sup> In turn, these concepts, the controversies they provoke, and practical applications from these ideas to health care delivery, powerfully influence the society within which they are held. The manner in which a disease is constructed, therefore, is not merely an abstruse philosophical enterprise, but also a significant tool of policy, which can affect the everyday lives and decisions of millions of people.<sup>10</sup>

Medicine has been described since Hippocrates as a synthesis of interactions between the doctor, the disease, and the patient.<sup>11</sup> Ideas about disease are formulated from a similar triad of observer (most often the physician), patient, and illness, which is the subjective response to disease by the sufferer. Several theories have been elaborated to describe this process.

### **Causal Theories**

Common causal theories for the origins of disease have altered in history, with some eras being dominated by explanations intrinsic to the patient, such as genetic and biochemical processes, and other times by extrinsic factors. External catalysts of disease might range from

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<sup>8</sup>Michel Foucault, The Birth of the Clinic: An Archaeology of Medical Perception, trans. A.M. Sheridan Smith (London: Tavistock Publications Ltd., 1973), p. 33; N. D. Jewson, "The Disappearance of the Sick-Man From Medical Cosmology, 1770-1870," Sociology Vol. 10 (1976), pp. 225-243 .

<sup>9</sup>Professor Jacalyn Duffin, History 883 lecture.

<sup>10</sup>For the significance of controversies in medicine to disease construction, see for example, Terra Ziporyn, "Introduction," Nameless Diseases (New Brunswick, N. J.: Rutgers University Press, 1992), pp. 1-9; H. Tristram Englehardt Jr. and Arthur L. Caplan, eds. Scientific Controversies: Case Studies in the Resolution and Closure of Disputes in Science and Technology (Cambridge: Cambridge University Press, 1987).

<sup>11</sup>Rosenberg, "Introduction," Framing Disease, p. xiii.

divine punishment or humoral imbalances in the body, to person-to-person contagion, climatological or other environmental influences. At times, both internal and external factors may be used to elucidate a single disease because the theories are not mutually exclusive.<sup>12</sup>

Since the late nineteenth century, explanations of specific diseases by extrinsic factors have dominated medical epistemology; ontological theory interprets disease as an entity separate from the healthy individual.<sup>13</sup> This hegemony of external explanations for disease in medical discourse has been significant for several reasons. It has led biomedical science for the past century to pursue the exploration of specific etiologies, diagnoses and therapies for each individual disease. In addition, thinking about disease as an entity "has had unquestionable value in campaigns to eradicate disease."<sup>14</sup>

By relying on external explanations of disease, medical knowledge also claims objectivity based on its ability to describe disease patterns among groups of patients. Ideas about causation of symptoms would be attached to visible body parts which could be observed.<sup>15</sup> Scholars describe the late nineteenth century as the pivotal point when medical scientists began to effectively differentiate diagnoses of similar diseases as separate entities on the basis of objective findings.<sup>16</sup> In turn, biomedicine has grown to value empirical observation over patients' subjective experiences.

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<sup>12</sup>Risse (1978), pp. 579-580.

<sup>13</sup>See for example, King, pp. 175-83; H. Tristram Englehardt Jr., "The Concepts of Health and Disease," in Concepts of Health and Disease, Arthur L. Caplan, H. Tristram Englehardt Jr., and James J. McCartney, eds. (Reading Mass.: Addison-Wesley Publishing Co, 1981), pp. 31-43.

<sup>14</sup>Hudson, p. 245.

<sup>15</sup>Risse (1978), p. 580.

<sup>16</sup>Rosenberg, "Introduction," Framing Disease, p. xviii; Hudson, pp. 136-137; Jewson, pp. 230-231.

In contrast, physiological or intrinsically-caused explanations for a disease muddy "the distinctions between healthy and diseased states, stress the uniqueness of each patient's illness, and internalize the pathological process by placing it in the organism."<sup>17</sup> Such physiological explanations emphasize an individual patient's outcome (prognosis) rather than diagnosis, and offer general treatments to address the bodily disturbances. Patient-blaming is more characteristic of those who subscribe to the physiological theory of disease. In the case of osteoporosis, while patients cannot be held responsible for their genetic makeup, they might be accused of 'unhealthy' behaviours. Yet individuals and populations, e.g. women or racial-ethnic groups, have been negatively stereotyped by purported genetic characteristics and equated with these traits. I will show that scientific attempts to explain osteoporosis have combined both internal and external causative factors to account for its complex origins in patient populations.

### **Patient-based Theories: Individual vs Population**

Independent of causal perspective, conventional biomedical thinking has been heavily influenced by the view of the sufferer: that disease is bad, discontinuous, and affects individual patients.<sup>18</sup> This dominant 'organismic' medical theory has been challenged, however, by attempts to integrate data relating to two characteristics of disease: the chronicity of some diseases, as a continuous illness within individuals--for example, in osteoporosis, bone loss is considered life long from age 35 and irreversible;<sup>19</sup> and factors arising from

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<sup>17</sup>Risse (1978), pp. 579-580.

<sup>18</sup>Rosenberg, "Introduction," Framing Disease, p. xix; Risse (1978), p. 584.

<sup>19</sup>For a discussion of physician and patient perspective on chronicity, see Anselm Strauss, "Chronic Illness," in The Sociology of Health and Illness: Critical Perspectives, Peter Conrad and Rochelle Kern, eds. (New York: St. Martin's Press, 1981), pp. 138-149.

epidemiology, the study of a disease's incidence, distribution, and control among populations, not individuals. Philosophical critics of the medical model recognize that the dominance of the organismic view of disease is an obstacle to prevention strategies: a solution would require a sea-change to a population view, which conceives of infirmity as continuous, and if not good, at least tolerable.<sup>20</sup>

Late twentieth-century critiques of the medical model and the scientific establishment have contributed to widening the range of patient responses towards traditional sources of biomedical knowledge and care. A continuum and mixture of lay attitudes has been identified, ranging from unquestioning belief and deference to cynicism, skepticism, distrust and fear.<sup>21</sup> Iatrogenic scandals have also served to erode the public's faith in the medical model.<sup>22</sup> In sum, these critical perspectives have posited a more nuanced understanding of the role of medicine in the history of disease: such theories challenge the unidimensional vision of scientific conquest of disease solely as a product of medicine's altruism and its intellectual and technological progress.

### Tools of Diagnosis

"Disease begins with perceived and often physically manifest symptoms."<sup>23</sup> Before

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<sup>20</sup>Risse (1978), pp. 584-585; Geoffrey Rose, "Sick Individuals and Sick Populations," International Journal of Epidemiology Vol. 14 (1) (1985), pp. 32-38; Rene Dubos, Man Adapting (New Haven: Yale University Press, 1965), p. 346.

<sup>21</sup>Critical works on issues such as power relationships in patient-doctor relationships were produced by social constructionists and others in the 1960's-1970's. For example, Ivan Illich, Limits to Medicine: Medical Nemesis: The Expropriation of Health (London: Marion Boyars, 1976); Michel Foucault (1973); Eliot Freidson, Professional Dominance: The Social Structure of Medical Care (Chicago: Aldine, 1970); Irving K. Zola, "Medicine as an Institution of Social Control," in Peter Conrad and Rochelle Kern, eds. The Sociology of Health and Illness: Critical Perspectives (New York: St. Martin's Press), pp. 511-527.

<sup>22</sup>See Illich (1973) for iatrogenic causes of disease.

<sup>23</sup>Rosenberg, "Introduction," Framing Disease, p. xvi.



the nineteenth century, symptoms were the only evidence available to let people know whether they were suffering from an illness. During the nineteenth century, the dominant medical paradigms shifted from the bedside, to clinical observations, and finally to laboratory medicine.<sup>24</sup> Since that time, innovative technologies and the application of the basic biological sciences to medicine have been crucial to the development of modern concepts about disease and cures.<sup>25</sup> Risse described the formulation of the modern Western biomedical model as "a gradual fine-tuning of distress sequences, established by a series of value judgments in response to the prevailing biological conditions."<sup>26</sup>

"Diagnosis and prognosis, the intellectual and social framing of disease, have always been central to the doctor-patient relationship."<sup>27</sup> As scientific inquiries shifted focus from observing organs and lesions to cells and their processes, reliance on laboratory findings gained importance. The inter-relationship between the patient and practitioner was irrevocably altered, as the value of patients' testimony of subjective illness was reduced, while the power and authority of medical expertise was augmented.<sup>28</sup> Prognosis (prediction of outcome) for an individual became contingent on the ability of practitioners to intervene in the disease process to provide treatment for the patient. Twentieth-century science has produced increasingly sophisticated explanations of disease causation, and thereby identification and a much increased range of therapeutic options. Explanation, control and

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<sup>24</sup>Jewson, pp. 225-243.

<sup>25</sup>Hudson, p. 123.

<sup>26</sup>Risse (1978), p. 584. See also Jewson, pp. 237-238 and Hudson, pp. 136-137.

<sup>27</sup>Rosenberg (1992), "Introduction," Framing Disease, p. xvii.

<sup>28</sup>Jewson, pp. 234-240; Rosenberg, "Introduction," Framing Disease, pp. xxii-xxiii.

prediction of distinct diseases by physicians was dramatically refined.<sup>29</sup> These factors were linked to the modern rise in power and prestige of medicine.<sup>30</sup>

### **Theoretical Background for the History of Osteoporosis**

In this thesis, I will show that all these epistemological and technological considerations have had a role to play in the construction of osteoporosis as a new disease. Since the Enlightenment, traditional voices of medicine have claimed that scientific discoveries are part of the inevitable march of progress. Such attitudes affect the way in which the medical establishment has been socialized to understand the disease entity and to communicate that knowledge to society. Medical approaches to research, diagnosis, treatment and preventative strategies are directly influenced by such values. Previous scholars, especially social constructionists, have analyzed medical epistemology, culture, and authority.<sup>31</sup> In particular, topics such as biological reductionism;<sup>32</sup> normality and abnormality;<sup>33</sup> and the ideology of risk have been important to the construction of late

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<sup>29</sup>Ziporyn, p. 5.

<sup>30</sup>Pellegrino, pp. 245-246.

<sup>31</sup>For social construction of knowledge in general, see Peter L. Berger and Thomas Luckmann, The Social Construction of Reality: A Treatise in the Sociology of Knowledge (Garden City: Anchor Books, Doubleday, 1966), especially on reification, pp. 88-92. For social construction of medicine specifically, see Peter Wright, "Introduction," in The Problem of Medical Knowledge: Examining the Social Construction of Medicine, Peter Wright and Andrew Treacher, eds. (Edinburgh: Edinburgh University Press, 1982), pp. 9-11; Peter Conrad and Joseph W. Schneider, "Professionalization, Monopoly, and the Structure of Medical Practice," The Sociology of Health and Illness: Critical Perspectives, Peter Conrad and Rochelle Kern, eds. (New York: St. Martin's Press, 1981), pp. 155-164.

<sup>32</sup>See Ludwik Fleck, Genesis and Development of a Scientific Fact (Chicago: University of Chicago Press, 1979).

<sup>33</sup>See for example, Berger and Luckmann, pp. 166-173; Georges Canguilhem, On the Normal and the Pathological (Dordrecht, Boston, Lancaster: D. Reidel, 1978); Horacio Fabrega, Jr. "The Scientific Usefulness of the Idea of Illness," in Concepts of Health and Disease, Arthur L. Caplan, H. Tristram Englehardt Jr., and James J. McCartney, eds. (Reading, Mass.: Addison-Wesley, 1981), pp. 131-141; Abram de Swaan, The Management of Normality: Critical Essays in Health and Welfare (London and New York, Routledge, 1990); Deborah Lupton, Medicine as Culture: Illness, Disease, and the Body in Western Societies (London: Sage

twentieth century medical knowledge.<sup>34</sup> I will show how the medical definition of osteoporosis is full of statistical ambiguities. Social constructionists have asserted that such numerical evidence can be interpreted in different ways, i.e. the facts do not necessarily speak for themselves. Nonetheless, the dominant positivist interpretation which quantifies physiological processes has led research and clinical practices in particular directions. I will also look at how medical assumptions about the disease process defined the patients, epidemiologically and socially.

A number of scientific discoveries are crucial to understanding how osteoporosis evolved and is presently conceived. Here I have relied upon several historians who studied the iterative process by which technology and medicine interacted.<sup>35</sup> I will specifically address the history of relevant pharmacological therapeutics and diagnostic tools, and the

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Publications, 1994), p. 85; Foucault (1973), p. 35; Hudson, p. 240.

<sup>34</sup> On probability in the construction of scientific knowledge, see Ernest Nagel, The Structure of Science: Problems in the Logic of Scientific Explanation (New York: Harcourt, Brace, & World, Inc. 1961), pp. 22-23; On relationship of 'risk' to 'disease' in epidemiology, Judith S. Mausner and Shira Kramer, Epidemiology: An Introductory Text, 2nd Edition (Philadelphia: W. B. Saunders, 1985), pp. 6-7. On victim-blaming and risk, see Robert Crawford, "You Are Dangerous to Your Health: The Ideology and Politics of Victim Blaming," International Journal of Health Services Vol. 7 (4) (1977), pp. 663-680. For debates between varying interpreters on concept of 'risk' see Anthony Giddens, The Consequences of Modernity (Cambridge, U. K.: Polity Press, 1992), pp. 131-134; Michel Foucault, "Governmentality" in The Foucault Effect, G. Burchell, C. Gordon, and P. Miller, eds. (Brighton: Harvester Wheatsheaf, 1991), pp. 87-194; Bryan S. Turner, "From Governmentality to Risk: Some Reflections on Foucault's Contribution to Medical Sociology," and Alan Petersen, "Risk Governance and the New Public Health," and Sarah Nettleton, "Governing the Risky Self: How to Become Healthy, Wealthy and Wise," in Alan Petersen and Robin Bunton, eds., Foucault, Health and Medicine (London: Routledge, 1997) all 3 articles, respectively pp. ix-xxi, pp. 189-206, 207-222; David Powell and William Leiss, "A Diagnostic for Risk Communication Failures," in Mad Cows and Mother's Milk: The Perils of Poor Risk Communication (Montreal and Kingston: Queen's -McGill Press, 1997), pp. 26-40.

<sup>35</sup>See Stanley J. Reiser, Medicine and the Reign of Technology (Cambridge: Cambridge University Press, 1978); Audrey B. Davis, Medicine and Its Technology: An Introduction to the History of Medical Instrumentation (Westport, Conn.: Greenwood Press, 1981); Joel D. Howell, Technology in the Hospital: Transforming Patient Care in the Early Twentieth Century (Baltimore: The Johns Hopkins University Press, 1995); Bertmann Holtzmann Kevles, Naked to the Bone: Medical Imaging in the Twentieth Century (New Brunswick, N. J.: Rutgers University Press, 1997).

interplay of these technologies with medical practices.<sup>36</sup>

Prior to the post-World War II era, traditional historians of medicine paid little attention to either non-elite or patient viewpoints. Social constructionist and subsequent post-modernist critics have asserted that scientific belief systems contribute to the inequitable power in the doctor-patient relationship. They argue that the immense prestige of the bioscientific model and the power of the medical establishment in the late 20<sup>th</sup> century have made it difficult for individuals "at risk," those already affected by disease, or the public at large to challenge the received wisdom.<sup>37</sup>

Feminism, consumerism, and the grey power movements, which originated in their contemporary forms in the 1960's and came to full flowering during the 1970's, have helped alter patient perspectives. Of particular importance to the way we understand osteoporosis, the feminist and grey power movements have pointed out the social construction of gender and aging. Not only is osteoporosis "bad" in medical perspectives, but aging itself with its associated loss of function and potential for physical deformity has been depicted negatively in iconographic and literary sources during much of Western history.<sup>38</sup> For these issues I

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<sup>36</sup>On therapeutics see Erwin H. Ackerknecht, "Aspects of the History of Therapeutics," Bulletin of the History of Medicine Vol. 36 (1962), pp. 389-419; Edmund D. Pellegrino, "The Sociocultural Impact of Twentieth-Century Therapeutics," in The Therapeutic Revolution: Essays in the Social History of American Medicine, Morris J. Vogel and Charles E. Rosenberg, eds. (Philadelphia: University of Pennsylvania Press, 1979), pp. 245-268. John H. Warner, The Therapeutic Perspective. Medical Practice, Knowledge, and Identity in America, 1820-1885 (Cambridge, Mass.: Harvard University Press, 1986); Guenter B. Risse, "The History of Therapeutics," in Clio Medica: Essays in the History of Therapeutics, W.F. Bynum and V. Nutton, eds. Vol. 22 (Amsterdam-Atlanta: Rodopi, 1991), pp. 3-11.

<sup>37</sup>Roy Porter, "The Patient's View: Doing Medical History from Below," Theory and Society Vol. 14 (1985), pp. 181-182; Guenter B. Risse and John Harley Warner, "Reconstructing Clinical Activities: Patient Records in Medical History," Social History of Medicine Vol. 5 (1992), pp. 183-84; Rosenberg, "Introduction," Framing Disease, p. xv; Peter Wright (1982), "Introduction," pp. 3-4 ; and Lupton, p. 80.

<sup>38</sup>Thierry Appelboom and Jean-Jacques Body, "The Antiquity of Osteoporosis: More Questions than Answers," Calcified Tissue International Vol. 53 (1993), p. 367. On stereotyping in general see Sander Gilman, "Introduction: What Are Stereotypes and Why Use Texts to Study Them?" in Differences and Pathology:

have relied upon feminist historians who study women's bodies and disease,<sup>39</sup> and on feminist critiques of modern medicine.<sup>40</sup> Socialist/marxist critiques of medicine in capitalist society have also been woven into some of these critical perspectives, and I have also examined the history and role of economic forces upon developments in medicine.<sup>41</sup> Specifically, I have focused on the financial bonanza reaped by the drug and the bone densitometry industries.<sup>42</sup>

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Stereotypes of Sexuality, Race and Madness (Ithaca: Cornell University Press, 1985), pp. 15-35. On stereotyping of physical appearance, see Jane Sprague Zones, "Beauty Myths and Realities and their Impact on Women's Health," in Sheryl Burt Ruzek, Virginia L. Olesen, Adele E. Clarke, eds. Women's Health: Complexities and Differences (Columbus: Ohio State University Press, 1997), pp. 249-275.

<sup>39</sup> Carroll Smith-Rosenberg and Charles Rosenberg, "The Female Animal: Medical and Biological Views of Woman and Her Role in Nineteenth-Century America," Journal of American History (Vol. LX, (2) (September 1973), pp. 332-356; Carroll Smith-Rosenberg, Disorderly Conduct: Visions of Gender in Victorian America (New York: Alfred Knopf, 1985); Wendy Mitchinson, The Nature of Their Bodies: Women and Their Doctors in Victorian Canada, (Toronto: University of Toronto Press, 1991); Londa Schiebinger, "Skeletons in the Closet: The First Illustrations of the Female Skeleton in Eighteenth Century Anatomy," and Mary Poovey, "Scenes of an Indelicate Character: The Medical 'Treatment' of Victorian Women," in The Making of the Modern Body: Sexuality and Society in the Nineteenth Century, Catherine Gallagher and Thomas Laquer, eds. (Berkeley: University of California Press, 1987), pp. 42-82 and pp. 137-168 respectively; Emily Martin, "Toward an Anthropology of Immunology: The Body as Nation State," Medical Anthropology Quarterly Vol. 4 (4) (December 1990), pp. 410-426.

<sup>40</sup>Claudia Dreifus, ed., Seizing Our Bodies: The Politics of Women's Health (New York: Vintage Books, Random House, 1977); Joyce Leeson and Judith Gray, Women and Medicine (London: Tavistock Publications, 1978); Sheryl Burt Ruzek, The Women's Health Movement: Feminist Alternatives to Medical Control (New York: Praeger, 1978); Anne Fausto-Sterling, Myths of Gender: Biological Theories about Women and Men (New York: Basic Books, Inc., 1985); Ellen Lewin and Virginia L. Olesen, Women, Health, and Healing: Toward a New Perspective (New York: Tavistock Publications, 1985); Nancy Worcester and Mariamne H. Whatley, eds., Women's Health: Readings on Social, Economic and Political Issues (Dubuque, Ia.: Kendall Hunt Publishers, 1988); Kathryn S. Ratcliff, et al. eds., Healing Technology: Feminist Perspectives (Ann Arbor: University of Michigan Press, 1989); Rima D. Apple, ed., Women, Health and Medicine in America: A Historical Handbook (New York: Garland Publishing Inc., 1990); Susan Sherwin, No Longer Patient: Feminist Ethics and Health Care (Philadelphia: Temple University Press, 1992).

<sup>41</sup>For example, Barbara Ehrenreich and Deirdre English, For Her Own Good: 150 Years of Experts' Advice to Women (New York: Anchor Books, Doubleday, 1978); Vicente Navarro, Dangerous to Your Health: Capitalism in Health Care (New York: Monthly Review Press, 1993); Chris Phillipson, Capitalism and the Construction of Old Age (London: MacMillan Press Ltd., 1982); Meredith Turshen, The Politics of Public Health (New Brunswick, N.J.: Rutgers University Press, 1989).

<sup>42</sup>On the drug industry see Paul K. Gorecki, "Introduction" in Controlling Drug Expenditure in Canada: The Ontario Experience (Ottawa: The Economic Council of Canada and the Ontario Ministry of Health, 1992); Jonathan Liebenau, Medical Science and Medical Industry: The Formation of the American Pharmaceutical Industry (London: MacMillan Press and Business History Unit, University of London, 1987); Joel Lexchin, The Real Pushers: A Critical Analysis of the Canadian Drug Industry (Vancouver: New Star Books, 1984); Kathleen McDonnell, ed., Adverse Effects: Women and the Pharmaceutical Industry (Toronto: Women's

Scholars have theorized about the appearance of "new" diseases in particular epochs, although few diseases from a biological perspective can be considered to be without historical antecedents.<sup>43</sup> Demographics, changes in social attitudes, the ability of science to detect early stages of disease in large population groups, and the availability of treatments, have contributed to disease recognition, in the case of osteoporosis.

### **Evidence for the Rise of Osteoporosis: Literature Searches**

A recent editorial in a prestigious medical journal described the overwhelming prevalence of the ailment's defining clinical symptom, osteoporotic fractures, which "affect 50 percent of women and 30 percent of men over the age of 50 years."<sup>44</sup> As recently as 1986, another authoritative journal led off an editorial about bone density screening with the following sentence: "Osteoporosis, once considered a boring disease if considered at all, has now become fashionable."<sup>45</sup> Given the industrial world's increased life expectancy as well as

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Educational Press, 1986); Jacalyn Duffin, Chapter 5 on Pharmacology, History of Medicine (Toronto: University of Toronto Press, forthcoming); Mildred K. Cho, "FUNDamental Conflicts of Interest," posted at the internet site [http://biomednet.com/hmsbeagle/1998/24/people/op\\_ed.htm](http://biomednet.com/hmsbeagle/1998/24/people/op_ed.htm) (January 30, 1998) Issue 24, p. 1. On the bone densitometry industry, I have relied on feminist critiques such as Mariamne H. Whatley and Nancy Worcester, "The Role of Technology in the Co-optation of the Women's Health Movement: The Cases of Osteoporosis and Breast Cancer," in Healing Technology, Kathryn Strother Ratcliff, ed., (Ann Arbor: The University of Michigan Press, 1989), pp. 199-220; Maryann Napoli, "Screening for Osteoporosis: An Idea Whose Time Has Not Yet Come," in Women's Health Readings Worcester and Whatley, eds. (Dubuque, Ia.: Kendall/Hunt Publishers, 1988), pp. 115-119; Maryann Napoli, "Bone Scam," Ms (March/April 1997), pp. 28-30; Sandra Coney, The Menopause Industry: How the Medical Establishment Exploits Women (Alameda, California: Hunter House, 1994).

<sup>43</sup>Historians of medicine have chronicled the appearance of many other 'new' diseases, and behaviours which 'become' diseases. For example, Mirko D. Grmek, History of AIDS (Princeton: Princeton University Press, 1990); Joan Jacobs Brumberg, Fasting Girls: The Emergence of Anorexia Nervosa as a Modern Disease (Cambridge, Mass.: Harvard University Press, 1988); and Michael Macdonald, "The Medicalization of Suicide in England: Laymen, Physicians, and Cultural Change, 1500-1870," in Rosenberg and Golden (1992), pp. 85-103.

<sup>44</sup>Richard L. Prince, "Diet and the Prevention of Osteoporotic Fractures," New England Journal of Medicine Vol. 337 (10) (September 4, 1997), p. 701.

<sup>45</sup>Susan Ott, "Should Women Get Screening Bone Mass Measurements?" Annals of Internal Medicine Vol. 104 (6) (June 1986), p. 874. Underlining added.

the demographic bulge in the proportion of older people, interest in chronic diseases among seniors is understandable, from medical, health policy, and economic vantage points. Yet fifty years ago, this apparently epidemic disease did not exist.

Many indicators can be invoked as evidence for the rise in osteoporosis: for example, the history of the Osteoporosis Society of Canada indicated that the organization rapidly expanded from its birth in 1982 to the present. But in the remainder of this chapter, I will set out the evidence for the rise of a new disease as found in medical and lay literature. Then in Chapter 2, I will show that the word osteoporosis originated in the early nineteenth century: it was only during the last two decades, however, that the patterns in frequency of citations in popular and scientific literature and standard English language dictionaries have indicated markedly increased interest in osteoporosis. The following survey demonstrates the recent rise in awareness of osteoporosis, known as “the silent thief of bone,”<sup>46</sup> as a disease concept.

**Dictionaries.** I reviewed 29 twentieth-century English language dictionaries published in 1955-1997 to discern when osteoporosis entered common lay usage.<sup>47</sup> The relative obscurity of this word/concept until the last quarter of the twentieth century was apparent. In the earliest fourteen dictionaries (1955-1975) shown in Table 1.1, there were only two citations for osteoporosis, one in 1961 and another in 1973, both in U.S. dictionaries. In contrast, 11 of the 15 reference books in the later grouping (1978-1997) mentioned osteoporosis. The absence of osteoporosis in the earlier group is especially

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<sup>46</sup>William A. Peck and Louis V. Avioli, *Osteoporosis: The Silent Thief* (Glenview, Ill.: Scott Foresman and Company, 1988), AARP Book (American Association of Retired People). I have found many other uses of the descriptor, “silent”, such as in D. and C. Schapira, who call the disease the “silent thief of bone.” p. 166.

<sup>47</sup>No dictionary published prior to 1955 remained in the reference collections of Stauffer Library or the downtown Kingston Public Library.

### Osteoporosis in Dictionaries

**Table 1.1** Emergence of Term "Osteoporosis" in English Language Dictionaries 1955-1997

<u>Pub. Year</u>	<u>Name of Dictionary</u>	<u>Country</u>	<u>Inclusion of Term</u>	
			<u>No</u>	<u>Yes</u>
1955	Webster's New World	U.S.	✓	
1958	Origins: A Short Etymologica	U.K.	✓	
1961	Webster's 3rd Unabridged	U.S.		✓
1966	Oxford Dictionary of English Etymology	U.K.	✓	
1966	Random House	U.S.	✓	
1967	Dictionary of Canadian English (Senior)	Can.		
1967	A Comprehensive Etymology	U.K.	✓	
1969	American Heritage Dictionary	U.S.	✓	
1972	Webster's 7th New College	U.S.	✓	
1973	Chambers 20th Century	U.S.		✓
1973	Barnhart Dictionary of New English	U.S.	✓	
1973	A Shorter Oxford	U.K.	✓	
1975	Oxford Illustrated	U.K.	✓	
1975	Random House College	U.S.	✓	

n= 14 Over 20 years there were 2 inclusions of the term "osteoporosis"

1978	Funk and Wagnalls	Can.		✓
1980	Houghton- Mifflin	Can	✓	
1983	Cambers 20th Century	U.S.		✓
1983	Gage	Can.	✓	
1984	Webster's 9th	U.S.		✓
1987	Collins Cobuild	U.K.	✓	
1987	Random House 2nd Unabridged	U.S.		✓
1987	Facts on File Encycl. of Word Origins	U.S.	✓	
1988	Webster's New World	U.S.		✓
1989	The New Lexicon Webster's	U.S.		✓
1989	Oxford English 2nd Edition	U.K.		✓
1991	Longman's	U.K.		✓
1996	Random House/Websters	U.S.		✓
1997	ITP Nelson	Can.		✓
1997	Gage Canadian	Can.		✓

n=15 Over 19 years there were 11 inclusions of the term "osteoporosis"



noticeable, because the majority contained definitions of medical terms for other relatively unfamiliar bone conditions, including osteoma, osteomalacia, and osteomyelitis.

**Medical Journals.** Occasional references to osteoporosis in major European languages peppered the medical literature for more than a hundred years.<sup>48</sup> In a methodical search through Index Medicus I identified only a sparse 6 citations referenced world-wide in the period from 1879 to 1899 (Table 1.2a). In a further search of every fifth year from 1905 to 1935, I found an additional 29 citations, with more than half of this total published in the last year (Table 1.2b).<sup>49</sup> Although measurements of research are fraught with difficulty, interest in this disease was clearly not waning.

A crude estimate of references was used to generate comparative data for total number of medical references in the Index Medicus between 1935-1965 as shown in Table 1.4a. It indicates growth rates in total medical references of 39% between 1935-65 and 23.8% between 1960-1965, while osteoporosis citations enumerated for Table 1.3 show an increase in osteoporosis references of 88% during that same 5 year period. Using the 1935 figure as a base, Table 1.4b confirms the assumption that research interest in osteoporosis was accelerating at a faster pace than the rate for all medical studies from about the early 1960's. A considerable drop in research activity between 1935-1950 corresponds to the diversion of resources during World War II and the immediate post-war recovery period.

Medline cites more than 11,000 medical and scientific articles on osteoporosis

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<sup>48</sup>Bennett, "Senile osteoporosis," Dublin Journal of Medical Science 3s (lxvi) (1878), pp. 272-74. (No initial for Bennett was found either in Index Medicus or Index of Surgeon General).

<sup>49</sup>A year by year perusal of the 1879-1899 volumes of Index Medicus turned up 6 citations to osteoporosis; from 1905 (the 1900 volume was missing from Bracken Library) to 1935 a search through every fifth year yielded 29 additional references, with 16 of these in 1935. "Osteoporosis" is used inconsistently by the editors of the Index during this period, rarely as a subject heading, and mostly found as part of a publication's title.

## Osteoporosis in Medical Literature

**Table 1.2a** Number of Citations Using "Osteoporosis" As Key Word in Index Medicus, 1879-1899

Years	<u>1879-1899</u>
# of Articles	6

Source: Index Medicus, All years surveyed 1879-1899

**Table 1.2b** Number of Citations Referring to "Osteoporosis" As Key Word in Index Medicus, 1905-1935

Years	<u>1905</u>	<u>1910</u>	<u>1915</u>	<u>1920</u>	<u>1925</u>	<u>1930</u>	<u>1935</u>	<u>Total</u>
# of Articles	3	0	0	0	2	8	16	29

Source: Index Medicus, Selected Years 1905 -1935

**Table 1.3** Number of Citations (Per Annum) Referring to "Osteoporosis" As Key Word in Index Medicus, Selected Years 1935-1965

Years	<u>1935</u>	<u>1940</u>	<u>1945</u>	<u>1950</u>	<u>1955</u>	<u>1960</u>	<u>1965</u>
# of References	16	13	10	14	20	78	147

Source: Index Medicus, Selected Years 1935-1965

### Osteoporosis in Medical Literature

**Table 1.4a** Crude Estimate of Total Periodical References for Selected Years 1935-1960\*

<u>Year</u>	<u>Aver. = Citations Per Page</u>	<u>Pages</u>	<u>Estimate of Total References</u>
1935	74.8	2773	207,420
1940	72	2202	158,544
1945	75	1659	124,425
1950	65.2	2899	189,015
1955	60.6	3338	202,283
1960	98.2	2372	232,930
1965	162.8	1771	288,319

\*The methodology suggested by Professor Jacalyn Duffin was to count the number of citations on 5 consecutive pages per year, add them and then divide by 5 to find an average number of references per page. The number of pages of periodical references was totalled and the two figures multiplied.

Source: Index Medicus

**Table 1.4b** Corrected Rate of Osteoporosis Citations in Index Medicus 1935-1960\*

<u>Year</u>	<u>Articles on Osteoporosis</u>	<u>Estimate of Total Medical References**</u>	<u>Corrected Rate of Osteoporosis Articles</u>
1935	16	207,420	16
1940	13	158,544	16.9
1945	10	124,425	16.7
1950	14	189,015	15.4
1955	20	202,283	20.5
1960	78	232,930	69.4
1965	147	288,319	105.7

\*In Table 1.4b, 1935 the base year 1935 is used for the calculations to show how the proportion of osteoporosis research compares to the estimate of total medical research during the period. The formula, suggested by Professor Jacalyn Duffin, divided the number of articles on osteoporosis in a given year by the total medical articles estimated for that year and then multiplied the result by 207,420.

\*\* See Table 1.4a for the calculations by which these figures were derived.

Source: Index Medicus

published world-wide between 1965 and September 1997.<sup>50</sup> During these last three decades, the frequency of publications has been growing, with a dramatic increase during the last ten years. A significant increase in references to articles on osteoporosis by a group of nine prestigious English-language medical journals<sup>51</sup> was also documented during the same period, as demonstrated in Table 1.5a. I have shown in Table 1.5b that growth in research on osteoporosis dramatically outstripped the rate of production for all medical articles beginning in the 1980's. In the four years after 1984, osteoporosis research activity grew five times faster than the rate for all medical literature.

**Other Periodical Literature.** Table 1.6 shows the contemporary rise in interest in osteoporosis in the United States as reflected in the frequency of references to the term in the Readers Guide to Periodical Literature during the 1950's to the 1990's. Guides to general periodical literature overlap to some degree with those of the scientific literature. For example, medico-scientific discoveries reported in Science are frequently cited in the Reader's Guide, which reflects more general public awareness than citations in professional publications. Data in Table 1.5a, therefore, is not completely separate from that in Table 1.6.

No reference to the term osteoporosis, as a cross-reference or subject heading, was found until the 1959-61 Reader's Guide. In this volume where the key word osteoporosis appears for the first time, relevant articles are found under the heading "Bone, disease;" the term osteoporosis, however, did not appear in their titles. In August 1970, the first article

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<sup>50</sup>Approximately 33,000 new citations are added to medline each month: about 7,300 weekly and 350,000-400,000 annually, according to the National Library of Medicine. Data was posted on February 24, 1998 at <http://www.nlm.nih.gov/databases/medline.html> and supplied by Suzanne Maranda at Bracken Library.

<sup>51</sup>Annals of Internal Medicine; British Medical Journal; Canadian Medical Association Journal; Journal of Clinical Investigation; Journal of the American Medical Association; Lancet; Nature; New England Journal of Medicine; and Science

### Osteoporosis in Medical Literature

**Table 1.5a** Number of Osteoporosis Citations on Medline 1965- Sept .1997

Years	<u>1965-75</u>	<u>1976-86</u>	<u>1987-1997</u>	<u>(Total)1965-1997</u>
Total # of Articles	2,728	2,990	5,285	11,003
% Increase	0	9.6	76.8	
Total # in 9 Elite Journals*	164	195	277	636
% Increase	0	18.9	42.1	

\*Elite English Language Journals Include: Annals of Internal Medicine; British Medical Journal; Canadian Medical Association Journal; Journal of Clinical Investigation; Journal of the American Medical Association; Lancet; Nature; New England Journal of Medicine; and Science.

Source: Medline Search. 1966 - September 24, 1997.

**Table 1.5b** Growth in Osteoporosis Citations Compared to All Citations in Medline 1966-1997

<u>Years</u>	<u>Osteop.Citations</u>	<u>All Citations</u>	<u>% Growth 'O'</u>	<u>% Growth for All</u>
1966-74	2385	1,986,485	n/a	n/a
1975-79	1162	1,279,100	-51.3	-35.6
1980-84	1303	1,389,032	+12.1	+08.6
1985-89	2241	1,688,907	+72.0	+21.6
1990-94	3589	1,900,512	+60.2	+12.5
1995-97*	2477	1,101,576	+38.0	+15.9

\*Percentage of growth has been corrected for the 2 year period.

Source: Medline Search for Osteoporosis citations, February 26, 1998; Data for total citations in Medline, National Library of Medicine, Internet Site, February 24, 1998.

### Osteoporosis in Lay Literature

**Table 1.6** Number of Citations Using Keyword "Osteoporosis" in American Periodicals for Selected Years between 1950 - 1996\*

Years	<u>7/39 - 2/59</u>	<u>3/59-2/81</u>	<u>3/84-3/85</u>	<u>1990</u>	<u>1995</u>	<u>1996</u>
# of Citations	0	11	13	19	19	23
Increase %	--	∞	18.2	46.2	0	21

Source: Readers Guide to Periodical Literature, Selected Years between 1950-1996

\*Every year was surveyed between the July 1939/June 1941 volume and the March 1980/February 1981. Subsequent years were analyzed at 5 year intervals.

about osteoporosis appeared in a national news weekly.<sup>52</sup> It was only in the 1984-85 volume that osteoporosis became a full subject heading with its own citations. From 1985 to the present, a rising awareness about the disease in a specific segment of the North American population becomes evident when an increased number of articles appear across a broad melange of popular women's magazines, news weeklies, and health-related publications.

A search at five-year intervals for the term osteoporosis in the Canadian Periodical Index showed a similar pattern to that found in the Reader's Guide. The first 6 articles about osteoporosis in Canada appeared between 1981- 1984 (2 in 1981, 2 in 1983, and 2 in 1984), listed under "bone disease," but a dramatic rise in articles only occurred in popular publications from 1985 onward (Tables 1.7a and 1.7b).

Similarly, a 5 year interval survey of the New York Times Index from 1940-1995 (Tables 1.8a and 1.8b) showed a rise in news articles under the subject heading osteoporosis, beginning in the mid-1970's, but with a steeper growth rate after 1985. A few articles about bones and bone metabolism, which may or may not have mentioned osteoporosis, appeared in the New York Times Index in 1950, 1955, and 1970.<sup>53</sup> The first cross-reference to osteoporosis under "Bone, disease" occurred in 1975, but a separate subject heading for osteoporosis did not appear until the 1980 volume. Seven articles appeared between 1981-1984, five of them in the 1984.

Finally, the Canadian Newspaper Index had no references to osteoporosis under "bone" or osteoporosis until 1990 (Table 1.9). Using the keyword "disease" in intervening

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<sup>52</sup>"Strengthening Brittle Bones," Time Vol. 96 (August 17, 1970), pp. 43-4.

<sup>53</sup>For example, in 1950 an article about new technology for measuring bone density appeared in the New York Times Vol. 31 (April 20, 1950), p. 2.

## Osteoporosis in Canadian Periodical Literature

**Table 1.7a** Number of Citations to "Osteoporosis" in the Canadian Periodicals for Selected Years 1920-1980

<u>Years</u>	<u>1920-1940</u>	<u>1940-1960</u>	<u>1960-1980</u>
# of Citations	0	0	0

Source: Canadian Periodical Index. Selected Years 1920-1980

**Table 1.7b** Number of Citations to "Osteoporosis" in the Canadian Periodicals for Selected Years 1985-1996

<u>Years</u>	<u>1985</u>	<u>1990</u>	<u>1995</u>	<u>1996</u>
# of Citations	7	11	8	11
% Increase	--	57.1	-27.3	37.5

Source: Canadian Periodical Index. Selected Years 1985-1996



### Osteoporosis in Newspapers

**Table 1.8a** Number of Citations Using Key Word "Osteoporosis" in the New York Times 1940-1970

<u>Year</u>	<u>1940</u>	<u>1945</u>	<u>1950</u>	<u>1955</u>	<u>1960</u>	<u>1965</u>	<u>1970</u>
# of Citations	0	0	0	0	0	0	0

Source: New York Times Index, Selected Years in 5 year intervals between 1940-1970

**Table 1.8b** Number of Citations Annually Using Key Word "Osteoporosis" in the New York Times 1975-1995

<u>Years</u>	<u>1975</u>	<u>1980</u>	<u>1985</u>	<u>1990</u>	<u>1995</u>
# of Citations	1	4	0	9	9
% Increase	--	300	--	$\infty$	--

Source: New York Times Index, Selected Years in 5 year intervals 1975-1995

**Table 1.9** Number of Citations Annually to Keyword "Osteoporosis" in Canadian Newspapers 1977-1997

<u>Years</u>	<u>1977</u>	<u>1980</u>	<u>1985</u>	<u>1990</u>	<u>1995</u>	<u>1997</u>
# of Citations	0	0	0	9	42	39

Source: Canadian Newspaper Index, Selected Years 1977-1990; and Winspir search of the Canadian Business and Current Affairs index of 9 newspapers for 1995 and 1997, April 15, 1998 by Elizabeth Bruton. of Stauffer Library

years revealed 2 articles on osteoporosis had appeared in the Canadian press in 1984, but the disease was not given its own sub-heading under osteoporosis until 1986. An electronic search identified significant interest in the disease in the Canadian press by 1995 and 1997.<sup>54</sup>

Table 1.10 summarizes the dates and source locations for the years when osteoporosis became a key word in both medical and lay literature.

### **Osteoporosis: Evidence for a New and Gendered Disease**

Not only has osteoporosis grown in frequency in its appearance in literature, it has also become a gendered disease. When I began my research, the variety of definitions which came from different lay and medical perspectives sparked my interest in studying the historical and epistemological origins of this disease (See Appendix I). The readings were more mixed than I had expected, however, in regard to my assumptions that osteoporosis is a women's disease. In part, I was influenced by my personal and professional interest in women's health issues; in part, I had been affected by popular and medical literature, which has framed osteoporosis as a women's disease, and encouraged postmenopausal woman to take hormones to avoid diseases of aging.

In medical writings, being old and female appears to have been conflated with being osteoporotic. For example, "Osteoporosis is the most common metabolic bone disease in the elderly affecting an estimated 25% of postmenopausal women in North America;" and, osteoporosis is "a condition characterized by attenuation of bone, representing the most

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<sup>54</sup>Winspir Search, Canadian Business and Current Affairs (C. B. C. A), April 15, 1998, by Elizabeth Bruton, Stauffer Library.

**Recognition of "Osteoporosis" in Medical and Lay Literature  
as Key Word or Subject Heading**

**Table 1.10** Year of Appearance of "Osteoporosis" As Key Word  
Or Subject Heading in Medical and Lay Literature

<u>Date</u>	<u>Location</u>
1959/61	<u>Readers Guide to Periodical Literature</u> as cross-reference
1961	<u>Webster's Unabridged Dictionary</u> -definition
1980	<u>New York Times Index</u> --"osteoporosis" as key word
1981	<u>Canadian Periodical Index</u> --under "bone disease"
1984	<u>Canadian Newspaper Index</u> --under "disease"
1984/85	<u>Reader's Guide to Periodical Literature</u> -- as subject heading
1985	Medline Mesh* heading, <u>Index Medicus</u>

\*There are over 15,000 Medical Subject Headings in the 'Mesh' system. Its key words and headings may change "to reflect the fast growing health care disciplines." The data base vocabulary, updated annually, is indexed by the U. S. National Library of Medicine.

common morbid condition of the elderly female."<sup>55</sup> During the 1966-1997 period, Medline citations showed female sub-headings under the topic osteoporosis were four times more frequent than male sub-headings, while female to male ratios for all citations to female and male sub-headings were only twice as numerous (Table 1.11).<sup>56</sup>

In Table 1.11, the majority of osteoporosis references (81%) did not specify sub-headings by either sex. Approximately 15% of the total number of citations for the entire period were linked with the sub-heading "female;" only 4% of the total were identified by the sub-heading "male." According to Dr. E. R. Yendt, The Osteoporosis Society of Canada, and other sources, osteoporosis has been understood recently to being a concern for both sexes. I will argue, however, that the overwhelming weight of associations in the popular imagination have been that osteoporosis is an aging woman's disease, and as a consequence, it has been ascribed by society with certain attitudes and values.<sup>57</sup> Indeed, the history of osteoporosis has been difficult to disentangle from the history of menopause and the history of hormone replacement therapy.

Osteoporosis clearly grew as a disease in medical and public awareness between the 1960's and the 1980's. Later chapters will explain the significance of events in the early to

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<sup>55</sup>Canadian Multicentre Osteoporosis Study (CAMOS), Protocol (Montreal, January 1995), p. 1; and Current Med Talk: A Dictionary of Medical Terms, Slang and Jargon (Stamford, Conn: Appleton & Lange, 1995), p. 632.

<sup>56</sup>On the sexism inherent in medical indexing and its effects since 1880 on reinforcing such attitudes in medical thinking, see Diana E. Long, "Hidden Persuaders: Medical Indexing and the Gendered Professionalism of American Medicine, 1880- 1932," in Women, Gender, and Science: New Directions, Sally Gregory Kohlstedt and Helen E. Longino, ed. Osiris Vol. 12 (1997), pp. 100-120.

<sup>57</sup>Socio-cultural valorization and stereotyping of diseases other than those associated with gender and age have been amply studied by previous writers. See for example, cancer and tuberculosis in Susan Sontag, Illness as Metaphor (New York: Farrar, Straus, and Giroux, 1978) and venereal diseases, Allan M. Brandt, No Magic Bullet: A Social History of Venereal Disease in the United States Since 1880 (New York, Oxford University Press, 1987).

### Gender in Medical Citations

**Table 1.11** Medline Citations--Subheadings by Sex

<u>Years</u>	<u>1966- 1980</u>	<u>1981-1992</u>	<u>1993-97*</u>	<u>Total 1966-97</u>
<u># of References</u>				
♂ & Osteop	23	206	251	480
♀ & "	155	894	594	1,643
Total Osteop	3,872	4,620	2,511	11,003
Total ♂	11,421	46,200	31,492	89,113
Total ♀	25,481	83,387	56,372	165,240

\* 4 year span

Source: Medline Search. 22 September 1997

mid-1980's which signaled a turning point when osteoporosis exploded as a phenomenon. According to Charles Rosenberg, "In some ways disease does not exist until we have agreed that it does, by perceiving, naming, and responding to it."<sup>58</sup> In layperson's terms, osteoporosis did not exist as a disease in North America until the final quarter of the 20th century.

### **Part 1(Chapters 2 - 4): The Medical Construction of Osteoporosis**

In Chapter 2, I will trace the antiquity of osteoporosis and its scientific underpinnings beginning with the history of osteoporosis before the Second World War. Medical advances in endocrinology, biochemistry of bone metabolism, genetics, and early technological advances in microscopy and diagnostic imaging helped transform osteoporosis from a physiological description of porous bone to a disease linked to a women's change of life. In Chapter 3, these themes will be carried into the post-war era. Changing definitions and conceptions about osteoporosis will be analyzed in both Chapters 2 and 3, with special emphasis on ideas from 1940 to the present. In Chapter 3, therapies and diagnostic technologies which have contributed to present formulations about osteoporosis as a disease entity will be delineated. For example, bone densitometry adopted from the 1980's onward, has shifted the diagnostic criteria of osteoporosis from patient symptoms to statistical measures of bone mass. In Chapter 4, the way in which the "typical" osteoporosis patient became defined as female and how epidemiology modified and incorporated that definition will be discussed.

### **Part 2 (Chapters 5-8): The Social Construction of Osteoporosis**

Part 2 will describe how social influences contributed to the emerging epidemic.

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<sup>58</sup> Rosenberg, "Introduction," Framing Disease, p. xiii.

Chapter 5 will be a transitional essay introducing the convergent medical, social, political, economic, and cultural factors that led to the explosion of osteoporosis as a new epidemic disease in the 1980's. In Chapter 6, I will review how osteoporosis emerged in the popular print media as a household word. Confusions and contradictions inherent in ideas about osteoporosis reflected in the public domain from internalist scientific controversies will be explored.

Viewpoints of other self-interested groups in society, in addition to the scientists and medical specialists, particularly patients and family members, corporations, and governments have been essential to recounting the development of the osteoporosis phenomenon. In Chapter 7, I will explain how ideologies of the new social movements of the 1960's and 1970's challenged traditional roles, values, norms and symbols implicit in the medical construction of osteoporosis. Patient groups and feminist, consumer, and grey power advocates became both allies and opponents to medical concepts and attitudes, especially in relationship to images of older women. Lastly in Chapter 8, I will argue that political and economic pressures had a significant impact on mainstream medicine's therapeutic advice and use of diagnostic tools.

## Chapter 2: The Antiquity and Origin of Osteoporosis to 1960

The history of biochemistry is a chronicle of a series of controversies...[which] exhibit a common pattern. There is a complicated hypothesis, which usually entails an element of mystery and several unnecessary assumptions. This is opposed by a more simple explanation, which contains no unnecessary assumptions...This process frequently requires 10 - 20 years. The reason for this long time lag was explained by Max Planck. He remarked that scientists never change their minds, but eventually they die. **John Northrop**, 1946 Nobel Prize Winner in Chemistry

Porous bones may have been around since antiquity, but the construction of osteoporosis as a disease is a product of a nineteenth- and twentieth-century medical agenda.

### Ancient and Modern Historical Evidence of Osteoporotic Bones

Cultural and paleopathological evidence of osteoporosis has been identified from both prehistoric and historic epochs. Writers of differing disciplines investigating the historical continuity of the disease osteoporosis, agree that "The apparent universality of osteoporotic demineralization in both time and space attests to a basic genetic unity within our species."<sup>2</sup> As will be demonstrated later in this chapter, awareness of the coherence of osteoporosis is something quite recent. Indeed, bones reveal and art depicts the physical characteristics of dowager's hump and loss of height from crushed vertebrae, which are now associated with the disease. But this evidence does not necessarily prove the "disease" existed in the past, and scholars disagree over how it relates to the diagnosis of osteoporosis in different populations.<sup>3</sup> The incidence of the porotic bone condition, whether or not it was recognized

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<sup>1</sup>John Northrop was quoted by Gilbert S. Gordan, "Fuller Albright and Postmenopausal Osteoporosis: A Personal Appreciation," Perspectives in Biology and Medicine Vol.24 (Summer 1981), p. 557.

<sup>2</sup>Anthony J. Perzigian, "The Antiquity of Age-Associated Bone Demineralization in Man," Journal of the American Geriatrics Society Vol. XXI (3) (March 1973), p. 100.

<sup>3</sup>For example see critiques of T. Appelboom and J. J. Body's assumptions about osteoporosis: J. Dequeker, "Vertebral Osteoporosis as Painted by Vittore Carpaccio (1465): Reflections on Paleopathology of Osteoporosis in Pictorial Art," Calcified Tissue International Vol. 55 (1994), pp. 321-322. Similarly, Belinda Lees, Theya Molleson, Timothy R. Arnett, and John C. Stevenson, "Differences in Proximal Femur Bone Density Over Two Centuries," The Lancet Vol. 341 (March 13, 1993), pp. 673-675 about paleopathologic



as a disease, might reflect the differences in demographics, number of pregnancies, life expectancy, lifestyle behaviours, environment, patterns of warfare, occupations and culture, not to mention contemporary scientific and technological knowledge.<sup>4</sup> It might be less anachronistic to ask whether or how it was experienced as subjective illness and whether or how it was managed by individuals and social groups during previous centuries.

### Etymology of Osteoporosis (1800-1940)

The word "osteoporosis" (based on the Greek roots for porous and bone) originated in France during the early 1820's, apparently coined by the Alsatian pathologist Jean-Georges-Chrétien-Frédéric-Martin Lobstein "The Younger" (1777-1835) to describe a pathological state of the bone.<sup>5</sup> Lobstein occupied one of the first chairs of Pathological Anatomy in a Faculty of Medicine. In addition, he has been credited with the eponymic description in 1833 of a rare inherited bone condition, osteogenesis imperfecta,<sup>6</sup> and coined the word

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research on skeletons in a burial ground in 18th and 19th century London, which provoked two responses: a letter in a subsequent issue of The Lancet and an editorial in the American Family Physician postulating various theories about causes of changes in femur bone density between the radiographed remains of these women with modern female populations.

<sup>4</sup>Porter, pp. 175-98.

<sup>5</sup>D. and C. Schapira, pp. 164-167. Daniel Schapira, a physician with a Ph. D. in bone metabolism and his wife Charlotte, a linguist, published the only historical research about the etymology of this word. After much effort, the latter found the clue leading to Lobstein in a rare German book. Her rationale for crediting the term to Lobstein originated with the French authors of Universal-Lexicon der practischen Medicin und Chirurgie. The word's acceptance, according to the Schapiras, is proved by its appearance in the 1832 general French language dictionary (Raymond's Dictionnaire général de la langue française et vocabulaire universel des sciences, des arts et des métiers). Charlotte Schapira found a more contemporary source, a German Lexicon called Universal-Lexicon der practische Medicin und Chirurgie (Leipzig: Heinrich Franze, 1941), which confirmed the attribution to Lobstein. (Private correspondence with C. Schapira, (20 August 1997).

<sup>6</sup>J. E. Schmidt, Medical Discoveries: Who and When (Springfield, Ill.: Charles C. Thomas, Publisher, 1959), p. 339. According to Schmidt, Lobstein's disease, also called osteopsathyrosis, was characterized as a condition in which "the bones are subject to fractures because of abnormal brittleness." Stedman's Medical Dictionary 1995 describes osteogenesis imperfecta as "a large and miscellaneous group of conditions of abnormal fragility and plasticity of bone with recurring fractures on trivial trauma.... These conditions are classified in 4 categories which vary according to the "mode of inheritance as well as on clinical and biochemical criteria." p. 1268.

“arteriosclerosis.”<sup>7</sup> According to Daniel and Charlotte Schapira, the word “osteoporosis” had been included in a non-medical French dictionary by 1832 and subsequently appeared in 19th-century lay and medical German and French dictionaries.<sup>8</sup>

A classic early nineteenth-century description of wrist bone fracture associated with falling on an outstretched arm was published in 1814 by Abraham Colles (1773-1843) in a Scottish journal. Colles, deemed “the morning star of the great Dublin school of medicine,” distinguished between this type of fracture and the pain and dysfunction caused by sprains and dislocations of the wrist.<sup>9</sup> Presumably Colles based his description on sophisticated clinical observations, as no report of an anatomical dissection was included in his paper, which initially received little attention.<sup>10</sup> Colles' fractures, named for the break in the distal radius bone, have been considered one of the three most typical sites for osteoporotic fractures by modern scientists.<sup>11</sup> The spinal, hip and wrist bone are most common fracture sites for women; for men, it is the hip and wrist bones.<sup>12</sup> None of the historical sources of

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<sup>7</sup>Alexander Brunschwig, “Jean Frédéric Lobstein: The First Professor of Pathology,” Annals of Medical History N.S. Vol. 5 (1933), pp. 82. A separate chair in Pathology was established at the medical school in Strasbourg for Lobstein in 1819.

<sup>8</sup>Schapiras, p. 165.

<sup>9</sup>Logan Clendening, Source Book of Medical History (New York: Dover Publications, Henry Schuman, 1960), pp. 499-501. The original Colles article “On the Fracture of the Carpal Extremity of the Radius” appeared in the Edinburgh Medical and Scientific Journal (1814). Use of the phrase ‘morning star’ in regard to Colles’ appeared in Clendening’s account and in H. Bloch, “The Asclepiads of Dublin: A Moment in Ireland’s Medical History,” Southern Medical Journal Vol. 83 (6) (June 1990), pp. 664-668.

<sup>10</sup>Leonard F. Peltier, “Fractures of the Distal End of the Radius: An Historical Account,” Clinical Orthopaedics and Related Research No. 187 (July-August, 1984), pp. 18-19.

<sup>11</sup>Nicola Peel and Richard Eastell, “Osteoporosis,” in ABC of Rheumatology, Michael L. Smith, ed. (London: BMJ Publishing Group, 1996), p. 36. Hip and spinal fractures are the other two most frequent sites for osteoporotic bone breakage.

<sup>12</sup>J. C. Stevenson, and M. S. Marsh, An Atlas of Osteoporosis (Park Ridge, New Jersey: The Parthenon Publishing Group Inc., 1992), p. 41.

information on Colles' fracture gave any clues as to the sex of the patient(s).

An early association between bone fragility and old age, especially in women, can be credited to the distinguished early nineteenth-century English surgeon Sir Astley Cooper (1768-1841), although he did not use the term osteoporosis. In the 1822 edition of his A Treatise on Dislocations and Fractures of the Joints in a chapter entitled "On Fractures of the Upper Part of the Thigh Bone." Cooper wrote: "Women are much more liable to this species of fracture than men; we rarely in our hospitals observe it in the latter, but our wards are seldom without an example of it in the aged female."<sup>13</sup>

In this same passage Cooper described the "feebleness of the female constitution," adhering to the widely held nineteenth-century belief regarding the impugned physical fragility of women's bodies.<sup>14</sup> This opinion was shared by many physicians of the era who not only embraced the conventions of their society but also endorsed them scientifically.<sup>15</sup> Cooper noted the imprecision and variation in human health attendant upon aging and described the limited opportunity of his contemporaries to observe porous bones, except during autopsy.

A sizeable body of medical literature about spinal and hip fractures had been

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<sup>13</sup>Sir Astley Cooper, A Treatise on Dislocations and Fractures of the Joints (Philadelphia: Lea and Blanchard, 1844), pp. 117-119. ( First edition, 1822). On Cooper's role in osteoporosis, see Epstein, p. 178.

<sup>14</sup>Mitchinson, pp. 30-40; Martha H. Verbrugge, Able-Bodied Womanhood: Personal Health and Social Change in Nineteenth Century Boston (New York: Oxford University Press, 1988), p. 8-9; Ehrenreich and English, pp. 5 -14; Poovey, pp. 137-168. A rich body of secondary literature has documented the dominant strain of Victorian beliefs about women's fragility and inferior health. The rise of such attitudes have been attributed to the significant economic and ideological impacts of the industrial revolution on the family structure.

<sup>15</sup>Mitchinson, p. 14.

produced world-wide by the third quarter of the nineteenth century.<sup>16</sup> The association between more frequent incidence of fractures of both hips and wrists in women over age 50 was pointed out by Paul von Bruns (1846-1916) in 1881.<sup>17</sup> In 1886, the first modern study on mechanical stress and its relationship to bone tissue formation has been credited to a Professor of Engineering in Zurich, named Culmann, and an anatomist A. Wolff.<sup>18</sup> In 1900, Paul H. M. Sudeck (1866-1938), a German surgeon, described acute bone atrophy following the occurrence of trauma.<sup>19</sup> This condition was described as "Osteoporosis, usually of the wrists, hands, and feet, in association with swelling and tenderness of underlying soft tissues, which follows fractures or minor injuries. Autonomic vasomotor disorders are the suspected cause."<sup>20</sup>

The Schapiras contended that "osteoporosis did not enter English medical usage until the twentieth century;" however, I found three earlier references to the word osteoporosis in British medical journals published in 1869, 1878, and 1881<sup>21</sup> and located at least one

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<sup>16</sup>Index Catalogue of the Library of the Surgeon-General's Office, U.S. Army (Washington: Government Printing Office), Vols. IV (1883) and XIII (1892). There were 173 authors listed under 'Femor. Fracture of the', pp. 622-625 in the earlier volume and 507 authors cited under 'Spine, Fracture of', pp. 483-491 in the latter.

<sup>17</sup>Epstein, p. 178.

<sup>18</sup>A.M. Cooke, "Osteoporosis," The Lancet Vol. I (April 30, 1955), p. 878.

<sup>19</sup> Traumatic atrophy became known as Sudeck's atrophy, Sudeck's porosis or traumatic osteoporosis. Atrophy is defined as the wasting of tissues, as from reabsorption of cells or from death, according to Stedman's Medical Dictionary, p. 1698. Because Sudeck's quote is a translation, it is unclear whether his reference to vasomotor disorders linked the wasting process to menopause.

<sup>20</sup>Stanley Jablonski, Illustrated Dictionary of Eponymic Syndromes and Diseases and their Symptoms (Philadelphia: W. B. Saunders Co., 1969), p. 297.

<sup>21</sup>The two earliest journals were cited in the Index-Catalogue of the Library of the Surgeon-General's Office, U.S. Army, Vol. II (Washington: Government Printing Office, 1881). Wilks, "Case of Osteoporosis or spongy hypertrophy of the bones," Transactions of the Pathology Society Vol. xx (London, 1869), pp. 273-277; Bennett, "Senile osteoporosis," Dublin Journal of Medical Science 3s Vol. lxvi (1878) pp. 272-74. A third reference was found in Index Medicus Vol. 3, 1881. It is M'Phail, "Specimens of Bones affected with

example of the word osteoporosis used in a mid-nineteenth century English medical text.<sup>22</sup> By 1888, a reference to osteoporosis had also appeared in a British veterinary publication to describe bone disease in cattle.<sup>23</sup>

The earliest reference to the term osteoporosis that I found in American medical literature was in the 1905 Proceedings of the New York Pathological Society. The report presented a "case of pronounced general osteoporosis" in the skeleton of a forty-year-old working-class woman.<sup>24</sup> No evidence of fractures was detected, although the individual had "the merest shells of compact bone tissue" and only a "moderate" hump; her skeleton, however, was so fragile that it was being destroyed by handling. The author reported that he had located very few cases of osteoporosis in the literature and remarked that "As a process osteoporosis was evidently rare and usually ascribed to senility or osteomalacia. The skeleton exhibited showed none of the characteristic senile changes and the age of the woman excluded such a possibility."<sup>25</sup>

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Osteoporosis,"Glasgow Medical Journal Vol. xvi (1881), pp. 137-139.

<sup>22</sup>Jones and Siev (no initials given), "In Osteoporosis the Affected Bone Presents an Increase of Size," Pathological Anatomy (1874), p. 841. An earlier example which existed in English from 1846 is a translation G. E. Day tr., "A specimen of Osteoporosis Growing on the Cranium of an Aged Person," Simon's Animal Chemistry, II, p. 410. Both examples are cited in The Oxford English Dictionary, 2nd. Edition, Vol. X, J. A. Simpson and E. S. C. Weiner, eds. (Oxford: Clarendon Press, 1989), p. 975.

<sup>23</sup>Index Medicus citations for the following articles appeared in the 1888, 1903, and 1905 volumes: A. E. Macgillivray "On a Peculiar Outbreak of Osteo-porosis or some other Bone Disease in Cattle," The Veterinary Journal & Annual Comparative Pathology [sic] Vol. xxvii (London, 1888), p. 153. Other early veterinary references to osteo-porosis include an article in 1903 in the previous journal by E. W. Oliver. In 1905 two veterinary articles pertaining to osteoporosis were published by W. Robertson: "Osteoporosis," Veterinary Record Vol. xvii, 2 pl. (London, 1904-1905), pp. 772-774; and "Equine Osteoporosis," Journal of Comparative Pathology & Therapy Vol. xvii (Edinburgh and London, 1905), pp. 114-128.

<sup>24</sup>E. S. McSweeney, "A Case of Pronounced Osteoporosis," Proceedings from the New York Pathological Society n. s., Vol. v (1905), pp. 36-38. The paper reflected contemporary confusion regarding medical ability to distinguish between two types of bone deformities: osteoporosis and osteomalacia.

<sup>25</sup>Ibid., p. 37.

The standard works of distinguished turn-of-the-century clinician and medical educator William Osler (1849-1919) revealed no direct reference either to the word 'osteoporosis' nor any related description. Osler, who worked and taught in Canada, the United States, and Britain, was silent on porous bone, but in editions of his The Principles and Practice of Medicine up to and including 1900, he did refer to another pathological bone condition, osteomalacia (rickets). Later editions of his standard physicians' manual mentioned a few other bone diseases: Osteitis Deformans (Paget's Disease), Osteogenesis Imperfecta, and Osteopsathyrosis.<sup>26</sup> Omitted from Osler's 1901 edition was any mention of bone fractures or prevention of accidental falls.

### **The Stage is Set: Early 20th Century Technology and Biological Science and the Construction of Osteoporosis**

The advent of electricity and the rise of the chemical industry in Western Europe and North America, two factors resulting from the second industrial revolution, contributed to the scientific discoveries crucial to understanding cellular processes and new imaging technology.<sup>27</sup> Historical developments in several areas of inquiry would prove of vital importance to the diagnosis and therapeutics of osteoporosis: laboratory and imaging technologies, genetics, biochemistry related to bone metabolism, and endocrinology. In the remainder of this chapter, I will outline parallel innovations in each of these four scientific

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<sup>26</sup>Sir William Osler, The Principles and Practice of Medicine: Designed for the Use of Practitioners and Students of Medicine 4th Edition (New York: D. Appleton & Co., 1901); also the 8th Edition of Principles and Practice, Thomas McCrae, ed. (New York: Appleton, 1912); and William Osler, Modern Medicine: Its Theory and Practice in Original Contributions by American and Foreign Authors (Philadelphia: Lea, 1907-1910). In Osler's 2nd and 3rd Editions published in 1898 and 1900 respectively, rickets is the only bone condition mentioned in the section entitled "Constitutional Diseases." Note Osler distinguishes between osteogenesis imperfecta and osteopsathyrosis, while Schmidt describes them as the same entity.

<sup>27</sup>Orville Frederick Denstedt, "A History of Biochemistry at McGill University," part of an unpublished manuscript of Historical Writings of the late Dr. Denstedt (1899-1976), p. 6. Copy obtained from Dr. Tassos Anastassiades.

domains. The time frames for each set of discoveries will be repeated, as each is discussed individually in chronological sequence (See Appendix II).

### **Diagnostic Imaging**

In December 1895 Wilhelm Roentgen (1845-1923) discovered x-rays and physicians began to systematically explore the skeleton of living persons. Within days of Roentgen's publication, x-rays were used clinically in Europe.<sup>28</sup> Within weeks, the earliest x-ray photographs called "skiagrams" showing early diagnoses of "fractures, dislocations, detection of foreign bodies, and examinations of pathological bone conditions" were published in scientific journals.<sup>29</sup> The first diagnostic use of X-rays in North America occurred on February 3, 1896 at Dartmouth College in New Hampshire by Professor Edwin Brant Frost, a physics professor (1866-1935) who photographed a broken forearm.<sup>30</sup> Canadian physicians were also quick off the mark in adopting the new technology.<sup>31</sup> Within months of Roentgen's findings, the first American physician specializing in radiology, Dr. William J. Morton (1845-1924) of New York, predicted the refinement of diagnoses of previously invisible structures in living patients which would be made possible by X-rays: "to detect and to diagnosticate [sic] irregularities, deformities, malformations, congenital or

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<sup>28</sup>Richard F. Mould, A History of X-Rays and Radium (Sutton, U.K: IPC Building and Contract Journals Ltd., 1980), p. 1.

<sup>29</sup>Mould, p. 4. Mould cites a series of articles published weekly by Sydney Rowland, "On The Application of the New Photography to Medicine and Surgery," British Medical Journal from February 8, 1896 to March 7, 1896, pp. 361-64; pp. 431-32; pp. 492-97; pp. 556-59; and pp. 620-22, respectively.

<sup>30</sup>Ruth and Edward Brecher, The Rays: A History of Radiology in the United States and Canada (Huntington, N. Y: Robert E. Krieger Publishing Co., 1969), pp. 16-17; Kevles, pp. 33-41 describes the role of T. A. Edison in adapting Roentgen's discovery.

<sup>31</sup>Charles Hayter, "Making Sense of Shadows: Dr. James Third and the Introduction of X-Rays, 1896 to 1902," Canadian Medical Association Journal Vol. 153 (9) (November 1, 1995), pp. 1250-1251. By the fall of 1896, Kingston General Hospital had obtained its first X-ray equipment.

otherwise of bones, and to identify dislocations as well as fractures--the co-existence of both or the existence of one to the exclusion of the other. Diseases of the bones which vary their density, either by increasing or diminishing it... are clearly located."<sup>32</sup> Morton assembled a large collection of roentgen plates which were used to solve diagnostic problems referred by other practitioners.<sup>33</sup> Decoding the shadowy images and interpreting these data into diagnostic signs or clues took years to achieve.<sup>34</sup>

The application of X-ray technology to routine diagnostic usage developed slowly during the next two decades. Indeed, it was not until after World War I that X-rays were regularly used for fractures.<sup>35</sup> X-rays became one of several important technological innovations which allowed scientists to make objective verifications (diagnosis) of fractures and changes in bone density, albeit only in those with marked bone loss, despite the relatively crude technology and safety hazards early in the century.<sup>36</sup> Confirmation of diagnoses through scientific investigation became common in hospitals between 1900-1925.<sup>37</sup>

Of major significance to the history of osteoporosis was the physician's new ability to detect bone disease in the absence of symptoms. Expectations rose for both physicians and patients in terms of defining the success of treatment interventions in bone disease. "In 1895,

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<sup>32</sup>Brechers, pp. 61-62. The quote is attributed to Morton, who was the son of one of the pioneers famous for the first public demonstration of ether as an anaesthetic for surgery.

<sup>33</sup>E. R. N. Grigg, The Trail of the Invisible Light: from X-Strahlen to Rad(bio)ology (Springfield, Ill.: Thomas, 1965), p. 785.

<sup>34</sup>Brechers, p. 110.

<sup>35</sup>Howell, pp. 104 and 110.

<sup>36</sup>Appelboom and Body, p. 367. The technological ability of conventional x-rays even today to accurately discern osteoporotic bone loss is still limited. Interviews with Dr. E.R. Yendt July 21, 1997 and Dr. L. Fransman, September 22, 1997.

<sup>37</sup>Howell, p. 2.



a leg which was shortened only 1 or 2 inches following a fracture was considered an 'excellent result': not so many years later, with X-ray visualization available, the same result might lead to a suit for malpractice."<sup>38</sup> Later during the 1930's and 40's, diagnostic technology had improved and was increasingly utilized.<sup>39</sup> The full realization of the X-ray's inherent danger was not understood until after 1945. Usage of this technology proceeded,<sup>40</sup> nevertheless, although cancer became an associated risk for both patients and medical professionals. From the mid-1920's, radiation safety standards were introduced along with attempts to quantify and regulate dosage. "The X-ray was the first technology to come with a built-in time bomb. The shock of this realization tore at the fabric of faith in all technology-- and that was perhaps 'he biggest change the X-ray made in twentieth-century sensibilities."<sup>41</sup>

### **Other Technologies: Microscopy**

For several hundred years since Jansson and Jansson (circa 1590)<sup>42</sup> and Anton van Leeuwenhoek (1632-1723), scientists have been able to study small objects through enlargements made possible by microscopy: however, only after an improved compound lens was invented in 1823 and other refinements, did microscopes become standard equipment for biological researchers. The invention of the electron microscope, patented in 1938 by

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<sup>38</sup>Brechers, p. 110

<sup>39</sup>Epstein, p. 178.

<sup>40</sup> The connection of x-ray technology to the development of modern genetics will be noted later in the text.

<sup>41</sup>Kevles, p. 4.

<sup>42</sup>Ernst Mayr, The Growth of Biological Thought: Diversity, Evolution, and Inheritance (Cambridge, Mass.: The Belknap Press of Harvard University Press, 1982). Mayr credits Jansson and Jansson, p. 854.

Reinhold Rudenberg in Germany and the U.S., further enhanced magnification.<sup>43</sup> Improved microscopy influenced scientific knowledge about bone metabolism and biological predisposition to disease, because sub-cellular changes could be detected before clinical symptoms were manifested.

### **Biochemistry of Micronutrients**

Although the word "biochemistry" originated in 1877 with F. Hoppe-Seyler (1825-95), "the fully-fledged and institutionalized discipline emerged only in the early 1900s."<sup>44</sup> Experimental methodology was used in physiological research by the mid-nineteenth century, but the experimental method was not disseminated to all areas of biological sciences until the twentieth century.<sup>45</sup> Application of the experimental method resulted in an explosion in biochemical knowledge from 1900 - 1950, termed the "Golden Age of Biochemistry" by Nobel laureate, E. A. Doisy (1893-1986), a physiologist and biochemist.<sup>46</sup> Many biological compounds, especially hormones and vitamins, were isolated, structurally determined and synthesized during these decades.<sup>47</sup> According to Doisy, the development of endocrinology as

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<sup>43</sup>Lois N. Magner, The History of the Life Sciences (New York: Marcel Dekker, Inc., 1979), pp. 158-178. For example, the human eye can see no smaller than about 1/250 inch. Traditional light microscopes, at their best, can enlarge by 2500 fold, whereas electron microscopes magnify objects by 40,000 fold.

<sup>44</sup>W. F. Bynum, E. J. Browne, and Roy Porter, eds., Dictionary of the History of Science (Princeton: Princeton University Press, 1981), p. 42.

<sup>45</sup>Garland Allen, Life Sciences in the Twentieth Century (New York: Wiley & Sons 1975), p. xvi.

<sup>46</sup>E. A. Doisy, "Reminiscences," in Perspectives in Biological Chemistry, ed. Robert E. Olson (New York: Marcel Dekker Inc., 1970), pp. 267-268.

<sup>47</sup> Pellegrino, p. 253 comments on the significance to modern medicine of both these agents, which though "they do not entirely remove the primary cause of a disease, hormone and vitamin therapy have permitted specific replacement of crucial molecules in the body. Some of these natural substances have even been synthesized or improved, so that physiology can be restored to normal; some inherited or acquired hormone deficits can be compensated for completely, if not eliminated." For more on the early history of medical interest in female reproductive hormones, see George W. Corner, "The Early History of the Oestrogenic Hormones." The Sir Henry Dale Lecture for 1964 at Middlesex Hospital London, Proceedings of the Society for

a science depended on the accretion of four stages of knowledge: "recognition of the gland or organ as one producing internal secretion; methods of detecting internal secretion; preparation of extracts leading to a purified hormone; the isolation of the pure hormone. determination of its structure and its synthesis."<sup>48</sup> Intimate inter-connections between academic and clinical sciences and the pharmaceutical industry were also emerging, which would have increasing consequences over the next decades.<sup>49</sup>

Both basic research and clinical studies in biochemistry and endocrinology contributed to reconceptualizations about osteoporosis and its cause(s). New ideas about the functioning of the body became influential in the emergence of endocrinology and bone metabolism studies. For example, in 1932 Walter Cannon (1871-1945) described the concept of homeostasis, the maintenance of a constant internal environment by the body's ongoing self-regulating physiological processes.<sup>50</sup> Towards the mid-twentieth century, porous bone's previous association with the aging process was amplified to include deficiencies in internal secretions and micronutrients. Following advances in endocrinology in the 1940's, clinical intervention therefore became an option for the first time. Several significant therapeutic

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Endocrinology. Journal of Endocrinology Vol. 31 (1964-65), pp. iii and xv.

<sup>48</sup>Medvei, p. 6. I have paraphrased Doisy' statements from his remarks quoted by Medvei from the 1936 Porter Lectures delivered at the University of Kansas School of Medicine.

<sup>49</sup> For the growth of intimate research relations between industry and academe during the interwar years in North America, see John P. Swaan, "Universities, Industry and the Rise of Biomedical Collaboration in America," in Pill Peddlers: Essays on the History of the Pharmaceutical Industry, Jonathan Liebenau, Gregory J. Higby, and Elaine D. Stroud, eds. (Madison, Wis.: American Institute of the History of Pharmacy, 1990), pp.73-90. See for "Golden Age of Drug Discovery," the 1940's-1950's, Rein Vos, Drugs Looking For Diseases: Innovative Drug Research and the Development of the Beta Blockers and the Calcium Antagonists (Boston: Kluwer Academic Publishers, 1991), p. 277.

<sup>50</sup>Judith S. Levey and Agnes Greenhall, The Concise Columbia Encyclopaedia (New York: Columbia University Press, 1983), p. 136. Cannon was a famous teacher of physiology and colleague of Fuller Albright at Harvard University.

discoveries pertaining to bone metabolism followed World War II (See Chapter 3).

### **Calcium and Vitamin D**

From 1900 to 1940 the role of calcium and its interplay with Vitamin D and other hormones in the process of bone formation was elucidated. American scientists John Howland (1873-1926) and Benjamin Kramer (1888-1972) linked the diagnostic measure of Vitamin D deficiency to calcium and phosphorus concentrations in blood, while Joseph C. Aub (1890-1973) conducted pioneering research in the mid-1930's on connections between calcium metabolism, the parathyroid gland and bone dissolution.<sup>51</sup>

Associations between dietary deficiencies and environmental factors, such as lack of sunlight, which produce the once common bone disease, rickets, had been known since the early 17th century.<sup>52</sup> Turn-of-the-century medical preoccupation with solving the enigma of rickets (osteomalacia in adult populations) led to the discovery of Vitamin D.<sup>53</sup> Rickets, also called the English disease, had become epidemic among children in the late nineteenth and early twentieth century in northern European and northeastern American cities. Socio-environmental changes brought about by the Industrial Revolution, such as increasing patterns of indoor work and significant blockage of sunlight by air pollutants caused the rise of this disease.<sup>54</sup> Traditional therapeutic use of cod-liver oil for rickets had also "declined

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<sup>51</sup>Anonymous, "Joseph Charles Aub (1890-1973): In Memoriam." *Endocrinology* Vol. 96 (1) (1975), pp. i-ii. Aub was the senior researcher with Fuller Albright at Massachusetts General Hospital in a famous case of a sea captain by which the linkage was revealed.

<sup>52</sup>Iain Macintyre, Imogen M. A. Evans, and Richard G. Larkins, "Vitamin D." *Clinical Endocrinology* Vol. 6 (1977), p. 65.

<sup>53</sup>Note the earlier reference to rickets in Osler's text.

<sup>54</sup>H. F. DeLuca, H. E. Paaren, and H. K. Schnoes, "Vitamin D and Calcium Metabolism," in *Biochemistry: Topics in Current Chemistry*, F. L. Boschke, ed. (Berlin and N. Y.: Springer-Verlag, 1979), pp. 3-4.

and fallen into disrepute" among physicians during the late nineteenth century.<sup>55</sup>

Between 1910 and 1919, agricultural biochemists at the University of Wisconsin, notably Elmer V. McCollum (1879-1967) and Harry Steenbock (1886-1967), isolated vitamins A, B, and D, and proved the importance of these micronutrients to the health and reproduction of farm animals.<sup>56</sup> Accidentally they stumbled on the observation of rickets in lab rats, which led to experiments with cod-liver oil and sunlight.<sup>57</sup> Rickets disappeared as a major public health concern in the industrial world by 1940, after these therapeutic breakthroughs were applied to human populations.<sup>58</sup>

Emil Fischer (1852-1919), a German biochemist who pioneered studies on human nutrition, developed laboratory methods significant for the later technological production of synthetic chemicals and foodstuffs.<sup>59</sup> Another 19th-century pioneer, Nikolai I. Lunin (1853-1937) a Swiss physiologist, observed that synthetic diets lacked essential substances needed to sustain life; such substances were precursors for the concept of vitamins.<sup>60</sup> The modern

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<sup>55</sup>Gale W. Rafter, "Elmer McCollum and the Disappearance of Rickets," Perspectives in Biology and Medicine Vol. 30 (4) (Summer 1987), p. 528. Rafter asserted that non-acceptance of cod-liver oil continued with many physicians, even after the scientific basis for its use had been established in 1923. p. 532.

<sup>56</sup>DeLuca, Paaren, and Schnoes, pp. 4-5.

<sup>57</sup>Peter Wilton, "Cod Liver Oil, Vitamin D and the Fight Against Rickets," Canadian Medical Association Journal Vol. 152 (9) (May 1, 1995), p. 1517. McCollum moved to Johns Hopkins in 1918 and completed his research on rickets there. Elizabeth Fee, "Improving the People's Health: Some Hopkins Contributions," American Journal of Epidemiology Vol. 134 (10) (1991), pp. 1016-17.

<sup>58</sup>Denis Gibbs, "Rickets and the Crippled Child: an Historical Perspective," Journal of the Royal Society of Medicine Vol. 87 (December 1994), p. 731. English physiologist Edward Mellanby's (1884-1955) scientific proof in 1918 of cod-liver oil's efficacy and Berlin paediatrician Kurt Huldshinsky's (1883-1941) successful experiments with ultraviolet light on the skin were eventually adapted during the next several decades.

<sup>59</sup>Bernard S. and June H. Schlessinger, eds., The Who's Who of Nobel Prize Winners 1901-1990, 2nd Edition (Phoenix: Oryx Press, 1991), p. 3.

<sup>60</sup>Ervin H. Ackerknecht, A Short History of Medicine (Baltimore: Johns Hopkins Press, 1982), p. 229.

idea of accessory nutrients in human diets originated with Frederick Gowland Hopkins (1861-1947) an English biochemist in 1906.<sup>61</sup> Six year later, Casimir Funk (1884-1967) a Polish-American biochemist, proposed the name "vitamines" "to describe organic compounds present in trace amounts which prevented or cured certain diseases."<sup>62</sup>

Despite these vitamin discoveries, their role in medicine was obscure until the 1920's.<sup>63</sup> By 1922 -25, Steenbock had isolated the factor in Vitamin D which cured rickets, synthesized it, and invented the commercial process of irradiation for its addition to milk; this would provide an additional source of Vitamin D to populations in industrial nations.<sup>64</sup> As late as 1928, Dr. Graham Lusk of Cornell University, "The Father of Nutrition in America," called vitamins "the group of as yet identified substances which at present cannot be classified...but upon whom the harmonious behavior of the organism depends."<sup>65</sup>

During the 1931-37 period, isolation and identification of nutritional forms of Vitamin D were accomplished by Steenbock, W. Hess (1862-1934), and A. O. R. Windaus (1876-1959), a German researcher.<sup>66</sup> Vitamin D was shown to stimulate absorption of calcium from the intestine in response to dietary calcium levels. Because researchers in the 1930's believed that Vitamin D acted directly on target tissues without metabolic action,

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<sup>61</sup>Ibid., p. 230.

<sup>62</sup>Gibbs, p. 731.

<sup>63</sup>Armand J. Quick, Bleeding, Drugs, Vitamins: Their Impact on History (self-published, 1976), p. 16. Quick, who worked at the University of Wisconsin, used this description to show that vitamins were a relatively obscure arena of scientific research, at the same time that Steenbock was forging ahead with his work in the agricultural department of the same institution.

<sup>64</sup>DeLuca, Paaren, and Schnoes, p. 5.

<sup>65</sup>Quick, p. 18. Quick worked on vitamin C, K, and Q discoveries. He cited Lusk's The Science of Nutrition.

<sup>66</sup>MacIntyre, Evans, and Larkins, p. 66.

vitamin D chemistry from 1940-1960 then became "quiescent."<sup>67</sup> Three more decades would elapse before the contemporary explanation of Vitamin D's functional role in the process of bone resorption related to osteoporosis would emerge.<sup>68</sup> Similarly, lack of sunlight and its connection to the metabolism of Vitamin D as a contributing factor for osteoporosis, did not become subjects for research until much later in the twentieth century.<sup>69</sup>

### **Hormones and Bone Metabolism**

In 1855, Claude Bernard (1813-1878) the noted French experimental physiologist, was the first to describe internal secretions produced by the human body. Anatomical knowledge about the ductless glands, however, is of more ancient provenance: in the 4th century B.C., Herophilus described the ovaries as "female testicles," and later Galen (129-201 AD) postulated about the role of the pituitary and thyroid glands.<sup>70</sup> Eighteenth-century Swiss scientist Albrecht von Haller noted that the thyroid, thymus and spleen, glands without ducts, released substances into the body's circulatory system.<sup>71</sup> In 1903, Charles E. Sajous (1852-1929) was the first U.S. scientist to publish a treatise on internal secretions.<sup>72</sup>

'Hormone' is derived from the Greek word meaning vital spirit from a verb to excite or arouse. The word was first used in the modern sense of the body's chemical messengers in

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<sup>67</sup>DeLuca, Paaren, and Schnoes, p. 3.

<sup>68</sup>Ibid., p. 5.

<sup>69</sup>Michael F. Holick "McCollum Award Lecture, 1994: Vitamin D-New Horizons for the 21st Century," American Journal of Clinical Nutrition Vol. 60 (1994), p. 627. The author cites several recent epidemiological studies on the elderly linking Vitamin D deficiency, sunlight deprivation, and hip fractures.

<sup>70</sup>V. C. Medvei, A History of Endocrinology (Lancaster, Boston and The Hague: MTP Press Limited, 1982), pp. 5-7, also pp. 824, 835, 846.

<sup>71</sup>Richard B. Welbourn, The History of Endocrine Surgery (New York: Praeger, 1990), p. 2.

<sup>72</sup>Medvei, p. 8.

1905 by Ernest H. Starling (1866-1927) the English physiologist and his colleague William Bayliss (1860-1924). Earlier physiologists had believed the excitation process was of nervous origin.<sup>73</sup> Nicolo Pende (b.1880), an Italian physician, coined the word "endocrinology" in 1909, but the concept of internal secretions was not universally accepted: in 1914 in Germany, "a well-known professor called the theory a 'Viennese humbug'."<sup>74</sup>

Historians have noted that the central paradigm for modern endocrinology was to view the dysfunction of each ductless gland's production of hormone or its removal as the origin of a deficiency disease.<sup>75</sup> The effects of castration on women were known to ancient physicians, but because the loss of ovaries were not life-threatening and subsequent changes in humans were subtle, little attention was paid to the physiology of the female reproductive system until after the middle of the nineteenth century. In 1931, the interdependency of the endocrine glands and specifically, the regulatory role of the pituitary gland, was metaphorically termed "the leader in the endocrine orchestra."<sup>76</sup> Several hormones were eventually identified as playing important functions in bone metabolism; most important were the reproductive hormone estrogen, the parathyroid hormone, and a hormonal form of Vitamin D (See Appendix III).

### **Organotherapy: Precursor to Treatment with Extracted Estrogen**

For hundreds of years, organotherapy, the practice of administering organs, tissue

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<sup>73</sup>Welbourn, p. 3.

<sup>74</sup>Medvei, p. 9.

<sup>75</sup> For example see: Corner, p. iii; and Diana Long Hall, "Biology, Sex Hormones and Sexism in the 1920's." The Philosophical Forum, Vol. V, (1-2) (Fall-Winter 1973-74), p. 81. (Claude Bernard and Frederick Banting also made this observation.)

<sup>76</sup>Welbourn, p. 3.



extracts, or body fluids to substitute for dysfunctional parts of the body, was a precursor of more modern cures for various dysfunctions.<sup>77</sup> Tissue of relevant organs, or those of animals, were chopped up and administered to patients even during antiquity.<sup>78</sup> The first modern scientist known to self-dose with this technique was Charles-Edouard Brown-Sequard (1817-1894), a distinguished French/American physiologist who injected himself with testicular substances in 1889. He claimed both physical and intellectual benefits from the treatments, and believed that he had discovered a potent substance derived from the male genitalia and that analogous substances existed in ovaries for women. Several other French physicians continued experimenting with such extracts on male and female patients. Although Brown-Sequard was not interested in commercial exploitation of his discovery, pharmaceutical companies soon began to successfully market such extracts in Europe and North America.<sup>79</sup>

By the turn of the century, the search for a magic bullet for menopausal problems was on its way. In 1896, three Central European gynaecologists independently and simultaneously provided women who had surgically lost their ovaries or experienced natural menopause with the first form of hormone replacement using ovarian tissue from cows.<sup>80</sup> G. W. Corner (1889-1981) described the link between the ensuing swift growth in sales of therapeutic

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<sup>77</sup>Welbourn, p. 5.

<sup>78</sup>Wulf H. Utian, "The Menopause in Perspective: From Potions to Patches," Annals of the New York Academy of Sciences Vol. 592 ( June 13, 1990), p. 1.

<sup>79</sup>Medvei, p. 717; George W. Corner, pp. v-vi. Corner was an eminent American endocrinologist who discovered progesterone in 1929, and later became a medical historian. His dates were in Morton's Medical Bibliography: An Annotated Checklist of Texts Illustrating the History of Medicine (Garrison and Morton), 5<sup>th</sup> Edition, Jeremy M. Norman, ed. (Aldershot, Hants.: Scolar Press, 1991), p. 191; McCrae, p. 112.

<sup>80</sup>H. Kopera, "The Dawn of Hormone Replacement Therapy," Maturitas Vol. 13 (1991), pp. 187-88. The physicians were F. Mainzer from Berlin, R. Mond from Kiel, and R. Chrobak from Vienna. Their research appeared within a three month span and the author declined to select one as the originator. McCrae, p. 112 believed a fourth German physician, T. Landau of Berlin, also in 1896, should be credited with being the originator of treating menstrual symptoms with desiccated ovaries.

products and the stature of their medical discoverers.<sup>81</sup> Remedies intended to treat women with a wide range of disorders attributed to ovarian problems were purveyed during the next several decades both by home producers and the emerging pharmaceutical industry: "minced fresh sow's ovaries taken in a sandwich, desiccated ovarian substance in powders or tablets, extracts made with water, glycerine, or alcohol."<sup>82</sup> Twentieth-century remedies for menopause have also included treatments with tranquilizers, electroshock and lithium.<sup>83</sup>

### **Estrogen Extracts: Scientific Advances During the Inter-war Years**

Discoveries related to estrogen, a female sex hormone, were critical to the establishment of osteoporosis as a disease entity. Ancient associations existed between the gonads, sexuality, reproduction, and secondary sexual characteristics.<sup>84</sup> By the early twentieth century, Walter Heape, at Cambridge in 1900, had linked "pro-estrum" to menstruation; in 1905, he theorized about a substance in the body linked to both growth and reproduction from his studies on the estrus cycle in lower animals.<sup>85</sup> Also in 1905, English physiologists, Francis H.A. Marshall (1878-1949) and William Adam Jolly (1873-1945), demonstrated that ovarian extracts could produce the state of "being in heat" in castrated animals. Cyclical changes in the endometrium were first described as a normal physiological process in 1908 by two Viennese scientists, Fritz Hitschmann (1870-1926) and Ludwig Adler (1859-1926). In 1923, American biochemists Edgar Allen (1892-1943) and E. A. Doisy isolated estrin, a form

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<sup>81</sup>Medvei, p. 836. Medvei cited Corner's observation that scientists gained renown for discovering successful therapeutic products; Corner was obviously speaking from personal experience.

<sup>82</sup>Corner, p. vi.

<sup>83</sup>Fausto-Stirling, pp. 112-113.

<sup>84</sup>Medvei, p. 676.

<sup>85</sup>Long Hall, pp. 84-85.

of estrogen. Also significant was the link between estrogens and bone formation in birds, first discovered in 1926 by Oscar Riddle (1877-1968).<sup>86</sup>

During the late 1920's and the 1930's, a number of other important developments pertaining to estrogen ensued, such as the isolation of estrogenic hormone in human urine in 1929 by Doisy and Sidney A. Thayer (1902-1969). Sales of synthetic hormones escalated through reduced cost; supplies of human estrogen had been scarce.<sup>37</sup> In 1943, a final stage in the development of commercial substitutes for the hormone occurred when James Goodall extracted estrogen from mare's urine, paving the way for a new drug, named Premarin, manufactured by Ayerst.<sup>38</sup> The original Premarin produced unpleasant side effects and had to be administered by injection, deterring its widespread adoption in the 1940's. Later when it was produced in tablet form, estrogen preparations had wider appeal.<sup>39</sup>

### **Extracted Estrogen Emerges as Therapy for Menopause in the 1930's**

Six years passed between estrogen's isolation in 1926 until medical literature in Europe and North America recorded two contenders for first therapeutic applications of extracted hormone. Drs. Samuel Geist and Frank Spielman at Mount Sinai Hospital in New York published the results of treating 25 menopausal women with "theelin" in May 1932.<sup>90</sup>

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<sup>86</sup>Medvei, p. 836.

<sup>37</sup>McCrae, p. 112. Corner, p. xiii. Corner describes Allen and Doisy's difficulty in obtaining sows' ovaries from numerous trips to a local St. Louis packing plant in Doisy's Model T.

<sup>38</sup>According to McCrae, p.112, Premarin, also known as conjugated equine estrogen, is less potent than DES but had fewer side effects. In the 1960's Canadian media reported on shocking treatment of the mares who were raised to produce urine for this drug. Douglas Marshall and Milan Korcok, "The Old Grey Mare's Worth Millions Now," Macleans (August 6, 1966), p. 1.

<sup>39</sup>Robert A. Wilson, Feminine Forever (New York: M. Evans and Co., 1966), pp. 112-113. Wilson reported that Doisy had to process more than 80,000 sows' ovaries to produce 1/12,000th gram of estrogen.

<sup>90</sup>Samuel H. Geist and Frank Spielman, "Therapeutic Value of Theelin in the Menopause," American Journal of Obstetrics and Gynaecology Vol. 23 ( 5) (May 1932), pp. 701-707.

Also in 1932 German physician, Carl Kaufmann (b.1900) treated women who were not menstruating or who had had their ovaries removed surgically with the new estrogenic hormone.<sup>91</sup> Later in 1938, Edward C. Dodds (1899-1973) and his colleagues in London described the first synthetic estrogen (stilbestrol).<sup>92</sup> Other writers have attributed its development to Americans Russell Marker and Thomas Oakwood in 1936.<sup>93</sup> Revelations of estrogen's side effects later became a notable part of the history of menopause, estrogens and osteoporosis (See Chapter 4).

### **Parathyroid Hormone**

Early recognition of the link between the parathyroid gland, bone disorder (osteomalachia), and calcium metabolism originated in 1906 with Jakob Erdheim (1874-1937), a distinguished Viennese skeletal pathologist. His 1914 study pertaining to the calcification of teeth (in rats) was also influential.<sup>94</sup> Baltimore's William G. MacCallum (1874-1944) and Carl Voegtlin (1879-1960), a pathologist and a pharmacologist respectively, demonstrated, in 1909, that calcium administration could control the effects of the removal of

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<sup>91</sup>Carl Kaufmann, "Über die Therapie ovarieller Störungen mit Hormonen der Keimdrüse," Med. Klinik Vol. 28 (July 8, 1932), pp. 955-57, cited in the 1932 Index Medicus. I cannot find my original source which referred to Kaufmann as the first doctor to use natural estrogen in 1932. Medvei lists Kaufmann as the first, but at a later date( 1933). Medvei, p. 836.

<sup>92</sup>Medvei, p. 836. In his history of endocrinology Medvei ventures into a number of controversial areas such as PMS, but interestingly he had little to say about menopause: "The perimenopausal and postmenopausal time periods in women and their hormonal balance-- or imbalance-- have been the subject of intensive study in the past decade, but it is outside the scope of this book to discuss them in detail." p. 681.

<sup>93</sup>McCrae, p. 112 and Wilson (1966), p. 185.

<sup>94</sup>Fuller Albright and Edward C. Reifenstein Jr., The Parathyroid Glands and Metabolic Bone Disease: Selected Studies (Baltimore: The Williams and Wilkins Co., 1948), p. vi. Inspired by Erdheim while spending a year in Vienna, Fuller Albright (1900-1969) a young American scientist, developed further studies in 1928-1929 on the parathyroid, calcium, phosphorus, and bones.

the parathyroid gland and the resulting drop in blood calcium.<sup>95</sup> Isolation of parathormone, the active principle in the parathyroid glands, was achieved in 1925 by Canadian biochemist James Bertram Collip (1892-1965).<sup>96</sup> Collip prepared a stable, physically active extract of the hormone which could be used for experimental purposes.<sup>97</sup> In 1932, Hans Selye (b. 1907) observed the increase in bone formation caused by the injection of parathormone while working in Collip's laboratory.<sup>98</sup>

### Genetics

In 1900, Hugo M. deVries (1848-1935), Carl Correns (1864-1933) and Erich Tschermak (1871-1962) all claimed rediscovery of Gregor Mendel's long-ignored theories of heredity published in 1866.<sup>99</sup> William Bateson (1861-1926), an English naturalist, publicized the Mendelian laws of inheritance and was credited with first using the word "genetics" in 1905/06.<sup>100</sup> In 1901, Archibald E. Garrod (1857-1936), a London physician, first linked defects in human metabolism to inherited factors and postulated that there were "chemically

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<sup>95</sup>Alison Li, "J. B. Collip, A. M. Hanson and the Isolation of the Parathyroid Hormone, or Endocrines and Enterprise," The Journal of the History of Medicine and Allied Sciences Vol. 27 (1992), p. 409.

<sup>96</sup>Ibid., p. 405. Although Collip is credited with this breakthrough, an obscure doctor in Minnesota, A. M. Hanson, had preceded Collip with the same discovery two years earlier. But Hanson had published his finding in a journal Military Surgeon, not widely read by academic scientists. At issue in this dispute was not only precedence, but also how discovery of hormones came to be defined within endocrinology in the differing goals of laboratory versus clinical science. Influence from the pharmaceutical industry also played a role. p. 406.

<sup>97</sup>Bynum, Browne, Porter, p. 207.

<sup>98</sup>Medvei, pp. 485-486. Selye's later fame derived from his research on stress.

<sup>99</sup>Mayr, pp. 727-731.

<sup>100</sup>Bynum, Browne, Porter, p. 165.

defined disorders caused by inborn errors of metabolism."<sup>101</sup> American zoologist Clarence Erwin McClung's (1870-1946) identified male and female sex chromosomes, in 1902.<sup>102</sup> The next year, Walter S. Sutton (1877-1916) theorized that the chromosome contained the unit of inheritance, and explained the mechanism for Mendelism as the division of cell nuclei within the chromosome.<sup>103</sup> Within the next decade, Thomas Hunt Morgan (1866-1945) an American embryologist, refined theories about the chromosome and gene into their classical concepts.<sup>104</sup> Limitations in microscopy impeded major advances in genetics from the 1930's to the 1950's. Because the gene could not be seen directly, only inferential assumptions from research on gene mutation were possible.<sup>105</sup> Key developments in genetics in the late 1920's and 1930's therefore occurred in research on mutations caused by radiation, especially in the work of H. J. Muller (1890-1967).<sup>106</sup>

Until the 1940's, non-geneticists had believed that genes were significant only in the inheritance of superficial traits such as eye colour. George W. Beadle (1903-1989), and E. L. Tatum (1909-1975) revived Garrod's theory and postulated the "one gene--one enzyme" theory of gene functioning in 1945. Their discovery initiated the turning point from the age of classical genetics to the molecular investigations of heredity in human populations after the

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<sup>101</sup>A. G. Beam and E. D. Miller, "Archibald Garrod and the Development of the Concept of Inborn Errors of Metabolism," Bulletin of the History of Medicine Vol. 53 (1979), p. 322. Garrod's concept, published later in 1909, was ignored because the disease he studied, alkaptonuria, was so rare; and geneticists at the time were not yet systematically studying genetics in humans. p. 327.

<sup>102</sup>Medvei, p. 677.

<sup>103</sup>Victor A. McKusick, "Walter S. Sutton and The Physical Basis of Mendelism," Bulletin of the History of Medicine Vol. 34 (6) (November-December 1960), pp. 487-88. Sutton was McClung's graduate student.

<sup>104</sup>Elof A. Carlson, The Gene: A Critical History (Philadelphia: W. B. Saunders, 1966), pp. 84-85.

<sup>105</sup>Mayr, p. 801.

<sup>106</sup>Carlson, p. 253.

1950's.<sup>107</sup> In 1942, Fuller Albright (see below) and Henry Klinefelter published research on a new endocrinological syndrome which one source credits as having stimulated the study of chromosome mapping for genetic disorders.<sup>108</sup>

### **Fuller Albright: “Discoverer” of Osteoporosis**

The term and concept of “osteoporosis” may have existed for a century or more, but modern interest and a more nuanced application of the notion dates from 1940, when Boston endocrinologist Fuller Albright (1900-1969) published his classic description of osteoporosis, integrating the mass of scientific discoveries in biochemistry and metabolism which I have just described. He distinguished the bone atrophy of senile osteoporosis from the type described as “of unknown cause,” or idiopathic osteoporosis, which he called post-menopausal osteoporosis.<sup>109</sup> In a series of papers from 1930 to 1945, Albright classified a variety of metabolic bone diseases and described the differences between osteoporosis, osteomalacia and osteitic fibrosa cystica.<sup>110</sup> Clinically, he showed that in osteoporosis, unlike other bone disorders, the skull is rarely affected.<sup>111</sup> Albright authored many original studies, publishing 118 papers during his lifetime. In his 1943 medical textbook, he asserted the new

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<sup>107</sup>Norman H. Horowitz, “Obituary: George W. Beadle,” Genetics Vol. 124 (1) (January 1990), pp. 1-4. Beadle, a geneticist in agricultural science, and Tatum, a biochemist, won the Nobel Prize in 1958 for this theory.

<sup>108</sup>J. C. Laidlaw and A. A. Maclean, “Fuller Albright: A Memoir,” paper presented at the Toronto Medical Historical Club, (February 22, 1991), p. 6. Copy obtained from Dr. E. R. Yendt.

<sup>109</sup>Fuller Albright, Esther Bloomberg, and Patricia H. Smith, “Post-Menopausal Osteoporosis,” Transactions of the Association of the American Physician Vol. 55 (1940), pp. 298-305.

<sup>110</sup>Laidlaw and Maclean, unpaginated appendix, Table 2.

<sup>111</sup>Anne P. Forbes, “Fuller Albright: His Concept of Postmenopausal Osteoporosis and What Came of It,” Clinical Orthopaedics and Related Research No. 269 (August 1991), p. 129.

concept that "hormones mediate everyday phenomena, not just freakish deformities."<sup>112</sup>

Fuller Albright appeared to have been remarkable as a man, a teacher, and a scientist.<sup>113</sup> He was highly regarded and honored for his many scientific achievements, despite a career which was prematurely and tragically truncated. Severely disabled by Parkinsonism when he did his pioneering work on osteoporosis.<sup>114</sup> Albright was virtually incapacitated physically in the mid-1940's, but still carried out his clinical and academic work (Figure 2.1). In 1956 he suffered a stroke, following experimental surgery upon which he had insisted against the advice of his surgeon. Although he lived another 13 years, Albright was rendered mute and totally bedridden.<sup>115</sup>

Albright enunciated the unconventional belief for medicine that "Nothing was irrefutable or ultimately conclusive."<sup>116</sup> In 1955, he was the youngest man ever to receive an honorary degree from his alma mater Harvard University.<sup>117</sup> John Eager Howard, an eminent endocrinologist at Johns Hopkins University, claimed that "Albright's name was probably more widely known around the world than that of any physician since Sir William Osler."

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<sup>112</sup>Gordan, p. 552. Gordan is hagiographic in this article about his former professor and mentor.

<sup>113</sup>Albright's papers, located at The Francis A. Countway Library of Medicine at Harvard University, are currently being processed and catalogued. The material on osteoporosis appears to be "primarily drafts of his manuscripts which were later published." Requests to obtain photocopies from the documentation were refused. (Private correspondence by mail and email with Lucretia McClure, Rare Books and Special Collections Department, July 29-September 24, 1997.)

<sup>114</sup>For example, he was President of the American Society for Clinical Investigation in 1944, Allston J. Stubbs and Martin I. Resnick, "Fuller Albright (1900-1969)," *Investigative Urology* Vol. 15, (4) (1978), p. 352; and President of the Endocrine Society in 1946-47, according to Howard, p. 380.

<sup>115</sup>Howard, pp. 379-80.

<sup>116</sup>Gordan, p. 548.

<sup>117</sup>Laidlaw and Maclean, p. 4.



and called him "The Father of Clinical Endocrinology".<sup>118</sup>

Quantitative analysis was a central focus of Albright's clinical investigations. He exhorted other researchers to "Measure Something" (Figure 2.2).<sup>119</sup> In 1935, he wrote "Science emerged from metaphysics when people began to make measurements."<sup>120</sup> Albright's studies focused on small numbers of patients rather than large populations. His attitude toward statistics was not worshipful: "I'm sure they are important, but if you have to use them, I don't believe it."<sup>121</sup> He was renowned for his ability to make fruitful connections between the application of bench research techniques and clinical studies. For example, his studies of bone were linked to his work in calcium-balance tests.<sup>122</sup> Albright introduced the nutritional research methodology of balance studies into mainstream scientific experimentation. Furthermore, "His ability to formulate working hypotheses was well-known."<sup>123</sup>

Because of Albright's own intellectual gifts and the generous "backing without

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<sup>118</sup>John Eager Howard, "Fuller Albright," *Perspectives in Biology and Medicine* (Spring 1981), p. 379-380. Albright spent the 1929 year at Hopkins as an assistant resident. Howard was a fourth year medical student at the time and worked under him there. Later Albright supervised Howard when the latter was a house officer at Massachusetts General Hospital. p. 375. According to E. R. Yendt, Howard, scion of a 'famous Baltimore family', became Albright's close friend as well as colleague. (Interview with E. R. Yendt, July 21, 1997.)

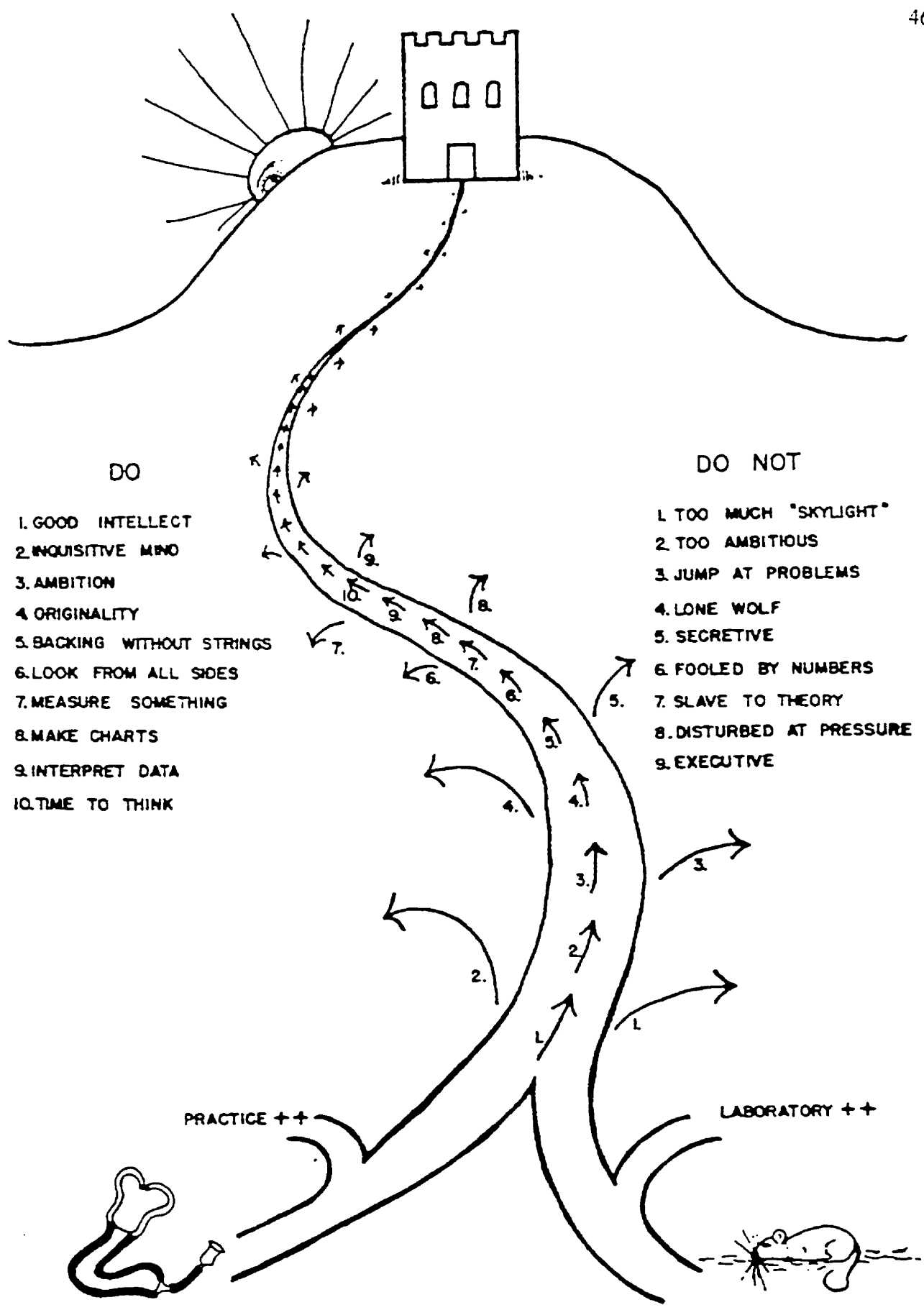
<sup>119</sup>See Albright's classic address to the American Society for Clinical Investigation, Atlantic City, N. J., May 8, 1944, called "Some of the 'DO'S' and 'DO-NOTS' in Clinical Investigation," *The Journal of Clinical Investigation* Vol. 23 (6) (1944), p. 922. Medvei, p. 527 and many others refer to this address and the diagram.

<sup>120</sup>Fuller Albright, J. A. Halstead, and E. Cloney, "Studies on Ovarian Dysfunction I. The Hormonal 'Measuring Sticks' available for Clinical Use and Values obtained on Normal Individuals." *New English Journal of Medicine* Vol. 212 (1935), pp. 192-95.

<sup>121</sup>Lloyd Axelrod, "Bones, Stones and Hormones: The Contributions of Fuller Albright," *New England Journal of Medicine* (October 29, 1970), p. 968.

<sup>122</sup>*Ibid.*, p. 967.

<sup>123</sup>Stubbs and Resnick, p. 352.



Source: Fuller Albright, "Some of the 'DO's' and 'DO-NOT's' in Clinical Investigation," *The Journal of Clinical Investigation* Vol. 23 (6) (1944), p. 922.

Source:

THE "DO'S" AND "DO-NOTS" ALONG THE ROAD LEADING TO THE CASTLE OF SUCCESS IN CLINICAL INVESTIGATION.

strings" from his departmental chief, Dr. James Howard Means. he made his mark as a researcher in a variety of endocrine and metabolic studies. Means gave Albright "wholehearted support with funds and the use of Ward 4 (Metabolism Unit) to permit unhampered scope for the investigative flights of fancy which constantly emanated from his brain."<sup>124</sup> Driven by a combination of curiosity and ambition, Albright required the participation of all his patients in his clinical tests. "Although his studies almost invariably started from the patient, he often seemed to be more interested in the disease than in its victim, and he used his patients largely to advance his investigative aims."<sup>125</sup>

Albright's work on a hormonal causation of bone deterioration in humans was based on prior research by Oscar Riddle in 1926 and the 1934 study by Preston Kyes' (1875-1949) on osteoporotic pigeons.<sup>126</sup> Previously known causes of osteoporosis were bone atrophy from lack of stress and strain (i.e., by disuse) and the decline of bone tissue that accompanies the aging process.<sup>127</sup> Albright limited his research subjects to individuals who were under 65 years of age, enabling him to separate post-menopausal and senile types of osteoporosis. He postulated that loss of estrogen led "to the failure of osteoblasts to lay down an organic matrix," as the underlying cause of the physiological process of bone loss.<sup>128</sup> He delivered his

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<sup>124</sup>Howard, p. 376. Ward 4 at Massachusetts General Hospital, founded in 1925, was one of the first dedicated metabolic research units in the United States.

<sup>125</sup>Axelrod, p. 967.

<sup>126</sup>Both works are cited in the initial paper by Albright, Bloomberg, and Smith, p. 305. Kyes' dates are from National Encyclopedia of American Biography 1893-1984 (39), pp. 103-04.

<sup>127</sup>Forbes, p. 128.

<sup>128</sup>Albright, Bloomberg, and Smith, pp. 298-305; and F. Albright, P. H. Smith and A. M. Richardson, "Post-menopausal Osteoporosis: Its Clinical Features," Journal of the American Medical Association Vol. 116 (May 31, 1941), p. 2465.

celebrated paper in Atlantic City, New Jersey on May 7-8, 1940. It was cited in the July-December 1940 Index Medicus, under a new categorization of "osteoporosis," called "menopause, disorder." This article was also cross-referenced to the Index's earlier classification of osteoporosis as a locomotor and bone and joint disease.<sup>129</sup>

In summary, Albright linked bone fragility in elderly women (osteoporosis) with menopause (estrogen loss). He expounded the "original and heretical concept to consider that fracture could result not only from trauma but from intrinsic inability of the skeleton to withstand normal biomechanical stress--fragility because of insufficient bone mass."<sup>130</sup> In the words of Albright's disciple, Gilbert S. Gordan, "the women whose skeletons long outlive their ovaries often reach the point of having 'too little bone.'"<sup>131</sup>

Osteoporosis research unfolded at what appears to be a leisurely pace in the 1940-1960 period, the "Fuller Albright era."<sup>132</sup> (See Table 1.3). Before 1940 and well into the 1950's, the most frequently used categories for osteoporosis citations, remained "Bones, fragility;" "Bones, atrophy;" "Spine, diseases;" "Spine, pathology;" "Ribs, pathology;" "Femur pathology;" and not those associated with menopause. Fuller Albright had predicted that osteoporosis would be the most common bone disease that physicians would encounter in their practices; however, it continued to be relatively ignored by medical researchers and

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<sup>129</sup>From Volume I in 1879 until Volume 28 in July-December 1940, Index Medicus citations mentioning "osteoporosis" were included under "Disease of Locomotion System, Bone and Joints."

<sup>130</sup>Gordan, pp. 552-53. Assessment of Albright is echoed by Epstein, p. 178, Schapiras, p. 164, and many of his other colleagues.

<sup>131</sup>Gordan, p. 552. "Too little bone" are Albright's own words.

<sup>132</sup>Epstein, p. 178.

educators well into the 1970's.<sup>133</sup>

In 1955, British physician A.M. Cooke estimated that a total of only 800 cases of osteoporosis had been documented in medical literature.<sup>134</sup> Cooke also analyzed 10 standard British medical texts published between 1950 and 1954 and found that in total, only 62 lines of text about any type of osteoporosis were printed cumulatively in these sources, and only 10 lines in total were devoted to post-menopausal osteoporosis.<sup>135</sup> Clearly Cooke and those who shared his concern were ready to rectify what they perceived as a gross oversight through the active promotion of disease recognition.

In Chapter 3, post-war scientific developments in therapeutics and diagnostic technologies relevant to the construction of osteoporosis as a new epidemic will be explored.

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<sup>133</sup>A.M. Cooke, "Osteoporosis," *The Lancet* Vol.1 (May 7, 1955), pp. 935. Cooke was a physician at the Radcliffe Infirmary, Oxford. (This article and an earlier part one in Vol. 1 (April 30, 1955) pp. 877-882, referred to earlier in Footnote #18 in this chapter, were abridged from the 1955 Lumleian lectures delivered before the Royal College of Physicians of London on April 19 and 21, 1955 under the title of "Some Aspects of Skeletal Disease."

<sup>134</sup>Cooke (May 7, 1955), p. 935.

<sup>135</sup>*Ibid.*, p. 935.

### Chapter 3: Post-War Science Uncovers A New Epidemic

The first of the many difficulties that we encounter is that of terminology. Many writers follow Humpty Dumpty--"When I use a word, it means just what I choose it to mean"--and the literature of metabolic bone disease abounds in loose and apparently little understood terminology. A. M. Cooke. British physician

In this chapter, I will relate the impact of post-war scientific advances on the medical construction of osteoporosis by using once again parallel chronological narratives for each of the following areas of inquiry: genetics, bone metabolism, epidemiology, therapeutics, and diagnostics. Between the 1960's and the 1990's, osteoporosis was transformed from a rare condition into an epidemic of heterogenous causes and ambiguous meanings.

#### Discoveries in Genetics 1950's-1990's: Predisposition to Osteoporosis

For several centuries, patterns of disease within families had been described in scientific literature, but a number of new concepts elucidated after World War II through research in the biochemistry of the gene became significant to medicine. Since Sutton's discovery of chromosomes as the carriers of genetic information early in the century, hundreds of diseases have been classified as having a genetic component, and in the final quarter of the twentieth century, scientists have been locating mutant genes for specific diseases on individual chromosomes (genome mapping).<sup>2</sup>

Genetic research did not play a significant role in the medical construction of osteoporosis until after 1950, when scientists had sufficiently penetrated the chemical structure of the gene, resulting in a more sophisticated understanding of the gene as the unit

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<sup>1</sup>A.M. Cooke, (April 30, 1955), p. 881.

<sup>2</sup>Mayr, p. 826. In 1973 only 25 human genes had been identified. Microbiologists had discovered 3,618 by 1993, and 7,000 by 1997, according to Stephen Strauss. "Why It's Tough to Name Genes and Be Genial," The Globe and Mail (January 1, 1998), p. A8.

of information in heredity.<sup>3</sup> The dynamic breakthrough came in 1953, when James D. Watson (b. 1928) and Francis H.C. Crick (b. 1916) described the double helix structure of DNA, how it replicated, and its significance for transferring genetic information in living cells. New lines of genetic inquiry unfolded after this achievement, including insights into the nature of genetic coding from the 1960's onwards.

Not only are inherited aspects of an individual's skeletal size pertinent to osteoporosis, but also metabolic processes, such as differences in the body's ability to absorb Vitamin D, are now believed to play a role in genetic predisposition to the disease. Moreover, visible physical characteristics, such as the early appearance of grey hair, have been associated with developing osteoporosis.<sup>4</sup> A recent theory explained the higher risk to lighter skinned populations by postulating that the vitamin D needed for calcium absorption may be more easily absorbed in darker skinned peoples.<sup>5</sup> And recent research on pairs of twins suggests that genetic factors may explain the association between muscle strength, lean mass and bone density.<sup>6</sup> Such genetic information currently may be used, along with other indicators, as diagnostic clues for asymptomatic individuals at risk.

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<sup>3</sup>Mayr, p. 807.

<sup>4</sup>Constance Holden, ed., "Silver Threads, Thin Bones," Science Vol. 266 (October 21, 1994), p. 366.

<sup>5</sup>Melva Weber, "Osteoporosis: Cancelled," Vogue, Vol. 175 (October 1985), p. 559. Weber likely took this hypothesis from Dr. Stanton H. Cohn, "Osteoporosis: How to Prevent the Brittle-Bone Disease (Fireside: Simon & Schuster, no date given), who she quotes in the article, but no clear attribution is made.

<sup>6</sup>Ego Seeman, John L. Hopper, Nicholas R. Young, Carmelo Formica, Peter Goss, and Con Tsalamandris, "Do Genetic Factors explain Associations between Muscle Strength, Lean Mass, and Bone Density? A Twin Study," American Journal of Physiology Vol. 270 (February 1996), pp. E320- E327.

## Discoveries in Endocrinology, Physiology, Pharmacology, and Rheumatology<sup>7</sup>

New knowledge about calcium, Vitamin D, and hormones and more sophisticated laboratory methodologies used by biochemists after World War II changed "horse and buggy endocrinology," a term used by Dr. E. R. Yendt for out-of-date theories and laboratory methods. From the late 1950's to the late 1980's, many discoveries altered scientific explanations of how bone is continuously formed and allowed the development of therapeutic options in addition to the estrogen recommended by Albright and his successors. Substances such as calcium, and hormones including a form of Vitamin D, parathyroid hormone, and calcitonin, were explored for their potential application in osteoporosis treatment. Osteoporosis became understood as a problem of imbalance in the bone remodeling process, when increased absorption outweighs the formation of both mineral and organic substances in the bone tissue.<sup>8</sup> Researchers began to search for treatments that would either inhibit bone dissolution or accelerate bone formation. Within the last decade, the discovery of estrogen receptors in bone-forming cells has led to new therapeutic substitutes for estrogen, and new opportunities for the drug industry.<sup>9</sup>

## Epidemiological Research on Osteoporosis

Epidemiology, the branch of medicine which studies population health, tracks the origin, causation, and extent of new epidemics and other diseases. A 1962 WHO/FAO study which set out to define calcium requirements in world nutritional standards, assumed that

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<sup>7</sup>Bone metabolism research has become part of the medical discipline called rheumatology.

<sup>8</sup>Peter A. Revell, Pathology of Bone (Berlin/ Heidelberg: Springer -Verlag, 1986), p. 28.

<sup>9</sup>E. F. Ericksen, D. S. Colvard, and N. J. Berg, M. L. Graham, K. G. Mann, T. C. Spelsberg, and B. L. Riggs, "Evidence of Estrogen Receptors in Normal Human Osteoblast-like Cells," Science Vol. 241 (1988), p. 84.



calcium deficiency was unlikely to be a cause of osteoporosis.<sup>10</sup> Its authors noticed that many of the world's people who consumed low calcium diets did not suffer from this bone disorder. Epidemiological investigations were sparked by this document concerning the etiological links and the extent of osteoporosis in various locales, including Finland, U. K., U. S., Jamaica, Gambia, India and Japan. The study focussed on 3 major issues: "(1) biochemical, radiologic and dietary information, (2) pathologic data, and (3) data on fracture epidemiology."<sup>11</sup>

Dr. B. E. C. Nordin, an English physiologist and physician then at the University of Glasgow, was funded, in part by WHO, to conduct a preliminary international study about these matters. He observed some racial and national differences in the age when the thinning processes begin and concluded from measurements of spinal density and thickness of finger bones that osteoporosis occurred in all countries studied. Nordin also found that men had discernable bone loss after middle age in a more universal pattern. He also deduced that the "epidemiology of fractured hip is more suggestive of an aging process." From the evidence that "osteoporosis does not appear in young people whatever the calcium intake, and it develops in the elderly of all the countries visited regardless of diet," he concluded that both aging and nutritional factors were possible causes of osteoporosis.<sup>12</sup> From the mid-1960's

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<sup>10</sup> B. E. C. Nordin, "International Patterns of Osteoporosis," Clinical Orthopaedics and Related Research No. 45 (March-April 1966), p. 19 cited Calcium Requirement, Report of FAO/WHO Expert Group, Geneva, 1962.

<sup>11</sup>G. Donald Whedon, "International Collaborative Study of Osteoporosis and Fracture Epidemiology," Clinical Orthopaedics and Related Research No. 45 (March-April 1966), p. 14.

<sup>12</sup>Nordin (1966), p. 29.

onward. then, osteoporosis was perceived as "a problem of worldwide importance."<sup>13</sup>

In 1964, M. R. Urist, another bone researcher, coined new names for the osteoporosis which appeared to occur from aging, "physiologic osteoporosis;" and a second type called "pathologic osteoporosis." Nordin postulated that the latter category might be an exaggerated form of the physiologic type or another process with the same outcomes.<sup>14</sup> Another distinction in categorization seems to have emerged around this time: the disease in males was termed "senile" osteoporosis; in women it was called "postmenopausal" osteoporosis.<sup>15</sup>

### **Therapeutic Imperatives: Calcium and Vitamin D**

Nordin's study helped launch a new emphasis in the 1960's on calcium as a crucial factor in explaining why some aging individuals of both sexes develop osteoporosis and others do not. He also elucidated calcium's possible relationship to fractures in the elderly.<sup>16</sup> Nordin asserted that dietary calcium was more effective than estrogen in "preventing spontaneous fractures, and relieving backache."<sup>17</sup> Calcium supplements as a treatment for the disease subsequently started to receive attention. G. Donald Whedon, a leading bone and joint expert, writing for popular consumption, categorically stated that "The most important development in osteoporosis during the past decade has been a re-awakened recognition that

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<sup>13</sup>Clayton Rich, D. S. Bernstein, S. Gates, R. P. Heaney, C. C. Johnston, Jr., C. A. Rosenberg, H. W. Schnaper, R. B. Tewksbury, and G. A. Williams, "Factors Involved in an Objective Study of the Efficacy of Treatment of Osteoporosis" in Clinical Orthopaedics and Related Research No. 45 (March-April 1966), p. 66.

<sup>14</sup>Nordin (1966), p. 29. This distinction has been perpetuated in some literature to the present time.

<sup>15</sup>The Medical Letter. Vol. 5 (19) (Issue 122) (September 13, 1963), pp. 73-74.

<sup>16</sup>Interview with Dr. E. R. Yendt, July 21, 1997.

<sup>17</sup>"Estrogens during and after the Menopause," The Medical Letter Vol. 7 (14) (Issue 169) (July 2, 1965), p. 55. B. E. C. Nordin, Advances in Metabolic Disorders Vol. 1 (New York: Academic Press, 1964), p. 125 is cited by The Medical Letter. According to the newsletter's consultants, by the mid-1960's, physical activity was also recommended by some physicians as a valid intervention for both the management and prevention of osteoporosis. (See Chapter 5 for The Medical Letter as an objective source of information on drugs.)

abnormality in calcium metabolism is closely involved as a cause of the disease."<sup>18</sup> This confidence notwithstanding, calcium therapy for osteoporosis became a controversy in the 1980's (See Chapters 6 and 8).

In 1952, A. J. Carlson (1875-1956) was the first to provide insight into the role of Vitamin D in calcium loss from existing bone.<sup>19</sup> In 1961, Harold and Helen Harrison at Johns Hopkins University demonstrated that Vitamin D also activated the transmission of phosphate across the intestinal membrane.<sup>20</sup> Biochemists at the University of Wisconsin, led by Hector F. DeLuca (b. 1930) in 1963, revealed the body's need for both Vitamin D and parathyroid hormone to mobilize calcium from previously formed bone.<sup>21</sup> By 1968, DeLuca determined that Vitamin D must be metabolically altered in both the liver and kidneys to function in regulating calcium in the body. He also discovered, isolated and synthesized the biologically active form of Vitamin D, which was reclassified a hormone.<sup>22</sup> Later in the 1970's, DeLuca's ongoing work on Vitamin D led to application in treatment for bone disorders. In the 1980's, it was further theorized that calcium homeostasis may be an underlying factor in explaining other cell functions in the human body including the "link

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<sup>18</sup>G. Donald Whedon, "Battling the Bone-Thinner," Today's Health Vol. 45 (9) (September 1967), pp. 66-70. In the mid-sixties he was the Director of the National Institutes of Arthritis and Metabolic Diseases at the U.S. National Institutes of Health.

<sup>18</sup>Allen G. Debus, ed., World Who's Who in Science: A Biographical Dictionary of Notable Scientists From Antiquity to the Present, First Edition. (Chicago: Marquis-Who's Who Inc., 1968), p. 299.

<sup>20</sup>Leon Eisenberg, "From Circumstance to Mechanism in Pediatrics During the Hopkins Century," Pediatrics Vol. 85 (1) (January 1990), p. 46.

<sup>21</sup>Dr. E. R. Yendt emphasized DeLuca's importance in the development of knowledge about bone and calcium. According to American Men and Women of Science 1995-96, 19th Edition Vol. 21 (New York: R. R. Bowker, c. 1995), p. 748. DeLuca holds more than 100 patents and has more than 900 publications on Vitamins A, D, parathyroid hormone and calcitonin.

<sup>22</sup>MacIntyre, Evans, and Larkins, pp. 66. This form of Vitamin D is called 1,25-dihydroxyvitamin D<sub>3</sub>.

that unites the degeneration of cellular mechanisms seen in both pathologic and normal aging processes."<sup>23</sup>

### **Hormones: PTH and Calcitonin**

Scientists knew about the parathyroid gland, but it was not until 1959, that American physiologist Howard Rasmussen (b.1925) actually isolated and defined a pure form of the parathyroid hormone.<sup>24</sup> Measuring parathyroid hormone (PTH) was not possible as a laboratory procedure until 1963, when Jerome A. Berson (b.1924), an American organic chemist, introduced a radio-immunological method for estimating parathyroid hormone in blood serum.<sup>25</sup> In 1970, researchers at Massachusetts General Hospital led by Dr. John T. Potts, Jr. synthesized the active ingredient in PTH which allowed therapeutic experimentation with the pure form of this hormone.<sup>26</sup>

The 1962 discovery of a new hormone, calcitonin, was the work of a Canadian physiologist, D. Harold Copp (1915-1998), at the University of British Columbia.<sup>27</sup> The role of calcitonin in bone metabolism is to lower the amount of blood calcium by depositing it in bone where it decreases resorption and by increasing calcium excretion.<sup>28</sup> A French scientist, Gérard Milhaud, was the first to investigate calcitonin's use in treating bone and calcium

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<sup>23</sup>Zaven S. Khachaturian, "Calcium and the Aging Brain: Upsetting a Delicate Balance?" Geriatrics Vol. 46 (11) (November 1991), p. 83. According to this theory, calcium homeostasis may be linked to the loss of brain function in aging.

<sup>24</sup>Li, p. 405. Both Collip and Hanson prepared extracts which were contaminated by fragments of hormone which were "biologically active but unstable."

<sup>25</sup>Interview with Dr. E. R. Yendt, July 21, 1997.

<sup>26</sup>Robert Reinhold, "Scientists Create Hormone That Aids In Bone Formation," New York Times (November 20, 1970), p. 1 and p. 27.

<sup>27</sup>Obituary, D. Harold Copp, The Globe and Mail (March 19, 1998), p. E6.

<sup>28</sup>Gérard Milhaud, "First Therapeutic Use of Calcitonin," Bone and Mineral Vol. 16 (March 1992), p. 206.

disorders in 1965. Both the scientific community and the pharmaceutical industry at the time were skeptical of calcitonin's therapeutic qualities: it was considered a "vestigial" hormone in humans, but by 1969. Milhaud *et al.* were reporting results of dramatic pain relief in osteoporotic patients.<sup>29</sup> According to Dr. Robert W. Hudson, calcitonin "tends to drive calcium into the bone,[but] we can do without it; it is a hormone looking for an action."<sup>30</sup> Human calcitonin as a treatment has been replaced in the last decade by extracts from salmon, which are more effective and less expensive.

### **Sodium Fluoride**

A 1966 study reported that communities with high fluoride content in their water supply appeared to have a reduced incidence of osteoporosis.<sup>31</sup> Researchers commenced experimental treatments of sodium fluoride for osteoporosis during the late 1960's.<sup>32</sup> By 1976, experts reported potentially promising therapeutic results of two studies, but also warned of fluoride's toxic properties at high doses.<sup>33</sup> Similarly equivocal analyses of fluoride for osteoporosis therapy were reported in 1987 and 1992.<sup>34</sup> (See Chapter 8).

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<sup>29</sup> *Ibid.*, pp. 201-210.

<sup>30</sup> Interview with Dr. Robert W. Hudson, August 1, 1997.

<sup>31</sup> Daniel Bernstein, Norman Sadowsky, D. Mark Hegsted, Charles D. Guri, and Frederic J. Stare, "Prevalence of Osteoporosis in High and Low fluoride Areas in North Dakota," *Journal of the American Medical Association* Vol. 198 (5) (October 31, 1966), pp. 85-90 or pp. 499-504 (two sets of page numbers).

<sup>32</sup> H. Spencer, I. Lewin, J. Fowler, J. Samachson, "Effect of Sodium Fluoride on Calcium Absorption and Balance in Man," *American Journal of Clinical Nutrition* Vol. 22 (1969), p. 381.

<sup>33</sup> "Osteoporosis," *The Medical Letter* Vol. 18 (23) (Issue 465) (November 5, 1976), pp. 99-100.

<sup>34</sup> "Prevention and Treatment of Postmenopausal Osteoporosis," *The Medical Letter* Vol. 29 (Issue 746), (August 14, 1987), p. 77; and "Choice of Drugs for Postmenopausal Osteoporosis," *The Medical Letter* Vol. 34 (Issue 882) (October 30, 1992), p. 102. The latter review also noted a study which observed increased incidence of hip fractures in older residents who lived in areas with fluoridated water: C. Danielson *et al.*, *Journal of the American Medical Association* Vol. 268 (1992), p. 746.

## Estrogen and Other Steroid Treatments

Estrogen was identified by Fuller Albright as the therapeutic drug of choice for postmenopausal women with osteoporosis; however, he carefully appended a cautionary note at the end of his famous 1940 article.<sup>35</sup> He and Dr. Joseph Meigs (1892-1963) had been treating younger patients for severe dysmenorrhea and some older patients for their menopausal symptoms with estrogen, before venturing into its use for osteoporosis. But they worried about the association between unopposed estrogen treatment and endometrial cancer. In fact as soon as Dr. G. N. Papanicolaou (1883-1962) published his technique for cell examination in 1941, Albright adapted a protocol of the "Pap" smear every six months for patients taking estrogen.<sup>36</sup>

Albright clearly believed that the small risk of endometrial cancer was a tolerable side effect of estrogen therapies. A frequently cited study in 1959 reviewed the use of estrogen during the previous 25 years.<sup>37</sup> Using the criteria of reduced height as an indicator of the degree of osteoporotic severity, this article concluded that "estrogen treatment is safe and effective in women who have postmenopausal osteoporosis and protective in women who do not."<sup>38</sup> Other experts were more circumspect in evaluation of estrogen's use and noted that:

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<sup>35</sup>Albright, Bloomberg, and Smith, p. 20. In Albright's words: "*Reservation*. Whether the effect of estrin on the calcium balance in post-menopausal osteoporosis is sufficient to make its administration of practical clinical value, it is as yet too soon to say."

<sup>36</sup>Interview with Dr. E. R. Yendt, July 21, 1997. Some practitioners, including Albright's disciple, Gilbert S. Gordan, may have been less punctilious in how they prescribed estrogen treatments. Dr. Yendt said: "Gilbert Gordan "was among the first who was a great advocate of estrogen, but his work wouldn't stand up to scientific scrutiny today."

<sup>37</sup>Philip H. Henneman and Stanley Wallach, "Prolonged Estrogen Therapy in Post-menopausal Women," Journal of the American Medical Association 171(1959), p. 1637.

<sup>38</sup>Forbes, pp. 134 - 135.

"There is some evidence of the value of estrogens in conserving calcium in the treatment of osteoporosis, though it is by no means conclusive."<sup>39</sup>

During the mid-1960's and into the 1970's, Gordan and other physicians experimented with androgen treatments for both male and female patients with osteoporosis.<sup>40</sup> But estrogen was widely prescribed for mild menopausal symptoms and other conditions during this time, notwithstanding adverse effects attributed to the hormone by at least 32 studies published in Europe and North America in 1965-66.<sup>41</sup> During the 1970's, three articles linking DES (1971) and female sex hormones with cancer in women's reproductive organs (1975 and 1976) led to changes in prescribing patterns by practitioners and a consumer revolt by the newly emerging women's health movement (See Chapters 4 and 7).

### **1980's-90's Development of Rational Derivatives: Bisphosphonates**

Traditionally, drugs were developed by chemical modification of natural products identified in an empirical process that was often serendipitous. During the postwar era, innovative ways of creating drugs were originated by researchers in Britain and the United States, who were seeking treatments for cancer, gout, heart disease, ulcers and other

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<sup>39</sup>The Medical Letter Vol. 7 (14) (Issue 169) (July 2, 1965), p. 55.

<sup>40</sup>G. S. Gordan, and E. Eisenberg, "The Effect of Estrogens, Androgens, and Corticoids on Skeletal Kinetics in Man," Proceedings of the Royal Society of London Vol. 56 (1963), p. 1027; E. W. Lafferty, G. E. Spencer, and O. H. Pearson, "Effects of Androgens, Estrogens and High Calcium Intake on Bone Formation and Resorption in Osteoporosis," American Journal of Medicine Vol. 36 (1964), p. 514. B. L. Riggs, J. Jowsey, R. S. Goldsmith, P. J. Kelly, and D. L. Hoffman, "Short and Long term Effects of Estrogen and Synthetic Anabolic Hormone in Post-menopausal Osteoporosis," The Journal of Clinical Investigation Vol. 51 (1972), p. 1659.

<sup>41</sup>In a Medline search (November 23, 1997) of the medical literature for 1965-66, 32 articles on adverse effects of estrogen were found. Nine of the total linked cancer to estrogen in their titles. Of these nine, 3 were in English and 6 were in other northern European languages, e.g. German, Norwegian, and Dutch.

diseases.<sup>42</sup> A new group of drugs, called rational derivatives, were designed by matching chemically manipulated products to the underlying biochemical and physiological explanations of body functions and dysfunctions. The experimental systems used to develop these substances in the commercial and academic arenas "help scientists to elucidate new aspects of drugs and diseases, to perform more precise measurements, and to transform basic and clinical concepts."<sup>43</sup>

The origins of rational derivatives began early in the twentieth century, with English physiologists John N. Langley (1852-1925) in 1905 and Sir Henry H. Dale (1875-1968) in 1906, who first observed that there were two types of receptors in tissues upon which binding of drugs caused excitatory or inhibitory responses.<sup>44</sup> In 1915, the German bacteriologist Paul Ehrlich (1854-1915) conceived of the concept of drugs binding to receptors in the cell.<sup>45</sup> Pioneering work by Herman J. Ahlquist (b. 1903) in 1948 differentiated two types of adrenaline receptors in the body's tissues; this paradigm was used later in the early developments of drugs derivatives called beta blockers.<sup>46</sup> Rational derivatives in therapeutics were the object of the 1988 Nobel Prize in Medicine and Physiology.<sup>47</sup>

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<sup>42</sup>Jean L. Marx, "The 1988 Nobel Prize for Physiology or Medicine," Science Vol. 242 (4878) (October 28, 1988), pp. 516-17.

<sup>43</sup>Vos, p. 119.

<sup>44</sup>Ibid., pp. 70 - 71.

<sup>45</sup>Interview with Dr. Gerald Marks, November 16, 1997.

<sup>46</sup>Ibid.

<sup>47</sup>Marx (1988), pp. 516-17. Three researchers were awarded the Nobel Prize for earlier work on rational derivatives. Gertrude Elion and George Hitchings (USA), employed by Burroughs Wellcome Company in North Carolina from the 1940's on, developed drugs used against cancer and other diseases. James Black (UK), at Smith, Kline, and French, was the discoverer in the 1960's of beta-blockers used in heart disease as well as an anti-ulcer drug cimetidine (Tagamet). M. Weatherall, In Search of a Cure: A History of Pharmaceutical Discovery (Oxford: Oxford University Press, 1990), p. 242. These drugs took several decades to develop for



In the late 1980's and 1990's, bisphosphonates, also rational derivatives, changed medical opinion about the ability to reverse bone loss due to osteoporosis. By the late 1990's, another group of derivatives, namely estrogen analogs, have been designed specifically to target bone receptors, and not those of women's reproductive organs.<sup>48</sup>

Research on a compound called pyrophosphate began in the 1960's. One of its discoverers, Herbert Fleisch a Swiss pathophysiologicalist (b. 1933),<sup>49</sup> stated that its discovery was "a good example of an interdisciplinary approach and of the inter-relation between basic and applied research."<sup>50</sup> By 1966, pyrophosphate was thought to be involved in the regulation of bone loss. Because this class of substances was unable to be administered orally, a twenty-year search for analogs commenced sponsored by a partnership between Proctor & Gamble and its academic investigators.<sup>51</sup> Some bisphosphonates, identified in the 1980's, did prove to stop bone dissolution, although the biochemical mechanism is still not totally understood.

### **A Roller Coaster of Beliefs in Therapeutics for Osteoporosis**

In sum, beginning in the 1960's across Europe and North America, a number of pharmaceutical treatments singly or in various combinations became available as therapies for osteoporosis. Hopes that these therapeutics would be efficacious led to academic and

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commercial release.

<sup>48</sup>Interviews with Drs. T. Anastassiades, R. W. Hudson, and E. R. Yendt, July - August 1997. These drugs are called selective estrogen receptor modulators (SERMs).

<sup>49</sup>Fleisch's date of birth is from Debus, p. 577.

<sup>50</sup>H. Fleisch, "Bisphosphonates--History and Experimental Basis," *Bone* Vol. 8 (Supp.1) (1987), p. S23.

<sup>51</sup>*Ibid.*, p. S24. Phosphate is a by-product of the detergent manufacturing process which explains the involvement of P & G., detergent manufacturers.

commercial exploration of these options. The Medical Letter of September 13, 1963 was the first occasion in which this pharmacological review presented opinions about therapeutics pertaining to osteoporosis. It noted that steroid drugs and calcium were being used for treatment of both "postmenopausal" and "senile" osteoporosis. Interestingly, the use of both types of therapies were judged to be "palliative" because "the fundamental causes of the disease are not known, and investigators disagree as to the effectiveness of treatment."<sup>52</sup> In 1966, a scientific study under the aegis of the U. S. Veterans Association acknowledged that no "direct objective study" on osteoporosis treatments had been done.<sup>53</sup> In North America, estrogen was the most favoured treatment from the 1960's onwards, while among eight European countries surveyed in 1987, calcium was more commonly utilized overall. (Figure 3.1) According to this source, Japanese doctors prefer giving their patients vitamin D, with calcitonin as their drug of second choice.<sup>54</sup>

### **Diagnostic Imaging: Earlier and More Accurate Measurement of Bone Loss**

Establishing a positive diagnosis for 'osteoporosis' using older x-ray technology had been fraught with difficulty, except in individuals who had significant bone loss, fractures, or had other clinical evidence of a health problem. X-ray evidence was equivocal at best and need for innovative methodologies was recognized by the early 1950's.<sup>55</sup> Albright and his

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<sup>52</sup>The Medical Letter Vol. 5 (19) (Issue 122) (September 13, 1963), p. 73.

<sup>53</sup>Rich, Bernstein, Gates, et al., p. 63.

<sup>54</sup>J. Dequeker and P. Geusens, "Review: Treatment of Established Osteoporosis and Rehabilitation: Current Practice and Possibilities," Maturitas Vol. 12 (1990), pp. 6-7.

<sup>55</sup> J. Gershon-Cohen, Harald Schraer, and Nathan Blumberg, "Bone Density Measurements of Osteoporosis in the Aged," Radiology Vol. 65 (September 1955), p. 416. Gershon-Cohen et al. said "Osteoporosis as diagnosed by the roentgenologist lacks the objectivity necessary for accuracy." Ellis Barnett and B. E. C. Nordin, "The Radiological Diagnosis of Osteoporosis: A New Approach," Clinical Radiology Vol.11 (1960), p. 166.



contemporaries had relied on time-consuming and painstaking metabolic balance studies to diagnose osteoporosis by monitoring the calcium excreted by patients.

It includes ...buying in advance all the food for months of constant diet to ensure that all canned and packaged goods are from the same lot; grinding and mixing the meat and freezing it in aliquots; baking all breadstuffs on the premises from weighed ingredients; weighing each portion of food served to the gram; and scraping the plate with a rubber scraper to make sure it is all eaten. Carmine was administered to mark the stool collections, the bed pans were rinsed with distilled water, and all urine voided was immediately refrigerated. Even the patients' activities were kept as constant as possible. The method of charting the data was improved over that used in the first paper on osteoporosis.<sup>56</sup>

Computer technology developed during the 1940's for wartime uses and became commercially available in the 1950's, but the ability to reconstruct images from mathematical data was not possible until twenty years later.<sup>57</sup> Combining computer and television technology during the post-war era and their gradual refinements have led to the development of X-ray's "daughter" technologies, which are of crucial importance to the history of osteoporosis.

By 1955, J. Gershon-Cohen identified the development of densitometric and computation equipment as a promising advance for the diagnosis of osteoporosis. Invented by physicists at Pennsylvania State University ca. 1939-49, the new procedure was adapted to provide more objective quantitative estimates of bone density.<sup>58</sup> Although bone density

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<sup>56</sup>E. C. Reifstein, Jr., F. Albright, S. L. Wells, "The Accumulation, Interpretation, and Presentation of Data Pertaining to Metabolic Balances, Notably Dose of Calcium, Phosphorus and Nitrogen," Journal of Clinical Endocrinology Medicine Vol. 5 (1945), p. 367.

<sup>57</sup>Kevles, pp. 4-5.

<sup>58</sup>Gerson-Cohen, p. 416. Gershon-Cohen was a physician in Philadelphia. The publication heralding the new methodology was: P. B. Mack, A. T. O'Brien, J. M. Smith and A. W. Bauman, "Method of Estimating Degree of Mineralization of Bones from Tracings of Roentgenograms," Science Vol.89 (May 19, 1939), p. 467. In 1947 also at Pennsylvania State, Raymond Pipinsky designed a machine, XRAC, permitting x-ray crystallographic data to be transformed into an "intelligible molecular picture." This advance allowed scientists to produce pictures of molecules in minute detail. Arthur J. Olson and David S. Goodsell, "Visualizing Biological Molecules," Scientific American (November 1992), p. 78.

measurements had been done earlier on "hundreds of normal people." the physicists, Gershon-Cohen, and his colleagues were the first to apply the technology in "the systematic study of a group of aged subjects who will be available for periodic re-examination." Their goal was to find "a better appraisal of senile osteoporosis."<sup>59</sup> The collaborators acknowledged continuing limitations in the new technology, especially in obtaining spinal measurements.

In 1960, B. E. C. Nordin and his Glasgow colleagues, were still publishing several alternative techniques using traditional radiological equipment for routine assessment of osteoporosis, although they recognized that their refinements were only an interim improvement over existing technology.<sup>60</sup> During the 1960's, clinicians and researchers expressed a need for standardized radiological scales to measure vertebral and long bones.<sup>61</sup>

Bone densitometry was refined over the next thirty years, transforming the diagnosis and construction of osteoporosis. The underlying principle is the use of a tiny amount of x-ray radiation to assess bone density at specific sites such as the spine or hip. Measurement is in grams of mineral per square centimeter of area.<sup>62</sup> Modifications in bone densitometry were tried which tested type of bone, precision and accuracy of measurements, and radiation

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<sup>59</sup>Gershon-Cohen, pp. 418 - 419.

<sup>60</sup>Barnett and Nordin, pp. 166 and 174. Their suggested refinement using cortical bone thickness "attempted to replace the subjective estimation of vertebral density by a simple measurement of biconcavity, one of the predominant radiological features in vertebral porosis." Dr. Yendt considered Nordin one of the major figures in the history of osteoporosis. Nordin's career has taken him from Glasgow, Leeds, and later to Australia.

<sup>61</sup>G. Donald Whedon, "International Collaborative Study of Osteoporosis and Fracture Epidemiology," Clinical Orthopaedics and Related Research No. 45 (March-April 1966), p. 14.

<sup>62</sup>Interview with Dr. Tassos Anastassiades, July 2, 1997. According to studies in the 1990's, this quantification of mineralization "is known to predict risk of fracture, with the caveat that prediction is best for the actual site measured," i.e. hip measurement used for hip fracture. See also Michael Jergas and Harry K. Genant, "Current Methods and Recent Advances in The Diagnosis of Osteoporosis," Arthritis & Rheumatism Vol. 36 (12) (December 1993), p. 1649.

dosages. leading to a succession of methods for calculating bone loss due to osteoporosis.<sup>63</sup>

In the 1960's, single-photon and x-ray absorptiometry (SPA) was introduced. It could not measure cortical and trabecular bone separately, but newer models are still being used due to its relative precision, low radiation, and comparative cost-effectiveness.<sup>64</sup> In the early 1980's, SPA was the first technology used to screen asymptomatic patients by measuring the mineral levels in the forearm.<sup>65</sup> Dual photon absorptiometry (DPA) was introduced in the early 1980's, allowing more accurate assessment by accounting for variable soft tissue thickness and composition between bone sites.

Today's state of the art bone densitometry method appeared commercially in 1987, in the development of more precise dual-energy X-ray absorption (known as DEXA or DXA), an innovation which replaced DPA.<sup>66</sup> DEXA uses two photon beams of different energies which are absorbed differently by bone and soft tissue, allowing for more refined measurements in the spine and hip.<sup>67</sup> DEXA was critical to the realization of bone densitometry's commercial and diagnostic potential,<sup>68</sup> its major advantage is the reduction in examination time and its greater accuracy and precision due to higher resolution and lack of

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<sup>63</sup>Jergas and Genant, p. 1649.

<sup>64</sup>Ibid., p. 1651.

<sup>65</sup>D. R., "The Thin-Bone Detector," Health Vol.14 (August 1982), p. 16.

<sup>66</sup>R. W. Keen, T. Nguyen, R. Sobnack, L. A. Perry, P. W. Thompson, and T. D. Spector, "Can Biochemical Markers Predict Bone Loss at the Hip and Spine?: A 4 Year Prospective Study of 141 Early Postmenopausal Women," Osteoporosis International Vol. 6 (1996), p. 405.

<sup>67</sup>The Medical Letter Vol. 38 (Issue 988) (November 22, 1996), p. 103.

<sup>68</sup>Jergas and Genant, p. 1651. Under the instigation of Dr. Yendt in 1986, Kingston General Hospital was the second site in Canada to obtain this technology (St. Joseph's Hospital in London was first). He expressed pride that KGH had bone densitometry technology before John's Hopkins Medical School. Interview with Dr. E .R. Yendt, July 21, 1997.

radionuclide decay.<sup>69</sup> Major disadvantages are its relative expense and the need to locate this equipment in hospitals, limiting this technology to mostly urban centres in industrialized countries.<sup>70</sup> Dr. Yendt dated the significant growth in awareness about osteoporosis to "the last 10 years, or since bone measurement allowed accurate diagnosis and treatment." He also noted that "no good fracture studies" were done before the advent of accurate bone density measures.<sup>71</sup> DEXA has become the definitive bone densitometry technology based on studies done between 1993 - 1996. Independent consultants validated DEXA at the end of 1996 and deemed it an accurate measure of osteoporotic bones and predictor for risk of fracture.<sup>72</sup>

Interest in and utilization of DEXA has grown parallel to the spectacular boost in perceptions of osteoporosis as an epidemic disease during the late 1980's and the decade of the 1990's. Table 3.1 displays the mushrooming of medical interest in DEXA bone densitometry since 1993. In Canada, the accessibility to DEXA technology is limited by provincial restraints on spending,<sup>73</sup> while in the United States, diffusion of expensive technology is unbridled.

Other diagnostic imaging techniques, developed since the 1960's, have been adapted for current usage or have been in the process of being evaluated for their ability to assess

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<sup>69</sup>Jergas and Genant, p. 1651.

<sup>70</sup>Interview with Dr. Tassos Anastassiades, July 2, 1997.

<sup>71</sup>Interview with Dr. E. R. Yendt, July 21, 1997.

<sup>72</sup>The Medical Letter Vol. 38 (Issue 988) (November 22, 1996), pp. 103-104.

<sup>73</sup>In Kingston on March 6, 1997, at a Grand Rounds lecture for the combined medical staff of local teaching hospitals held at the Hotel Dieu Hospital, a 12-month waiting period was required for a bone density test. By October 1997, at a Public Forum Panel discussion at the Grand Theatre, the estimated waiting time had extended to eighteen months. Utilization data of bone scanning for Ontario which was requested from OHIP has not been received and may be delayed indefinitely. (Phone Interviews with J. Axelrad and R. Kennedy.)

### Bone Densitometry

**Table 3.1** Number of Citations for Densitometry and X-Ray Densitometry  
In Medline, 1966-1997

<u>Years</u>	<u>Densitometry</u>	<u>X-ray Densitometry</u>	
	<u># of Articles</u>	<u># of Articles</u>	<u>% Growth</u>
1966-75	3,845	493	
1976-80	805	237	-51.9
1981-86	1,101	230	-03.0
1987-92	1,694	413	-79.6
1993-97	984	1,581	+282.8

Source: Medline Search October 20, 1997



bone density and bone structure. In 1963, Alan MacLeod Cormack (b. 1924) published reports of an experimental scanner using a computer to reconstruct images from x-ray data. He later shared the Nobel Prize in 1979 for the invention of computer axial tomography (CT).<sup>74</sup> CT scanners did not become commercially available, however, until the 1970's.<sup>75</sup> In the mid-1970's, quantitative computed tomography (QCT) was developed and "is the only method that provides a true measurement of density [grams per cubic centimeter of bone], by determining both the bone density and the distribution in 3 dimensions at any skeletal site." In the early 1980's, QCT was adapted for screening osteoporosis patients and made widely available through use of regular CT machinery; technical issues and higher radiation doses, however, limited QCT's use to research centres.<sup>76</sup> QCT is more expensive than DEXA and cannot measure bone density at the femoral neck of the hip joint.<sup>77</sup>

Changes in scientific understanding of bone led to more interest in ultrasound during the 1990's.<sup>78</sup> Ultrasound techniques measure both the speed of sound conduction and how it is attenuated through bone. The process was first used in industrial material testing. Its first application to bone took place in the 1960's, but use in diagnosing osteoporosis has been recent.<sup>79</sup> Innovations in hardware and software have allowed ultrasound techniques to obtain

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<sup>74</sup>Emily J. MacMurray, ed., Notable 20th Century Scientists Vol. 1 (Detroit: Gale Research Inc., 1995), p. 405. The prize was shared with Godfrey N. Hounsfield.

<sup>75</sup>Kevles, pp. 312 -314. Previously, William Oldendorf had constructed a model scanner without computer in 1958.

<sup>76</sup>Jergas and Genant, p. 1654.

<sup>77</sup>The Medical Letter Vol. 38 (Issue 988) (November 22, 1996), p. 103.

<sup>78</sup>Interview with Dr. Tassos Anastassiades, July 2, 1997.

<sup>79</sup>Jergas and Genant, p. 1656

enhanced precision and ease of use. The machinery is portable and has potential for widespread screening.<sup>30</sup> Other advantages include low cost and no radiation exposure, but questions pertaining to ultrasound measurement and their relationship to the mass and other properties of bone still render this technology less desirable as a diagnostic tool.<sup>31</sup> Ultrasound methods, however, are used widely outside of North America.<sup>32</sup> Finally, quantitative magnetic resonance (MR) has been used, but only in basic research on bone and not yet adapted for clinical studies. All of the bone mineral density measurement techniques require quality assurance controls.<sup>33</sup>

### **The Meaning of the Diagnosis “Osteoporosis”**

If symptoms of disease are the subjective indicators of illness experienced by individual sufferers, signs are the clinical observations interpreted by medical professionals to determine a diagnosis. Criteria for diagnosis have been crucial to the development of osteoporosis as a pathognomonic (distinctively characteristic) disease entity. In modern western societies the relationship between patient and physician is contingent upon diagnostic criteria for a “disease,” because labeling of illness must precede prognosis and undertaking preventative or curative interventions.<sup>34</sup> Clinicians are faced with the epistemological dilemma of classifying unique individuals, whose symptoms do not neatly fit into identical

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<sup>30</sup>Interview with Dr. Tassos Anastassiades, July 2, 1997.

<sup>31</sup>Jergas and Genant, p. 1656

<sup>32</sup>The Medical Letter Vol. 38 (Issue 988), November 22, 1996, p. 103. Philip D. Ross, “Osteoporosis: Frequency, Consequences, and Risk Factors,” Archives of Internal Medicine Vol. 156 (July 8, 1996), p. 1405. According to Ross, an epidemiologist at the Hawaii Osteoporosis Center, quantitative ultrasound technology had not been approved by the FDA for predicting fracture risk at the time he wrote the article.

<sup>33</sup>Jergas and Genant, pp. 1656-57.

<sup>34</sup>Risse (1978), p. 584; Rosenberg, “Introduction”, Framing Disease, p. xviii.

patterns of diagnostic categories as described in the medical literature, and devising appropriate prognoses and treatments.

Each individual patient to be encountered by the physician represents a specific arrangement of signs and symptoms that one way or the other will not fit the generalized clinical pattern. Every doctor-patient interaction, each therapeutic decision, and each act of intervention in sick people challenges clinical taxonomy. The individuality of patients and the complexity of real life medical practice forms a rich source of variation and deviation. Disease concepts loose [sic] fixed meanings in daily practice of clinical diagnosis and treatment.<sup>85</sup>

Osteoporosis used to be diagnosed after symptoms appeared, or after serious bone loss was detectable by x-rays. By the mid-1980's, however, osteoporosis became for some patients an epidemic of symptomless disease, and for others a disease with significant clinical symptoms.

### **Crunching Numbers: Using Densitometry Data to Define Disease**

Physicians apply scientific knowledge to groups of patients with similar characteristics to make logical therapeutic decisions. By combining knowledge from "objective" clinically controlled trials with information gained from social interaction with their medical peers, and their accumulated experiences with groups of patients, physicians are expected to suggest outcomes and appropriate interventions for individual patients.<sup>86</sup>

Cultural and social factors mediate medical knowledge.

To diagnose osteoporosis, two types of numerical measurements by bone scans are used: a "T-score" which measures mineral content or density against a reference range of "young, healthy" premenopausal adults; and a "Z-score" which compares findings against an

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<sup>85</sup>Vos, p. 47.

<sup>86</sup>ibid., pp. 255-260.

age-matched population.<sup>37</sup> Since 1994, diagnostic criteria established by the World Health Organization have used the T- Score measures in Table 3.2 for labeling the degrees of bone loss associated with osteoporosis.<sup>38</sup>

The criteria used for diagnostic purposes by the WHO Study Group for risk assessment of fractures was set for a threshold that applied only to Caucasian females. One possible explanation for what appears to be an inappropriate tool for an international organization such as WHO, is that threshold values for bone mineral measurement have not been researched to the same extent for Caucasian men and other races.<sup>39</sup> Other explanations are economic disinterest (technology is unable to be sold to less developed Third World countries); unintended ethnocentricity; and/or racism, since Asians are thought to be at higher risk than the general population of North Americans.

In medical literature of the 1990's, bone density measurements have been recognized as a risk factor for populations. Such statistical risks, however, cannot be correlated precisely with clinical diagnoses of an individual's lifetime risk for fracture. Age is another major factor correlated with the risk of fractures; the percentage of individuals with osteoporosis,

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<sup>37</sup>John A. Kanis, Jean-Pierre Devogelaer, and Carlo Gennari, "Practical Guide for the Use of Bone Mineral Measurements in the Assessment of Treatment of Osteoporosis: A Position Paper of the European Foundation for Osteoporosis and Bone Disease," Osteoporosis International Vol. 6 (1996), p. 257.

<sup>38</sup>Michael Kleerekoper and Louis V. Avioli, "Evaluation and Treatment of Postmenopausal Osteoporosis" in Primer on the Metabolic Bone Diseases and Disorders of Mineral Metabolism, 3rd Edition, Murray J. Favus, ed. Official Publication of the American Society for Bone and Mineral Research (Philadelphia: Lippincott-Raven, 1996), p. 265. Criteria were from World Health Organization: "Assessment of fracture risk and its application to screening for postmenopausal osteoporosis," Report of a WHO Study Group. World Health Organization Technical Report Series, Vol. 843 (1994), pp. 1-129.

<sup>39</sup>Kanis, Devogelaer and Gennari, pp. 257-258. The bone density "reference data" was obtained from one of the two largest manufacturers of bone densitometry equipment, Hologic QDR Systems of Waltham, Mass. and was used as an appendix for an American osteoporosis source book: Murray Favus, ed., Primer on the Metabolic Bone Diseases, 3rd Edition, An Official Publication of the American Society for Bone and Mineral Research. Murray Favus, ed. (Philadelphia: Lippincott-Raven, 1996), pp.463-466. Their data was derived "almost entirely" from a Caucasian population.

## Diagnostic Criteria for Osteoporosis

**Figure 3.2** WHO Diagnostic Criteria for Osteoporosis. 1994

<u>Status</u>	<u>Criteria</u>
Normal	BMD or BMC within 1 SD of young adult reference mean.
Low Bone Mass (Osteopenia)	BMD or BMC between 1.0 and 2.5 SD below young adult reference mean.
Osteoporosis	BMC or BMC 2.5 SD or more below the young adult reference mean.
Severe (established) Osteoporosis	Low BMD value with one or more nontraumatic fractures.

Abbreviations:

BMD=	Bone Mineral Density
BMC=	Bone Mineral Content
SD=	Standard Deviation
Young Adult Reference Mean=	“Healthy” adults aged 30–40 years

Source: World Health Organization, “Assessment of Fracture Risk and its Application to Screening for Postmenopausal Osteoporosis,” Report of a WHO Study Group. World Health Technical Report Series Vol. 843 (1994) as cited in “Evaluation and Treatment of Postmenopausal Osteoporosis,” Primer on the Metabolic Bone Diseases and Disorders of Mineral Metabolism, 3rd Edition, Murray J. Favus, ed. (An Official Publication of The American Society of Bone and Mineral Research) (Philadelphia: Lippincott-Raven, 1996), p. 265.

especially women over the age of 50. increases geometrically with age as a function of the distribution of bone mineral density in the population. The risk of fracture also increases exponentially when the measurement is below 2 Standard Deviations. The risk of fracture is estimated to double for each standard deviation decrease in bone mineral.<sup>90</sup> (Figures 3.3, 3.4 and 3.5). The Medical Letter, however, cautioned that "Specific bone mineral density cutoffs alone are not indications for treatment; most authorities believe that other criteria must also be considered both in starting therapy and in monitoring its effectiveness."<sup>91</sup>

Similar qualifiers have been used to modify the application of risk factors for other "diseases" such as high cholesterol with heart conditions and hypertension for strokes.<sup>92</sup> Historian Charles Rosenberg has called this process of using sophisticated measuring of physiological processes for screening of populations the creation of "an assortment of pre- or protodisease states accompanied by a difficult assortment of personal and policy decisions."<sup>93</sup> According to recent European research, "bone mineral density is... at least as good as...blood pressure in predicting stroke, and considerably better than the use of serum cholesterol to predict coronary artery disease." The authors of this study noted, however, that "there is no absolute threshold of bone mineral that discriminates absolutely who will or will not fracture." If an individual had a normal bone density score, he/she would be at lower risk, but

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<sup>90</sup>Kanis, Devogelaer, and Gennari, p. 258.

<sup>91</sup>The Medical Letter Vol. 38 (Issue 988) (November 22, 1996), p. 103. W. Sturtridge et al. Canadian Medical Association Journal Vol. 155 (October 1, 1996), p. 924 is cited for the risk fracture predictions and B. Ertinger et al, Annals of Internal Medicine Vol. 125 (Oct. 1, 1996), p. 623, is cited for the caution about other indicators.

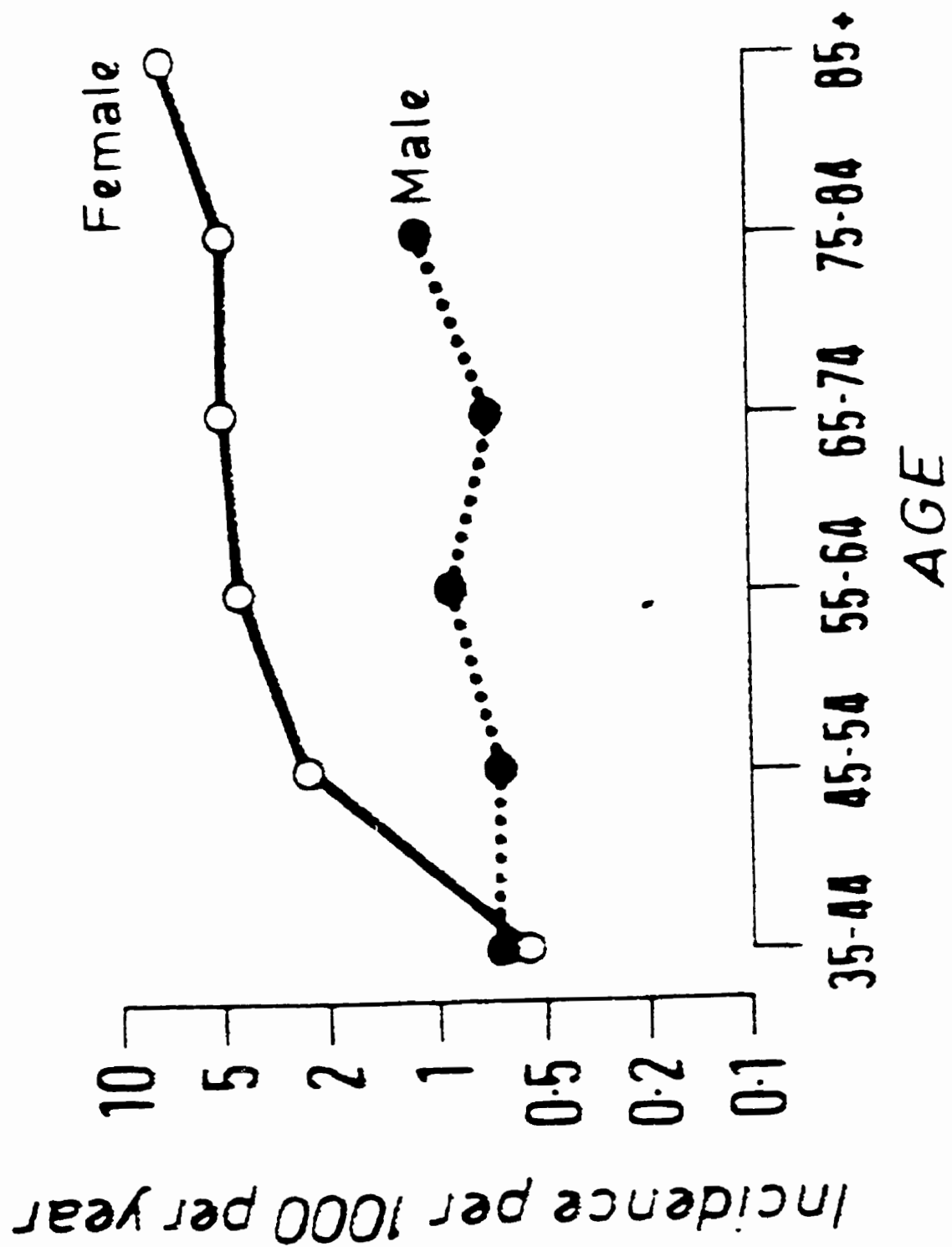
<sup>92</sup>Robert Lindsay, "Prevention of Osteoporosis." Primer on the Metabolic Bone Diseases and Disorders of Mineral Metabolism 3rd Edition, An Official Publication of the American Society for Bone and Mineral Research. Murray Favus, ed. (Philadelphia: Lippincott-Raven, 1996), p. 257.

<sup>93</sup>Rosenberg, "Introduction," Framing Disease, footnote#12, page xxv.

## BONE DENSITY - LUMBAR SPINE, L1 - L4

T SCORE SD from peak bone mass	% YOUNG ADULT VALUES BELOW T SCORE	NON TRAUMATIC FRACTURES LIFE TIME RISK % women at age 50 YR.		DIAGNOSIS
		SPINE	ANY SITE	
0	50	16	40	NORMAL
-1	16	32	80	OSTEOPENIA
-2.5	0	96	240	OSTEOPOROSIS

**Source:** This figure was compiled and designed by Dr. Joan Harrison with data from John A. Kanis, L. Joseph Melton III, Claus Christiansen, Conrad C. Johnston, and Nikolai Khaltsev. "The Diagnosis of Osteoporosis," Journal of Bone and Mineral Research Vol. 9 (8) (1994), pp.1137-1141.

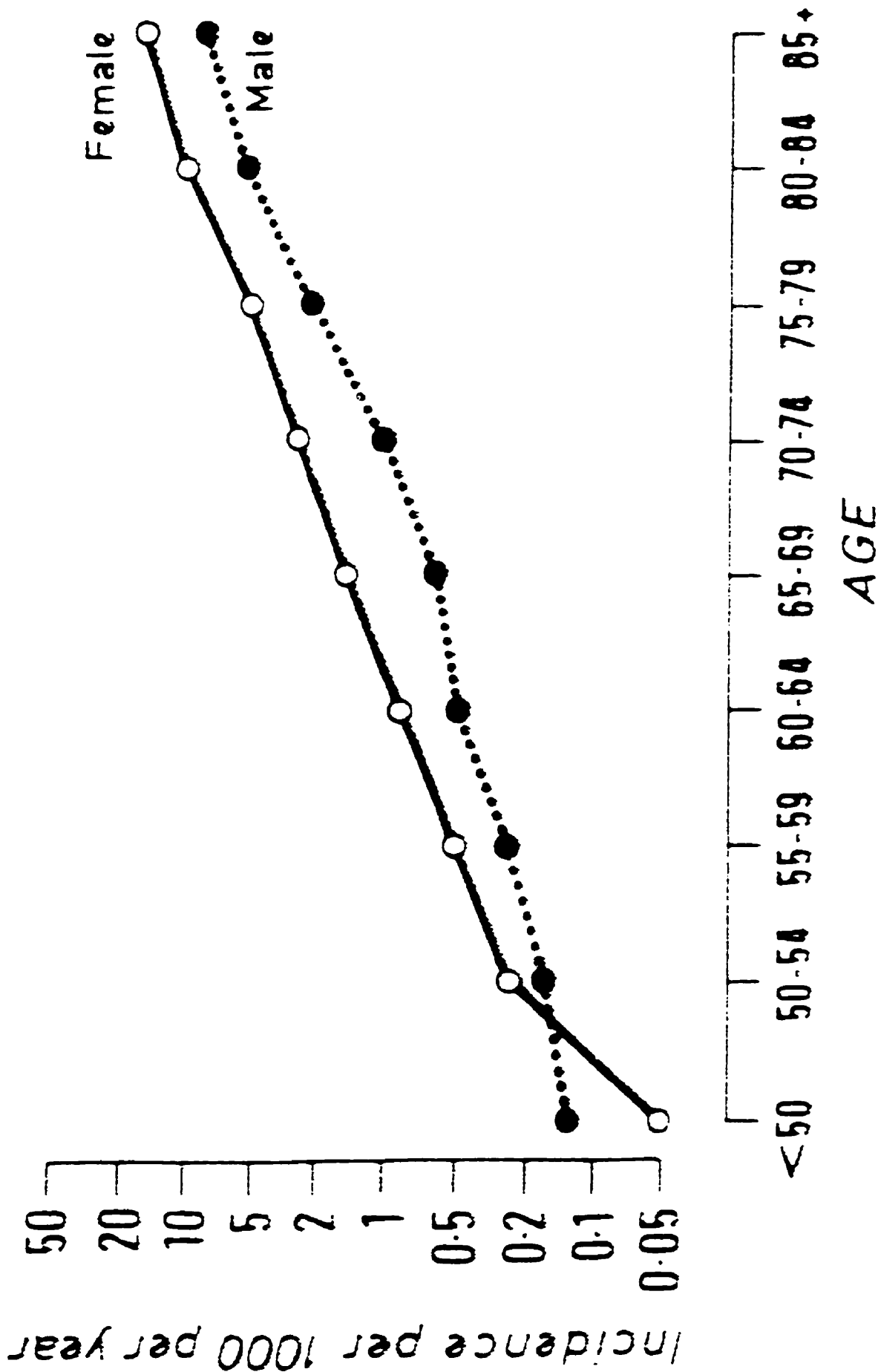


Wrist fractures—the incidence by age and sex.

N.B. The logarithmic scale used in this figure minimizes the difference between incidence rates.

Source: I.D. Gerald Richards and Mark R. Baker. The Epidemiology and Prevention of Important Disease (London: Churchill Livingstone, 1988), pp. 121-122.





**Femoral neck fractures—the incidence by age and sex.**

N.B. The logarithmic scale used in this figure minimizes the difference between incidence rates.

Source: I.D. Gerald Richards and Mark R. Baker. The Epidemiology and Prevention of Important Disease (London: Churchill Livingstone, 1988). pp. 121-122.

might still experience fractures: but if that individual had a measurement in the osteoporotic range, then fractures are more likely to occur.<sup>94</sup>

An additional diagnostic tool, based on mathematical probability, therefore has been created to measure the potential for an individual's cumulative fracture risk from the multiplicity of causal factors: "the remaining lifetime fracture probability (RLFP)." "RLFP is calculated from age, bone density, life expectancy, and anticipated future bone loss," and has been utilized for the purpose of individual treatment decisions, particularly for prescribing drugs for prevention purposes.<sup>95</sup> Physicians have become reliant on bone mass measurements not only for negotiating therapeutic options and monitoring the effects of treatments, but also "to enhance compliance."<sup>96</sup>

Not surprisingly, the vast preponderance of persons diagnosed with osteoporosis as represented in the current literature of the 1980's and 90's, are postmenopausal women (ages 50+) and the age-associated osteoporosis categories for both sexes. Using the WHO definition of osteoporosis, recent predictions have estimated that among women of 60-70 years, only 11% have "normal" BMD, more than 50% are osteopenic, and almost 33% have osteoporosis. And after 80 years, 70% of women have osteoporosis. According to several studies, 54 % of postmenopausal white women have osteopenia and 30% are osteoporotic; of the latter group defined as having osteoporosis, more than 50% already had fractures.<sup>97</sup> Such high prevalence rates are also characteristic of other chronic disorders found in the aging

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<sup>94</sup>Kanis, Devogelaer, and Gennari, p. 258.

<sup>95</sup>Wasnich, p. 251.

<sup>96</sup>Kanis, Devogelaer, and Gennari, p. 259.

<sup>97</sup> Ross, p. 1400.

population, such as hypertension, high cholesterol, and impaired glucose tolerance, which are defined by similar clinically measured signs of disease.<sup>98</sup>

Most pain and illness attributed to osteoporosis comes from the effects of fractures; hip fractures, however, account for most deaths blamed on the disease. Incidence of hip fracture in the U.S. also has been shown to increase exponentially after age 50, rising from 2 women out of 1000 at age 65, to about 30 per 1000 by age 85 during any given year. But lifetime risk for osteoporosis is different from another set of epidemiological statistics which predict lifetime risk for osteoporotic fractures. "The lifetime risk of hip, wrist, or clinically diagnosed vertebral fracture is about 40% for white women and 13% for white men."<sup>99</sup>

A consequence of using bone scan measurements as a method of diagnosing osteoporosis has been that millions of symptomatic and asymptomatic individuals in the older population have been labeled with a condition which puts them in a higher risk category for almost all types of fractures. Thus, as diagnostic tools became more refined between the 1960's and the 1980's, a once rare disease was on its way to becoming an epidemic, but its meaning continued to be ambiguous.<sup>100</sup> According to recent experts, its "heterogeneity" as a disease entity, is attributable to differences in fracture sites, age and sex distribution, and differences in the pathophysiology of bone remodeling at the time of bone failure.

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<sup>98</sup>L. J. Melton III, "How Many Women Have Osteoporosis Now?" Journal of Bone and Mineral Research Vol. 10 (1995), pp. 175-177.

<sup>99</sup>Ross, pp. 1400-1402.

<sup>100</sup> See de Swaan, p. 60 on the implications for disease construction of early detection by modern technology and organizational innovations which have implemented mass examinations of populations. He also noted the trend for physicians to urge "anticipatory health care" on their entire patient clientele.

Furthermore, these same researchers asserted: "Even in post-menopausal women, osteoporosis is a heterogeneous condition...Osteoporosis is generally regarded as a disorder which is not accompanied by pathognomonic biochemical alteration. Most studies show a considerable overlap with normal values in all the various measurements made."<sup>101</sup> Both the cause of the disease and the criteria defining bone loss remain unclear.

In the next chapter, I will show how the disease during the 1960's to the 1980's became a recognizable epidemic predominantly associated with women.

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<sup>101</sup> Dequeker and Geusens, p. 2.

## Chapter 4: "When the Skeleton Outlives the Ovaries:" Osteoporosis As a Gendered Disease

Certain medical practices and beliefs can be more adequately explained in terms of the social role of the physician and of the psychological needs of his patients than in terms of their experimental justification or their therapeutic consequences. K. Codell Carter, *Philosopher and historian*<sup>1</sup>

Since Fuller Albright, medicine has constructed osteoporosis as a gendered disease due to overlapping demographic, epistemological, professional, and social factors. These influences converged in the process of medicalizing menopause, which began in the 1930's after synthesized hormone therapy was made available and became established in the early 1970's. Hormone replacements were the first and, later, the most controversial of remedial agents linked not only to menopause but also to osteoporosis.<sup>2</sup>

Beliefs and values about menopause and aging women held by medical practitioners have been directly related to the development of present concepts about osteoporosis. Between the 1960's and 1980's, osteoporosis slid into the medicalized and gendered niche provided by menopause. This trend was stimulated by feminist critiques of menopause, and

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<sup>1</sup>K. Codell Carter, "On the Decline of Bloodletting in Nineteenth-Century Medicine." *The Journal of Psychoanalytic Anthropology* Vol. 5 ( 3) (Summer 1982), p. 220. Carter used this as his premise for explaining the rapid decline in bloodletting during the 19th century.

<sup>2</sup>An enormous academic literature on the history of menopause has been produced from medical and feminist perspectives. I have relied on the following scientific sources: Robert A. Wilson, *Feminine Forever* (New York: M. Evans and Co., 1966); Utian, pp. 1-7; Geist and Spielman, pp. 701-707; Richard L. Landau, "What You Should Know About Estrogens: Or the Perils of Pauline," *Journal of the American Medical Association* Vol. 241 (1) (1979), pp. 47-51; P. A. van Keep, "The History and Rationale of Hormone Replacement Therapy," *Maturitas* Vol. 12 (1990), pp. 163-170. For feminist studies I relied on: Carroll Smith-Rosenberg, "Puberty to Menopause: The Cycle of Femininity in Nineteenth-Century America," in *Disorderly Conduct: Visions of Gender in Victorian America* (New York: Alfred Knopf, 1985), pp. 182-196; Frances B. McCrea, "The Politics of Menopause: The 'Discovery of a Deficiency Disease,'" *Social Problems* Vol. 31( 1) (October 1983), pp. 111-123; Fausto-Stirling, pp. 90-119; Susan E. Bell, "Changing Ideas: The Medicalization of Menopause," *Social Science and Medicine* Vol. 24 (6) (1987), pp. 535-542; Susan E. Bell, "Sociological Perspectives on the Medicalization of Menopause," *Annals of the New York Academy of Sciences* Vol. 592 (June 13, 1990), pp. 173-178; Linda A. Mitteness, "Historical Changes in Public Information About the Menopause," *Urban Anthropology* Vol.12 (1983), pp. 161-179; Patricia A. Kaufert and Sonja M. McKinley, "Estrogen-Replacement Therapy: The Production of Medical Knowledge and the Emergence of Policy," in *Women, Health and Healing: Toward a New Perspective*, Ellen Lewin and Virginia L. Olesen, eds. (London: Tavistock, 1985), pp. 113-138.

boosted by the controversies about estrogen's carcinogenic properties. As menopause was perceived as less of a "problem," the disease osteoporosis became a justification for widespread use of hormone replacements. At the end of the chapter I will discuss how the gendered construction of osteoporosis fails to account for all aspects of the disease.

### **20<sup>th</sup> Century Demography: Historic Changes in Life-Expectancy**

Two significant trends in human longevity are essential to understanding the conjuncture between the medicalization of menopause and the construction of osteoporosis as a new disease during the twentieth century. First, in 1900, the life expectancy of American women was 50 years: for women who lived long enough to experience menopause, it occurred at the end of the life span and was often associated with death.<sup>3</sup> In the latter half of the century, the post-menopausal phase of women's lives represents one-third of their lifetime. Second, in the nineteenth century, many more women died before reaching menopause; in 1900, only 4% of the total population attained an age of more than 65 years.<sup>4</sup> Since men appear to develop osteoporosis even later in the life span, it is not surprising that in eras and places where life expectancy is or was less than in the late twentieth-century industrialized world, men would not be perceived of being at risk for the disease.

### **The Medical Construction of Menopause**

In biblical and earlier times, people pondered about the difference in fertility patterns in the life-cycles of men and women, but menopausal symptoms first became associated with

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<sup>3</sup>Judith Golden, "You're Just in Menopause," Canadian Women Studies Vol. 5 (3) (Spring 1984), p. 74.

<sup>4</sup>Adele E. Clarke, "Women's Health: Life-cycle Issues," in Women, Health, and Medicine in America: A Historical Handbook, Rima D. Apple ed. (New York: Garland Publishing Inc., 1990), p. 27.

other diseases only in the late eighteenth century.<sup>5</sup> C. P. L. De Gardanne first used the term "la ménèspausie" in 1816, to describe symptoms related to cessation of menstruation.<sup>6</sup> Presumably, folk remedies were used for centuries to alleviate any significant symptoms which women experienced at the change of life. Bleeding was used for menstrual discomforts in the late 17th - early 18th centuries, for elite women who had the financial wherewithall to consult physicians.<sup>7</sup> Later in the nineteenth century, when heroic therapeutic measures had declined, sedatives were prescribed; and at the turn of the century, when abdominal surgery began to be safer due to antiseptic and anaesthetic advances, hysterectomy was used for some women who experienced severe bleeding.<sup>8</sup> Early attempts to find a therapeutic agent for menopausal symptoms were described in Chapters 2 and 3.

### **19<sup>th</sup> Century Medical Attitudes Towards Menopause: Precursors to Modern Agism and Sexism**

Carroll Smith-Rosenberg has described a rich mine of evidence pertaining to the attitudes of nineteenth-century medicine toward the menopause. Other forms of Victorian discourse, in contrast, ignored menopause because it impinged on issues of human sexuality.<sup>9</sup> Not only were women regarded as weaker than men in medical opinion, but also they were viewed as significantly different, and believed to be controlled by their physiology, especially

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<sup>5</sup> Utian, p. 1.

<sup>6</sup> "Avis aux femmes qui entrent dans l'âge," was published in Paris in 1816. Joel Wilbush, "La Ménèspausie--the Birth of a Syndrome," *Maturitas* Vol. 1 (1979), p. 145; and Joel Wilbush, "Menopause and Menorrhagia: A Historical Exploration," *Maturitas* Vol. 10 (1988), pp. 83-108. Wilbush is an anthropologist whose views lean toward the medical model.

<sup>7</sup> See Carter, pp. 219-234.

<sup>8</sup> Joel Wilbush, "Confrontation in the Climacteric," *Journal of the Royal Society of Medicine* Vol. 87 (June 1994), p. 342.

<sup>9</sup> Smith-Rosenberg, pp. 182-196.

their reproductive organs.<sup>10</sup> "Woman's sexual and generative organs were hidden within her body, subject not to her will but to a biological clock of which women were only dimly aware and which they were clearly unable to control."<sup>11</sup> Menopause, regarded as a physiological crisis, could herald either a time of increasing ill health or a new beginning in the "Indian summer of a woman's life."<sup>12</sup> Two other interpretations of menopause existed in the dominant Victorian medical opinion: it was associated with notions of sin and decay; and ca. 1900, after the emergence of Freudian theory, "it was viewed as a neurosis."<sup>13</sup>

According to Smith-Rosenberg, the outcome of menopausal problems depended on a woman's previous behaviours, particularly conformity or non-conformity to Victorian sexual and social expectations. Freedom from the wearing strains of continued pregnancy was seen as positive both by women and many practitioners of the period. Frequently, women turned to patent medicines such as Lydia Pinkham's Vegetable Compound to relieve complaints related to the cessation of menstruation.<sup>14</sup> For reasons of status and remuneration, physicians offered to provide care and comfort for women who experienced psychic or physical disturbances during menopause. Treatments frequently suggested for menopausal problems were relegated

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<sup>10</sup>See Schiebinger, pp. 42-52. She described the "childlike" meanings attached to early representations of a differentiated female skeleton. See Chapter 7 for a more complete list of references to women's bodies in feminist writings.

<sup>11</sup>Smith-Rosenberg, p. 183.

<sup>12</sup>Ibid., p. 191. A laundry list of diseases believed caused by menopause from one contemporary expert cited did not mention bone disease or fracturing. The closest symptom identified was "rheumatic pains."

<sup>13</sup>McCrea, p. 111.

<sup>14</sup>Sarah Stage, Female Complaints: Lydia Pinkham and the Business of Women's Medicine (New York: W. W. Norton and Co, 1979), especially chapter 3 "The Age of the Womb," pp. 64-88.



to avoidance of stress, rest, and "a commitment to domesticity." Aging women were commonly perceived, however, to be aesthetically repugnant or figures of fun.<sup>15</sup>

**"Menopause: A Ghost Exorcized by Therapy"<sup>16</sup>**

Helene Deutsch, a psychologist who believed that "at menopause a woman's main psychological task was to accept the progressive biological withering she experienced," helped perpetuate negative attitudes about menopause into the twentieth century.<sup>17</sup> The medicalization of menopause slowly emerged in North America. Instead of a life-cycle event, menopause came to be defined as a hormonal deficiency disease. This trend continued into the present time, despite questioning or dissenting voices within the medical fraternity.<sup>18</sup> For example, New York Drs. Samuel H. Geist and Frank Spielman in 1932, when announcing treatment of menopausal patients with theelin (estrogen), made the following remarks about the elusiveness of diagnosing and treating menopause, and confounding factors attributable to the doctor/patient relationship:

The correct evaluation of symptoms is so complicated that definite conclusions are difficult to draw. So many other factors enter into the patient's physical status in the menopause that it is only by unceasing and untiring effort that results worthy of attention may be arrived at. The reasons that the patient felt better was often found to be some happy event, good news, or improvement in her environment....Most of them were grateful for the

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<sup>15</sup>Smith-Rosenberg, pp. 185 and 193.

<sup>16</sup>This phrase is from M. M. C. Botelho, "Menopause: A Ghost Exorcized by Therapy," in Medical-Economic Aspects of Hormone Replacement Therapy, Proceedings of a Ciba-Geigy Workshop, Basel Switzerland, 9 March 1993, J.-M. Cosséry, ed. (Pearl River, N. J.: Parthenon Publishing Group, 1993), p. 43. Botelho opened her article saying "Nowadays we realize that even nature needs to be aided! The physical, psychological and metabolic transformations that gradually appear in the climacteric woman must be avoided."

<sup>17</sup>Fausto-Stirling, pp. 112-113.

<sup>18</sup>Bell (1987), p. 535.

treatment and the interest shown, even to the point of recording improvement in order, as they thought, to please the physician.<sup>19</sup>

Once menopause became widely accepted as a biologically-based disease caused by an endocrine deficiency, pressures "to treat" created an atmosphere that obliged doctors to use hormone replacement on their patients.<sup>20</sup> Bell cited 19 scientific texts or articles published ca. 1938-1941 pertaining to the clinical use of estrogens for treating menopause by specialist physicians, and posited that this research activity was part of what Conrad describes as the "conceptual phase" of medicalization.<sup>21</sup> University of Chicago physician Richard Landau challenged this interpretation claiming that it was "logical" during the 1930's and 1940's to treat the menopausal syndrome which he characterized as ranging from

constipation to nausea, from emotional depression to agitation, from blurring of vision to frigidity, and many in between. However, on the basis of thousands of observations, it eventually became apparent that vasomotor flushes and the cessation of menses were symptoms that could be quantitated[sic] rather easily and readily agreed on as being menopausal symptoms.<sup>22</sup>

Menopause, in any case, was firmly on its way to being constructed as a disease in medical circles during the 1940's to the mid-1960's.

### **Medical Views of Menopause in Popular Literature, 1950's-60's**

I searched the Reader's Guide to Periodical Literature for references to menopause to track attitudes in popular literature between 1929-1961, from the time when natural estrogen

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<sup>19</sup>Geist and Spielman, pp. 702-703.

<sup>20</sup>Bell (1990), p. 174. Although there are two other models of menopause, psychological and environmental which Bell and others have posited, she asserted the clear dominance of the biological model.

<sup>21</sup>ibid., pp. 535 and 541-542. Frances McCrae dated the medicalization of menopause to the 1960's "when synthetic estrogen became widely available." McCrae, p. 111. I found Bell's chronology more persuasive.

<sup>22</sup>Landau, pp. 47-48.

was isolated to just prior to the estrogen boom. A steadily increasing trickle of articles about menopause appeared during this time, many written by physicians who had published in the scientific journals, and also in women's magazines, national weeklies, and in the American Medical Association's own publication Hygeia (later called Today's Health), intended for lay audiences.<sup>22</sup> Table 4.1 illustrates the growing interest in menopause in popular periodicals during the three decades between 1929-1959.<sup>24</sup> The first explicit references (in a popular article's title) to the treatment of menopause with estrogens in the Reader's Guide was in 1939.<sup>25</sup> DES, the estrogen synthesized in 1938, was first mentioned in a title in an 1941 issue of Hygeia.<sup>26</sup>

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<sup>22</sup>I surveyed the Reader's Guide to Periodical Literature Volumes 8-21 (January 1929- February 1959 inclusive). Only Volume 9, covering the period July 1932-June 1935, contained no citations to menopause. E. L. Sevringhaus published an article entitled "Woman Faces Fifty," Hygeia Vol. 17 (August 1939), pp. 685-88. The latter also published a scientific study, which was one of the articles cited by Bell as evidence for her chronology: E. L. Sevringhaus, "Treatment of the Menopause," Journal of the American Medical Association Vol. 116 (1941), pp. 1197-99. I had completed my own survey before I received the article by Mitteness, an anthropologist, through Inter-Library Loan. In all early volumes of the The Reader's Guide until Volume 20 (March 1955 through February 1957), users were directed to locate literature on "menopause" by the cross-referencing advice: "see Woman, Health and Hygiene." In 1957, the Guide finally changed its categorization and listed articles about menopause directly under the heading "menopause".

<sup>24</sup>Reader's Guide to Periodical Literature Vol. 8 (January 1929-June 1932) through Vol. 21 (March 1957-February 1959.) I relied on evidence in titles because the popular women's magazines and the AMA popular publications are unavailable at the Queen's Library from the 1940-mid 1960's. Later searches at the Metro Reference Library in Toronto indicated that their holdings of the popular literature from this era survives in incomplete runs and are housed in their Special Collections.

<sup>25</sup>"Changing Life Sensibly: New Hormone Treatment for Menopause," Independent Woman Vol. 18 (September 1939), p. 297, and abridged version with the same title in Reader's Digest Vol. 35 (October 1939), pp. 101-03. (Independent Woman was the publication of the American Association of Business and Professional Women.)

<sup>26</sup>H. Haberman, "Help for Women over 40: New Synthetic Correctly known as Dies. stilbetrol," Hygeia Vol. 19 (November 1941), pp. 898-99. This was also abridged in Reader's Digest of the same month.

### Menopause in Popular Literature

**Table 4.1** Number of Articles in Popular American Periodicals on Menopause 1929-1959 (Berman)

	<u>1929-39</u>	<u>1939-49</u>	<u>1949-59</u>	<u>Total</u>
# of Articles	7	15	15	37

Source: Reader's Guide to Periodical Literature, 1929-1959

Following World War II, the majority of liberated wartime women returned to the home, increasingly located in burgeoning suburbs.<sup>27</sup> *Kinder und kuchen* were back in style as the most satisfying choices to fulfil "normal" female aspirations.<sup>28</sup> Ambivalent notions, similar to those in nineteenth-century medical literature on women's health and menopause, appeared prevalent in popular literature until just before 1950.<sup>29</sup> Assumptions about the change of life were commonly interlaced with ideas about the social roles of women. A new frankness, however, about menopausal implications for a woman's sexuality became a prominent part of the post-war discourse.

Between 1950 and 1970, negative attitudes toward menopause became fashionable: but from the 1940's onwards, language used in some titles cited in The Reader's Guide invoked strong fears of threatened losses of health, sexuality, youth, and happiness with the onset of menopause.<sup>30</sup> Feminist scholars attribute this trend to the increasing availability of

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<sup>27</sup>Mary Beth Norton, ed., Major Problems in American Women's History (Lexington, Mass.: D. C. Heath & Co., 1989), pp. 350-386. Whether this was a forced pressure on women to reassert more traditional roles or whether this was the real desire for many women or a combination of both factors has been debated in the literature. For example, in this widely used textbook, a whole chapter is devoted to essays and excerpts from primary literature relevant to this discussion.

<sup>28</sup>Betty Friedan, The Feminine Mystique (New York: Norton, 1963).

<sup>29</sup>Mitteneess analyzed the content of 64 popular magazine articles from the Reader's Guide on menopause which appeared from 1900 to 1976. She chose to end her study in 1976 because that year saw the re-issuing of the Boston Women's Health Collective's Our Bodies, Ourselves by a major commercial publisher, Simon & Schuster. Mitteneess, p. 165. In her view, Our Bodies, Ourselves marked "the beginning of a transformation in the sources of information available to women concerning their reproductive health. It was a model which prompted an avalanche of feminist writings, which in turn affected the nature of the scientific debates over women's health issues." Of the 64 articles Mitteneess surveyed, 48 fell into either women's and 'general-readership' magazine categories, but did not include newspaper accounts. She excluded the cross-over journals which mostly report "technological advances" such as Science News and Science Digest. Mitteneess, p. 166.

<sup>30</sup>C.G. Hartman, "Sexual Education for the Woman at Menopause," Hvgeia Vol. 19 (September 1941), pp. 699-701; F. Kennedy, "Don't Fear Change of Life," Woman's Home Companion Vol. 71 (November 1944), p. 24; H. Deutsch, "Dangerous Age for Women," Science Digest Vol. 17 (May 1945), pp. 41-42; J. Scott, "You Need not Fear the Menopause," Ladies Home Journal Vol. 63 (March 1946), p. 33; Paul de Kruif, "New Help for Women's Change of Life," Reader's Digest Vol. 5 (January 1948), pp. 11-14; "Sex Hormones Make Old People Feel Better," Science Digest Vol. 30 (December 1951), p. 73; A. Q. Maisel, "Promise for

medical intervention, such as hormone replacement therapy.<sup>31</sup> Before the 1960's, most physicians resisted prescribing hormones to their patients; neither the medical community nor the broad public had as yet been overwhelmingly convinced that menopause was a disease, and not just the natural concomitant of aging. Members of the medical establishment used and were sought by the mass media to convey messages to both the general public and their colleagues. Examples from the weekly magazines in the mid-1950's illustrate the trends.

In 1951, Dr. Earl O. G. Schmitt described a "menopausal group" as one of five categories of "present-day" nervous women in a Newsweek report from an AMA meeting. Menopause continued to be associated with neurotic and weak woman: "a scared and lonely individual in need of a friend...." Her doctor was portrayed as the "hearer of her story...with a sympathetic and attentive ear." Schmitt cited a full range of experts who might assist such a patient, but "On this team," he said, "the doctor, preferably the family doctor, must always be the captain." He continued, "I have a firm conviction that more nervous women are created over the bridge table than the washtub. Many women are frustrated about their capacity for work because they cannot measure up in endurance to someone whom they select as ideal." Schmitt claimed to comfort his patients by telling them levels of fortitude differ among individuals:

We are not all endowed with equal amount of energy. Just as a fancy five-gaited horse would be unable to pull the proportionate load on a brewery wagon, so also the powerful muscular workhorse would look out of place hitched to a fancy carriage.<sup>32</sup>

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Happiness: Hormone Therapy," Woman's Home Companion Vol. 81 (September 1954), pp. 40 - 41.

<sup>31</sup>Mittiness, pp. 168 and 173.

<sup>32</sup>"Women With Nerves," Newsweek Vol. 38 (December 17, 1951), p. 45. Schmitt was from San Jose, California.

Two other examples from 1954 inferred patriarchal views about the women.

menopause, and women's role in society. Dr. D. E. Kost Shelton, a geriatrician at U.C.L.A. remarked on "new" expectations for aging American women:

She does not have to relinquish the husband of her youth to the designing young widow down the street...The reason why: the use of sex hormones, administered by a good physician. A half century ago.... women were expected to fade away in their 50's. They had fulfilled their destiny as seed pods and were willing to dry up and blow away. Now, with female life expectancy raised from 48.7 to 72.4, grandma can hope to have a second lease on life.

Skelton criticized the conservative use of estrogen by "some" physicians, who prescribed the drug only for "acute stages of menopause" because they worried about possible breast or uterine cancers. He believed that death rates from these two cancers "are no greater now, when estrogens are in common use, than they were 25 years ago." In Skelton's opinion, estrogen should be prescribed during and after menopause. He dismissed his colleagues' timid use of estrogen and belief in menopause as a "natural phenomenon" with the comment, "This is a vapid argument. It is reminiscent of the outworn arguments against anesthesia in childbirth, against cosmetics, against everything progressive in life."<sup>33</sup>

Two psychiatrists from Salt Lake City, Drs. C. H. Hardin Branch and David Reiser intended to discount traditional reductionist beliefs about women's experiences with menstruation, pregnancy and menopause; however, their message was couched with a caution

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<sup>33</sup>"Hope for Grandmothers," Newsweek Vol. 43 (June 28, 1954), p. 82. Citation includes reference to the entire paragraph and the indented quote. Skelton, too, was interviewed in the context of an AMA annual convention.

that "Thriving on her importance to husband and children. she may lose her self-esteem when she is less necessary." Time illustrated their concern with a cartoon (Figure 4.1).<sup>34</sup>

**"From Puberty to Grave:"<sup>35</sup> A Medical Messiah for Menopausal Travail**

Although an inexpensive form of estrogen was available in 1960, its use was still not widespread. Brooklyn, N.Y. gynaecologist, Robert A. Wilson (b. 1895) emerged during the 1960's as a "moral entrepreneur:"<sup>36</sup> he pushed to make estrogen the magic bullet for all menopausal-related "pathologies." Wilson echoed Skelton's call to other physicians in his 1966 popularizing paean to estrogen, Feminine Forever :

The concept of menopause prevention--after having so long been stymied by indifference and outmoded attitudes--is at last spreading from a relatively small group of enlightened physicians to wider circles of the medical profession...It is a safe estimate that the number of sexually restored post-menopausal women in America will pass fourteen thousand in 1967....These women constitute a significant beginning of a wholly new concept of women's life.<sup>37</sup>

Wilson estimated he had treated 5,000 women with estrogen, or 42 to 83% of American women then receiving the drug for menopausal complaints.<sup>38</sup> For Wilson, "feminine forever" meant preserving appearance and sexuality through estrogen, the key to happiness :

This need for distinctive femininity as an indispensable social asset is by no means confined to young girls on a husband hunt. A matron's prestige and a businesswoman's

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<sup>34</sup>"Women and Womb," Time Vol. 64 (September 27, 1954), p. 58. Their quote was taken from the medical publication, GP (General Practitioner).

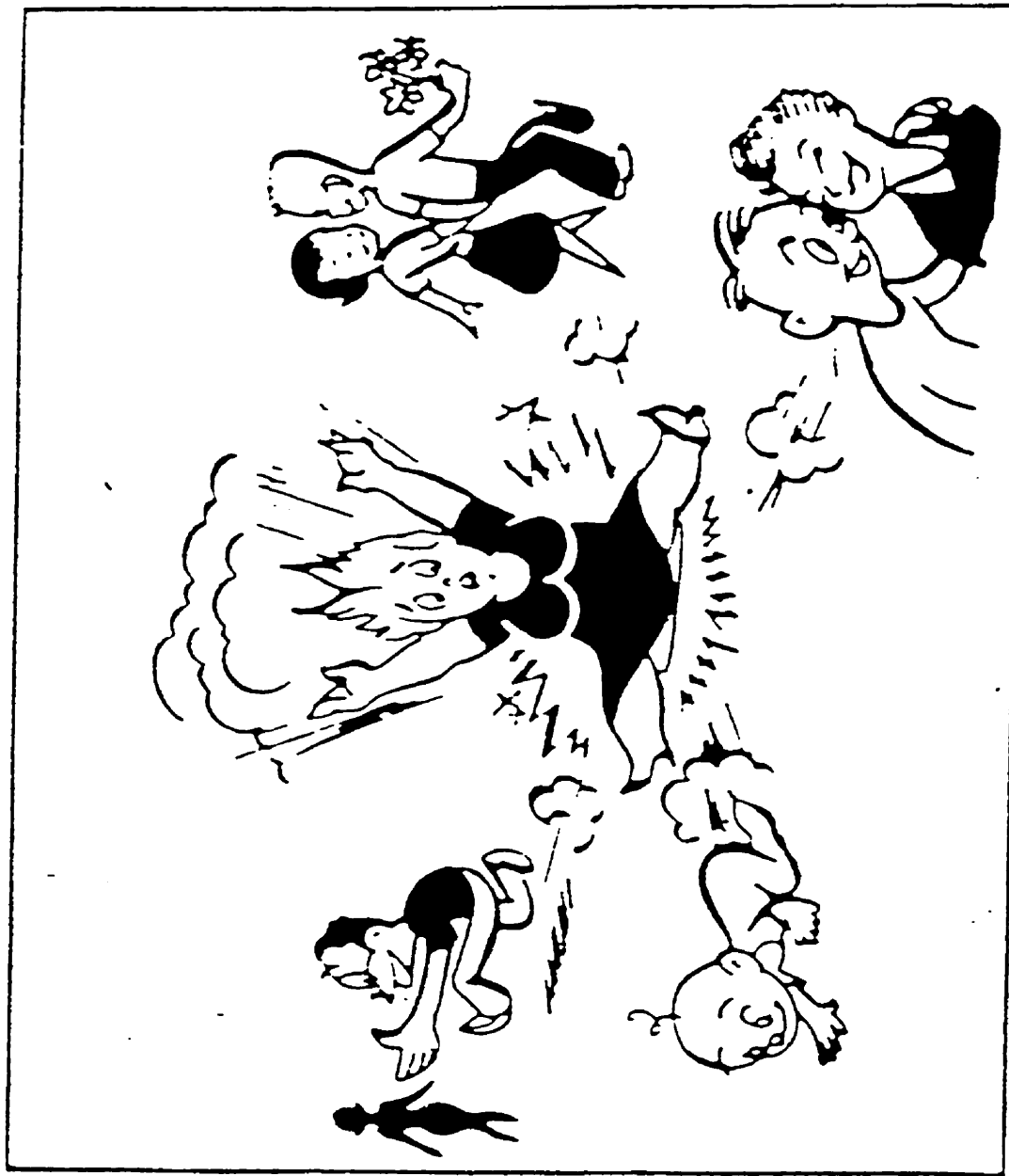
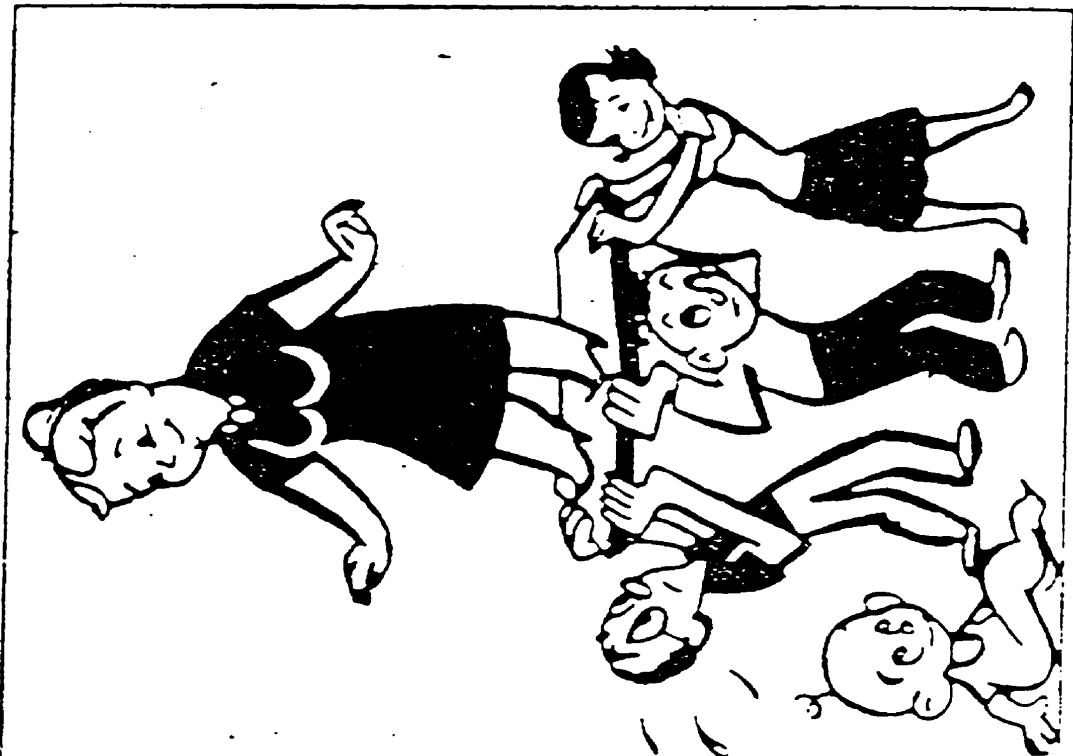
<sup>35</sup>Robert A. and Thelma A. Wilson, "The Fate of Nontreated Postmenopausal Woman: A Plea for the Maintenance of Adequate Estrogen from Puberty to Grave," Journal of American Geriatrics Society Vol. 11 (April 1963), pp. 347-362.

<sup>36</sup>McCrae, p. 112. She used Elliot Freidson's term. Freidson (1970), p. 252.

<sup>37</sup>Wilson (1966), p. 21. Underlining added. Wilson himself used messianic language about his role in saving women, so the religious metaphors are appropriate.

<sup>38</sup>Ibid., p. 115.





“Thriving on her importance to husband and children she may lose self-esteem when she is less necessary.”

Figure 4.1 Cartoon of Menopausal Woman

Source: “Women and Womb,” *Time* Vol. 64 (September 27, 1954), p. 58. Cartoon and quote taken from *GJP* (General Practitioner), a medical journal.

success depend too, at least indirectly on the body chemistry that enables a woman to attain full femininity, both physically and psychologically. And with the extra years of a longer lifespan, the modern woman understandably longs for ways to retain her invaluable aura of femininity long past the traditional barrier of menopause.<sup>39</sup>

Wilson believed that he must convince doctors to recognize "the many dangerous and agonizing symptoms" of menopause. He blamed medical training for spending "Perhaps no more than a single thirty-minute lecture on menopause." due to the belief that the change of life was an inevitable and natural part of aging.<sup>40</sup> (See Chapter 5 for a parallel in medical education about osteoporosis prior to the 1980's.) Dr. Wilson determined who needed estrogen and appropriate dosages by developing a unique reductionist diagnostic tool called the "Femininity Index" consisting of an analysis of three types of vaginal cells.<sup>41</sup>

Wilson's crusade to bring estrogen to every woman has been cited in both medical and feminist literature as the defining moment for the dramatic surge in interest and sales of estrogen for menopause, and his attitudes clearly fell on fertile ground in contemporary medical circles (Figure 4.2 and Figure 4.3). An explosion of interest in treating all menopausal women with hormones, occurred both in Europe and North America.<sup>42</sup> Feminine Forever was quoted and/or excerpted in more than 300 articles published in popular women's magazines during the 1960's and early 1970's.<sup>43</sup> The book "resulted in the power of

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<sup>39</sup>Ibid., p. 27.

<sup>40</sup>Ibid., p. 35.

<sup>41</sup>Ibid., p. 117

<sup>42</sup>See Fausto-Sterling, p. 112 and McCrae, p. 112 (page numbers are identical-its not a mistake); Utian, p. 2 and van Keep, p. 163.

<sup>43</sup>McCrae, p. 114.

# Derivation of Menopausal Index

Figure 4.2 "Menopausal Index"

Symptom	Factor	Severity*	Numerical Conversion†
Vasomotor	4	M	8
Paresthesia	2	+	6
Insomnia	2	+	6
Nervousness	2	M	4
Melancholia	1	+	3
Vertigo	1	S	1
Weakness (fatigue)	1	S	1
Arthralgia and myalgia	1	M	2
Headache	1	S	1
Palpitation	1	+	3
Formication	1	0	0
Menopausal index (sum)			35

\* 0 = none = 0; S = slight = 1; M = moderate = 2; + = marked = 3.  
 † Numerical conversion = factor X severity.  
 ; Severe = 35+; moderate = 20-35; mild = 15-20.

Source: Herbert S. Kupperman, Ben B. Wetchler, and Meyer H. G. Blatt, "Contemporary Therapy of the Menopausal Syndrome," *The Journal of the American Medical Association* Vol. 171 (12) (1959), p. 1629.

Because the menopausal syndrome can be as much an emotional as a hormonal problem...

Note: This chart is purely symbolic, intended to represent general medical opinion on emotional/estrogen fluctuations that occur in woman. During the menopause, these changes are often associated with distressing symptoms.



Puberty: Period of change: estrogen levels low, but beginning to rise; psychosomatic and psychological symptoms during this difficult developmental stage tend to be high.

Roche introduces new

# MENRIUM<sup>®</sup>

(chlordiazepoxide plus water-soluble conjugated estrogens)

... provides the dependable antianxiety action of Librium<sup>®</sup> (chlordiazepoxide): Librium (chlordiazepoxide), as adjunctive therapy, has already proven to be highly beneficial in relieving numerous psychogenic symptoms of the menopause caused by anxiety, tension and apprehension.

... helps replace hormonal deficiency with conjugated estrogens: conjugated estrogens are considered by some as a hormonal replacement therapy of choice for the menopausal patient; they also provide beneficial effects on the skin and vaginal mucosa. Also, estrogen therapy in itself has been reported to enhance psychological well-being in the menopausal woman.

... helps improve patient acceptance: Menrium is well accepted because of its convenience of administration and high degree of effectiveness in relieving both emotional and vasomotor symptoms of the menopausal syndrome.

... generally well tolerated: in the 1372 patients placed on Menrium therapy, an 8.8% incidence of side effects was reported, chiefly drowsiness or sleepiness, gastrointestinal manifestations including nausea and/or vomiting, and skin rash and/or pruritus. Untoward effects seen with either chlordiazepoxide or conjugated estrogens may occur. Thus, complete product information should be consulted before prescribing.

The Journal of the American Medical Association Vol. 198 (4) (1966), pp. 284-285.

Source:



**Sexual maturity:** Estrogen values reach their peak; in contrast, emotionally related symptoms are usually reduced.

**Menopause:** Period of change: decline in estrogen values; rise in psychosomatic/psychological symptoms.

**Postmenopause:** Period of decline: levels of estrogen are decreasing; in many cases, emotional symptoms tend to remain high.

For management of both emotional and somatic complaints of the menopause

MENRIUM 5-2	Each tablet contains 5 mg chlordiazepoxide and 0.2 mg water-soluble conjugated estrogens.
MENRIUM 5-4	Each tablet contains 5 mg chlordiazepoxide and 0.4 mg water-soluble conjugated estrogens.
MENRIUM 10-4	Each tablet contains 10 mg chlordiazepoxide and 0.4 mg water-soluble conjugated estrogens.

Before prescribing, please consult complete product information, a copy of which follows:

**Contraindications:** Women with cancer of breast or genitalia, except inoperable cases, and those with known hypersensitivity to chlordiazepoxide and/or conjugated estrogens.

**Warnings:** Caution patients about possible combined effects with alcohol and other CNS depressants, and against hazardous occupations requiring complete mental alertness. Exclude other possible causes of menopausal syndrome manifestations. Use with caution in sedation-prone individuals. Withdrawal symptoms similar to those seen with barbiturates, including convulsions, have been reported following discontinuance of chlordiazepoxide HCl. Potential benefits of chlordiazepoxide in pregnancy, lactation or women of child-bearing age should be weighed against possible hazards to mother and child. Clinical studies indicate on safety in pregnancy. Manifestations of Librium (chlordiazepoxide) overdose include somnolence, confusion, coma, diminished reflexes; if seen, employ usual symptomatic and supportive therapy.

**Precautions:** In elderly and debilitated patients, limit dosage to smallest effective amount of chlordiazepoxide; increase gradually as needed and tolerated. Concomitant administration with other psychotropic agents generally not recommended. Paradoxical reactions to

chlordiazepoxide have been reported in psychiatric patients. Observe usual precautions in patients with impaired renal or hepatic function or with impending depression, particularly those with suicidal tendencies. Variable effects on blood coagulation very rarely reported in patients receiving Librium (chlordiazepoxide) and oral anticoagulants.

**Adverse reactions:** Untoward effects seen with either compound alone may occur with Menrium. With chlordiazepoxide, drowsiness, ataxia and confusion reported in some patients; while usually avoided by proper dosage adjustment, these are occasionally observed at lower dosages. Also encountered have been a few instances of syncope, isolated occurrences of skin eruptions, edema, minor menstrual irregularities, nausea and constipation, extrapyramidal symptoms, increased and decreased libido, and occasional reports of blood dyscrasias, including agranulocytosis, jaundice and hepatic dysfunction. Periodic blood counts and liver function tests advisable during prolonged treatment. Changes in EEG patterns (low-voltage fast activity) observed during and after chlordiazepoxide treatment.

With estrogens, headache, nausea and vomiting, anorexia, gastrointestinal discomfort, dysuria and urinary frequency, jitteriness, breast engorgement, formation of breast cysts, skin rashes and pruritus occasionally seen. Administration may also be associated with uterine bleeding and/or followed by withdrawal bleeding.

**Usual dosage:** One tablet t.i.d. for 21 days, followed by one-week rest periods.

**How supplied:** Menrium 5-2, light green tablets, each containing 5 mg chlordiazepoxide and 0.2 mg water-soluble conjugated estrogens — bottles of 60 and 500. Menrium 5-4, dark green tablets, each containing 5 mg chlordiazepoxide and 0.4 mg water-soluble conjugated estrogens — bottles of 60 and 500. Menrium 10-4, purple tablets, each containing 10 mg chlordiazepoxide and 0.4 mg water-soluble conjugated estrogens — bottles of 60 and 500.

Roche Laboratories  
Division of Hoffmann-La Roche Inc.  
Nutley, N.J. 07110



The Journal of the American Medical Association Vol. 198 (4) (1966), pp. 284-285.

Source:

consumerism being brought directly into the office of physicians, but also caused the physicians themselves to take sides in a fiery debate which still continues."<sup>44</sup>

### **New Reasons to Use Estrogen**

Included in Wilson's pitch were the tidings that the elixir of youthful looks and sexuality could be prescribed to treat 26 avoidable physical and mental symptoms characteristic of untreated menopause and aging.<sup>45</sup> Other medical researchers were already recommending estrogen as a preventative for ailments such as cardiovascular disease.<sup>46</sup> The Medical Letter of July 2, 1965 reported an equivocal message about the many claims.<sup>47</sup> Wilson chided gynecologists and generalists for their slowness to use estrogen, by pointing to its benefits in respect to osteoporosis. "Enlightened orthopedic surgeons had become aware of the restorative effect of estrogen on the bones of middle-aged and older women and adopted the practice of prescribing massive doses of estrogen to their pre- and post-operative patients to speed the healing of fractures."<sup>48</sup>

Wilson's book was welcomed by some "middle-class women and in some medical circles." Linda Mitteness found 47% of the popular articles on menopause she surveyed cited

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<sup>44</sup>Utian, p. 2. Utian is Professor of Reproductive Biology and Obstetrics and Gynaecology at Case Western Reserve University Medical School. Germaine Greer calls Utian the "Grand Master in Menopause" and P.A. van Keep the "Dutch Master in Menopause." She linked Utian's research sponsorship to the Germany drug company Schering, and van Keep's to AKZO, the Dutch pharmaceutical concern. Germaine Greer, The Change: Women, Aging and the Menopause (New York: Fawcett Columbine, 1991), pp. 13-14.

<sup>45</sup>Wilson (1966), pp. 128, 131, 169-170. McCrae, p. 113 cited Wilson's article as mentioning osteoporosis on p. 66 in "A Key to Staying Young," Look (January 1966), pp. 68-73.

<sup>46</sup>M. Edward Davis, Nels M. Stranjord, and Lawrence H. Lanzl, "Estrogens and the Aging Process: The Detection, Prevention, and Retardation of Osteoporosis," Journal of the American Medical Association Vol. 196 (3) (April 18, 1966), p. 129; Kaufert and McKinlay, p. 116.

<sup>47</sup>The Medical Letter Vol. 7 (14) ( Issue 169) (July 2, 1965), p. 54.

<sup>48</sup>Wilson (1966), pp. 169-170.

Wilson as their authoritative source, despite her contention that his views were not representative of his contemporaries' research on menopause.<sup>49</sup>

In Europe, a 1969 survey of women in five countries, showed women's knowledge about menopausal symptoms and possible treatment and the accuracy of their information were directly correlated with the level of publicity about hormones in that country. Medical practitioners were faced with "queries from patients who were asking for 'those Pills that keep women young.'"<sup>50</sup> The percentage of women surveyed who actually sought estrogen therapy was considerably less than those who were aware of its availability. As in North America, some physicians did not go along with the estrogen frenzy. Wilson had a special champion in West Germany, a Dr. Christian Lauritzen, one of several "leading experts" who promoted Wilson's contention that declining estrogen determined the deterioration of aging women. Lauritzen "gave the hypothesis enough credibility to allow HRT to enter the realm of normal, acceptable clinical research and practice," despite the opinion that such a theory was "based on a mixture of common sense, conjecture, animal experiments and scanty clinical experience."<sup>51</sup>

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<sup>49</sup>Mitteneess, p. 174. Her comment related to finding only two of his published articles were based on his own original research.

<sup>50</sup>van Keep, pp. 165-66. Van Keep was a founder with Wulf Utian of the International Menopause Society in Belgium in 1978. The organization's journal, Maturitas, also launched in 1978, is "the international journal for the study of the climacteric." Utian, p. 5.

<sup>51</sup>van Keep, pp. 165-66. The survey was published in proceedings of the first European conference on hormone replacement therapy which took place in Geneva in 1971, sponsored by the International Health Foundation. Christian Lauritzen and P.A. van Keep, eds., Ageing[sic] and Estrogens: Frontiers of Hormone Research (Basel: Karger, 1973). HRT is the acronym for hormone replacement therapy.

## Feminist Critique of the Medicalization of Menopause

By the early 1970's, the women's movement in North America began to refute some aspects of the medicalization of menopause. (See Chapter 7). At its inception, the women's health movement, a spin-off of the larger feminist project, focused on younger women's issues. Subsequently, as older women increased in number, concern for the problems of older women also expanded.<sup>52</sup> Intense scrutiny by feminist activists and academics on health issues concerning women's life-cycle events, generated a substantial literature on the medicalization of menopause.<sup>53</sup> In the words of feminist philosopher Jacqueline N. Zita, "Menopause is a physical event in the body, but its interpretation as the loss of *true femininity*, as *disease*, *dysfunction*, or *functionlessness* or as a *natural life cycle transition* with complicated political consequences determines how it is experienced and perceived."<sup>54</sup>

That menopause be considered a natural and normal event; and that women have the right of access to information about drugs, especially hormone replacements, have been

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<sup>52</sup>Marilyn Pearsall, "Introduction," *The Other Within Us*, Marilyn Pearsall, ed. (Boulder, Colo.: Westview Press, 1997), p. 1 and Charlotte F. Muller, *Health Care and Gender* (New York: Russell Sage Foundation, 1990), p. 220.

<sup>53</sup>A vast feminist popular and academic literature on menopause has been generated. A computer search on January 25, 1998 of books on this topic held in Queen's University libraries revealed that of a total 67 items, 79% (53) were published since 1980, and more than half since 1988. Only three items were listed from the 1960's and only 8 during the decade of the 1970's. See such recent popular feminist books as Janine O'Leary Cobb, *Understanding Menopause: Answers & Advice for Women in the Prime of Life* (New York: Plume Book, Penguin, 1993); Gail Sheehy, *The Silent Passage: Menopause* Rev. ed. (New York: Pocket Books, 1995); The Boston Women's Health Book Collective, *The New Our Bodies, Ourselves: A Book By and For Women*, Updated and expanded for the 1990's (New York: A Touchstone Book, Simon & Schuster, 1992.); and Greer and Coney, cited previously. For influential feminist academic studies on menopause and hormone replacement see Patricia A. Kaufert and Sonja M. McKinlay, "Estrogen-replacement Therapy: The Production of Medical Knowledge and the Emergency of Policy," in *Women, Health, and Healing: Toward a New Perspective*, Ellen Lewin and Virginia Olesen, eds. (New York: Tavistock Publications, 1985), pp.113-138; also Bell, McCrae, and Mittness.

<sup>54</sup>Jacquelyn N. Zita, "Heresy in the Female Body," in *The Other Within Us: Feminist Explorations of Women and Aging*, Marilyn Pearsall, ed. (Boulder, Colo.: Westview Press, 1997), p. 106.



policy priorities of the NWHN.<sup>55</sup> The confusion of female physiology with women's social roles at the time of "the change" has been at the root of strong feminist objections to the pathologizing of menopause.<sup>56</sup> Such views provided a counterpoint to mainstream medical positions, and during the last three decades the medical community itself has responded.

For some feminists, medicalization of menopause created several problems specifically relevant to osteoporosis, the most obvious related to accusations of overtreatment: the call in some medical circles for almost universal, "puberty to grave" hormone replacement therapy. Many feminist writers, lay and medical, have argued that hormones may be an entirely appropriate option for some women, but for others, this therapy has the potential for harm.<sup>57</sup>

Medicalization of menopause has also raised issues of social control. When normal life-cycle events such as menopause have been pathologized, women have been persuaded that medical care and therapy may be more essential to their well-being than might be the case. Dependency on medical advice, thereby, may become more important than a patient's own acquired knowledge. Many women (and men) have been convinced by science that

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<sup>55</sup>Loree Bykerk and Ardith Maney, U. S. Consumer Interest Groups: Institutional Profiles (Westport, Conn.: Greenwood Press, 1995), p. 195. For more on the National Women's Health Network (NWHN), see Chapter 7.

<sup>56</sup>Joyce Leeson and Judith Gray, Women and Medicine (London: Tavistock Publications, 1978), pp. 99-100 is one early example of this well-established argument.

<sup>57</sup>Janine O'Leary Cobb as cited by Brenda Branswell, "The HRT Conundrum" in Maclean's Vol. 111(2) (January 12, 1998), pp. 54-55. Also see Renate Klein and Lynette J. Dumble, "Disempowering Midlife Women: The Science and Politics of Hormone Replacement Therapy (HRT)," Women's Studies International Forum Vol. 17 (4) (1994), p. 327; Barbara Seaman in Coney, p. 7. For examples of medical interpretations of decision-making with patient values in mind, see M. Dianne Delva, "Hormone Replacement Therapy: Risks, Benefits, and Costs," Canadian Family Physician Vol. 39 (October 1993), pp. 2149-2154 and Lynn Rosenberg, "Hormone Replacement Therapy: The Need for Reconsideration," American Journal of Public Health, Vol. 83 (12) (December 1993), pp. 1670-73.

doctors know best and always act in the patient's best interest,<sup>58</sup> but hormone replacement controversies since the 1970's have demonstrated that "the production of medical knowledge is determined by ideological and socio-political factors among which women's own needs and interests have low priority."<sup>59</sup> To the chagrin of those who fervently believed in the efficacy of hormonal therapy, the majority of women in Europe and North America did not take hormones for decades. Physicians' increased interest and rhetoric about patient participation in decision-making about hormone therapy may have stemmed more from practicing defensive medicine than from a desire to share power.<sup>60</sup>

### **Estrogen Frenzy: Peaks and Troughs With Cancer Scares**

A link between breast cancer and ovaries had been made in 1889 by Albert Schinzinger (1827-1911) of Freiburg, Germany.<sup>61</sup> Scientific suspicion about linkages between estrogen and uterine cancer was documented in laboratory animals during the 1930's. The first significant volley in what later became a major estrogen controversy was a 1947 article by S. B. Gusberg of New York,<sup>62</sup> which cited 11 previous studies showing estrogen to be carcinogenic in female reproductive organs.<sup>63</sup> Many women who started

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<sup>58</sup>See for example, Ehrenreich and English, pp. 69-68; Mitchinson, p. 46; and Karen B. Levy, The Politics of Women's Health Care: Medicalization as a Form of Social Control (Las Colinas, Tex.: Ide House, 1992). p. 49.

<sup>59</sup>Kaufert and McKinlay, pp. 113-116.

<sup>60</sup>Ibid., p. 134.

<sup>61</sup>Welbourn, p. 284.

<sup>62</sup>McCrae, p. 115.

<sup>63</sup>S. B. Gusberg. "Precursors of Corpus Carcinoma Estrogens and Adenomatous Hyperplasia," American Journal of Obstetrics and Gynecology Vol. 54 (6) (1947), p. 905. In S. B. Gusberg, "Current Concepts in Cancer: The Changing Nature of Endometrial Cancer," New England Journal of Medicine Vol. 302 (13) (January-June 1980), p. 729. Gusberg pointed out that the danger of using estrogen without progesterone had been known for 30 years.

taking hormone replacement treatment declined or dropped estrogen treatments because of unpleasant side effects, and fear of cancer. In 1963, the following statement appeared in The Medical Letter: "There is conflicting opinion as to whether continued estrogen therapy may predispose to cancer, with no positive evidence that it does....It is simpler, and probably less hazardous and more effective, to rely on intensive calcium therapy than on hormone therapy."<sup>4</sup>

Nonetheless, estrogen use boomed from the mid-1960's until the mid-70's, when four important studies linking hormonal treatments to increased risk of cancer appeared in 1971, 1975 and 1976.<sup>5</sup> By 1975 in the U.S. alone, an estimated 6 million women had started estrogen.<sup>6</sup> Fear was widespread, even beyond the cohort of menopausal women, due to the explosive growth from the 1960's onward of the contraceptive pill, which also contained estrogen. The U.S. Government, in response to the uproar, changed the labeling accompanying estrogen prescriptions in 1977, and forced manufacturers to include warnings about various risks for women using estrogen.

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<sup>4</sup>The Medical Letter Vol. 5 (19) (Issue 122) (September 13, 1963), p. 74.

<sup>5</sup>P. Greenwald, J. J. Barlow, P. C. Nasca, and W. Burnett, "Vaginal Cancer After Maternal Treatment with Estrogens," New England Journal of Medicine Vol. 285 (1971), p. 390. This article documented the risk of vaginal cancer in daughters of women who had taken DES in pregnancy. The following articles linked the increased risk of endometrial (uterine) cancer in women who had been treated with estrogen. D. C. Smith, R. Prentice, D. Thompson, W. L. Hermann, "Association of Exogenous Estrogen and Endometrial Carcinoma," New England Journal of Medicine Vol. 293 (1975), p. 1164. M. K. Ziel, and W. D. Finkle, "Increased rise in Endometrial Carcinoma among Users of Conjugated Estrogens," New England Journal of Medicine Vol. 293 (1975), p. 1167. T. H. Mack, M. C. Pike, B. L. Henderson, R. I. Pfeiffer, V. R. Gerkins, M. Arthur, and S. E. Brown, "Estrogens and Endometrial Carcinoma in a Retirement Community," New England Journal of Medicine Vol. 294 (1976), pp. 1262-1267.

<sup>6</sup>Fausto-Stirling, p. 112.

Dr. Richard L. Landau wrote an angry and sarcastic response to the legislation in 1979, criticizing the bureaucratic and legislative response.<sup>67</sup> Interestingly, Landau wanted the F.D.A. to add osteoporosis as a benefit on the new labels and accused the agency of deliberately omitting this use for the drug. "Balancing the possible increased risk of endometrial cancer with its disabling and life-shortening potential against the crippling, painful, and even life-shortening consequences of severe osteoporosis as well would lessen the relative hazards of long-term estrogen therapy. The osteoporosis story should have been told."<sup>68</sup>

### **Making Sense of the Etiology of Osteoporosis: 1980's to the Present**

The gendering of osteoporosis has been dependent on acceptance that the dominant explanation for the disease is estrogen deficiency after menopause: the osteoporotic patient is mostly assumed to be a postmenopausal woman. An examination of recent explanations for osteoporosis, however, reveals two broad categories of causation for bone loss in both sexes, corresponding to the two broad theoretical categories of disease causation discussed in Chapter 1: a complex set of physiological processes (the biomedical model) and a wide range of environmental and behavioural influences (the social model). In medical discourse, the predominant explanation focuses on biological factors, especially estrogen loss and genetic inheritance (Figure 4.4). In Foucault's terms, the medical "gaze" has shifted from patient, to lesion and tissue, to cell, and finally to sub-cellular structures.<sup>69</sup> Sophisticated

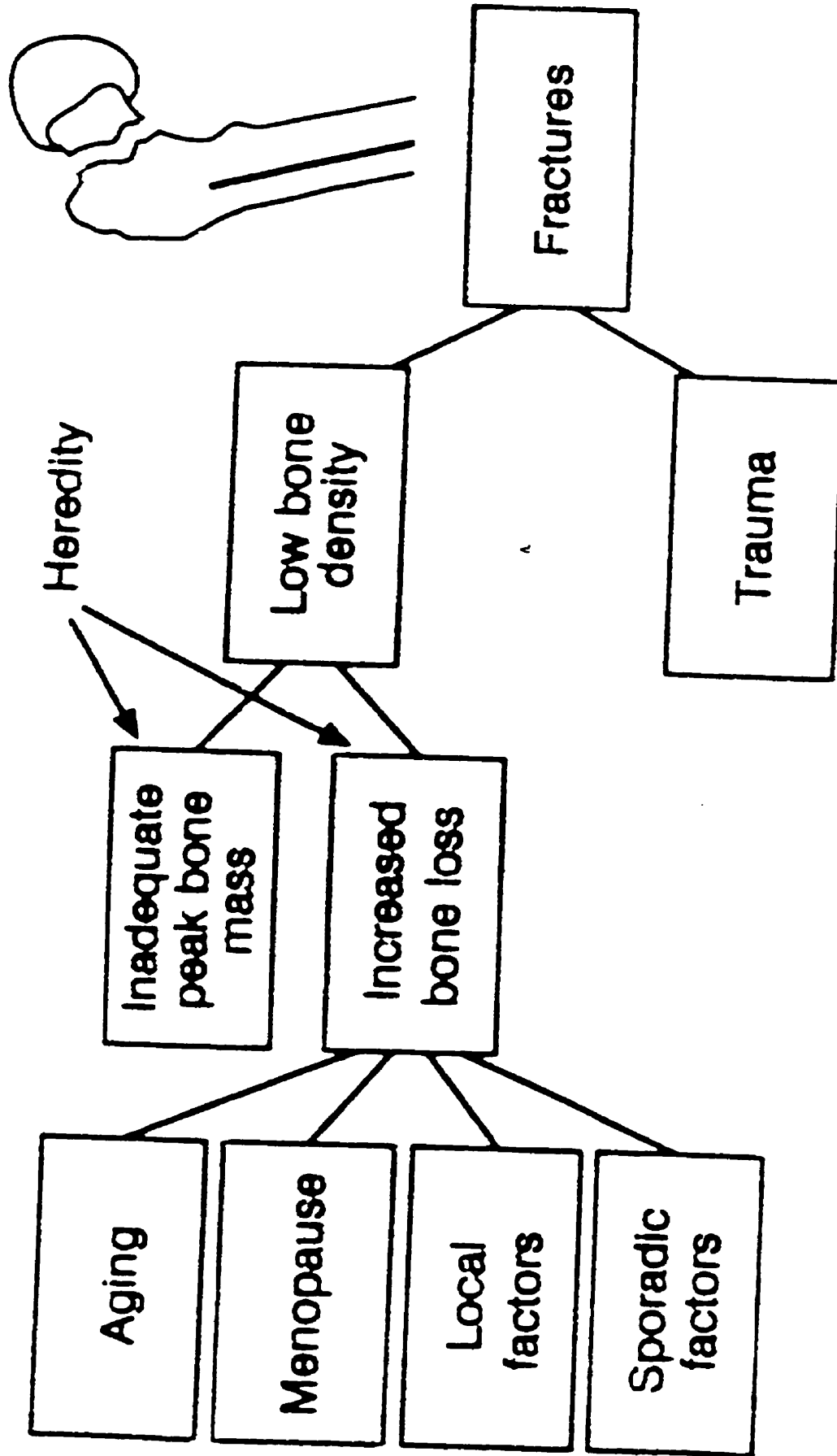
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<sup>67</sup>Landau, pp. 47-51. He attributed self-serving motives to the regulatory changes at the expense of women patients, plus the connivance of anti-birth control groups. I would like to learn if Landau was related to Berlin doctor, T. Landau, who used organotherapeutic preparations in 1896.[ McCrea, p. 112.]

<sup>68</sup>Landau, p. 49.

<sup>69</sup>Foucault, pp. 119-170.

Figure 4.4 Conceptual Model of Etiology of Osteoporotic Fractures



FR0008-10

Conceptual model of the pathogenesis of fractures related to osteoporosis.  
(Modified from Riggs.)

Source: L. Joseph Melton, III, "Epidemiology of Osteoporosis: Predicting Who is at Risk," *Annals of the New York Academy of Sciences* Vol. 592 (1990), p. 299.

contemporary biomedical investigations have not yet resulted in a simple, elegant explanation of the biological causation of osteoporosis.

**Multifactorial Causality-- Biological and Social Influences.** Osteoporosis as conceived in the 1990's has been deemed the most common metabolic bone disease in the so-called developed countries of the world and categorized by terms referring either to persons at risk or its etiology (cause).<sup>70</sup> Medical literature has described "primary" osteoporosis as having 3 sub-types: postmenopausal; senile or age-associated; and idiopathic (of unknown cause, affecting premenopausal women, young and middle-aged men). It is unclear why a distinction is made between post-menopausal and senile osteoporosis. Two types of osteoporosis have been linked to aging: Type I found in a minority of women within 15-20 years after the menopause which results mostly in spinal fractures; and Type II which is found in both sexes after age 75 and is evinced by both vertebral and hip fractures.<sup>71</sup> Some have argued for a primary/secondary causal distinction, since evidence implies a difference in the physiological mechanisms underlying these two types:--a low-turnover vs high-turnover in the bone remodeling cycle.<sup>72</sup> Some medical authorities described postmenopausal osteoporosis as a contributor to the senile variant.<sup>73</sup> Another contemporary expert says that

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<sup>70</sup>Michael Kleerekoper and Louis V. Avioli, "Evaluation and Treatment of Postmenopausal Osteoporosis," in Primer on the Metabolic Bone Diseases and Disorders of Mineral Metabolism, 3rd Edition. Murray J. Favus, ed. (Philadelphia: Lippincott-Raven, 1996), p. 264. Osteomalacia, also called rickets in children, is believed to be the most prevalent metabolic bone disease in the so-called less developed countries where large portions of the population may experience diets which are deficient in nutritional requirements.

<sup>71</sup>B.L. Riggs, and L. J. Melton, "Evidence for Two Distinct Syndromes of Involutional Osteoporosis," American Journal of Medicine Vol. 73 (1983), pp. 899-901.

<sup>72</sup>Kleerekoper and Avioli, p. 265

<sup>73</sup>Forbes, p. 129. Forbes claimed that Fuller Albright himself made this point.

the distinction between the two types of osteoporosis is academic, because there is no difference in treatment.<sup>74</sup>

“Secondary” osteoporosis has been described as bone loss caused by an identifiable external agent such as a drug or another disease process, such as anorexia nervosa, Type 1 diabetes,<sup>75</sup> or excessive thyroid hormone.<sup>76</sup> This concept of the disease corresponds to the ontological theory of the disease (Chapter 1). Drug groups which cause bone loss in patients include steroids, the combination of cyclosporine and prednisone, exchange resins, and some anticonvulsants.<sup>77</sup> Secondary osteoporosis accounts for about 20% of cases in women and 40% of cases in men.<sup>78</sup> Primary and secondary causes are understood to be interactive rather than independent of each other.<sup>79</sup> It is now generally accepted that the development of optimal bone mass (quantity of bone tissue in the skeleton) achieved by individuals at skeletal maturity through normal growth and attributable to genetic heritage is a critical

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<sup>74</sup>Dr. Angela Garcia, Lecture on Osteoporosis, November 12, 1997, at the Kingston Public Library, sponsored by the Queen's Gerontology Project's speakers series Aging and Health. Dr. Garcia is an endocrinologist and geriatrician at St. Mary's of Lake Hospital.

<sup>75</sup>Interview with Dr. R.W. Hudson, August 1, 1997.

<sup>76</sup>Robert Lindsay, Osteoporosis: A Guide to Diagnosis, Prevention, and Treatment (New York: Raven Press, 1992), unpaginated Definition page.

<sup>77</sup>Barbara P. Lukert, "Glucocorticoid and Drug-Induced Osteoporosis," in Primer on the Metabolic Bone Diseases and Disorders of Mineral Metabolism, 3rd Edition, Murray J. Favus, ed. An Official Publication of the American Society for Bone and Mineral Research. (Philadelphia: Lippincott-Raven, 1996), p. 280. Forbes mentions that adrenocorticotropic hormone began to be available after 1944, followed by other cortisone family of drugs after 1950. Iatrogenic [treatment induced] osteoporosis started to show up subsequently. Forbes, p. 132.

<sup>78</sup>Peel and Eastell, p. 37.

<sup>79</sup>Sundeep Khosla, L. B. Riggs, and L. J. Melton III, "Clinical Spectrum," in Osteoporosis: Etiology, Diagnosis, and Management. Second Edition. B. Lawrence Riggs and L. Joseph Melton III, eds. (Philadelphia and New York: Lippincott-Raven, 1995), p. 205.

factor. Because all humans lose bone mass, those who start with more are not as severely affected by tissue loss later in life.<sup>30</sup>

In contrast, a physiological theory (Chapter 1) of osteoporosis has also been expounded. Genetic research in the 1990's has revealed a number of other inherited characteristics other than ethnicity (Asian and Caucasian), gender, and bone structure that appear to be linked with osteoporosis. A single gene recently identified as a Vitamin D receptor "is one of the main determinants of bone mass and is therefore implicated in osteoporosis."<sup>31</sup> Other genetic markers previously mentioned, such as prematurely grey hair and fewer teeth associated with osteoporotic patients have also been recently noted.<sup>32</sup> One author suggested that a tendency to familial osteoporosis might be explained by "mild and unrecognized osteogenesis imperfecta", a rare inherited bone disorder, which then shows up after menopause as osteoporosis.<sup>33</sup> A Canadian geneticist recently stated his theory about disease causation:

Now is the turn of some very important persons to be recognized; they are the patients (the outliers for some biological trait) who have been putting the same question to me and my colleagues, over and over again for three decades. A simple question: Why do I have this disease (Phenotype), now? Yet one so difficult to answer. What I know now is that every disease has two histories: one is biological and hidden in ultimate (genetic) causes and susceptibilities; the other is proximate and found in experience. Together they usually explain a person's disease.<sup>34</sup>

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<sup>30</sup>Robert P. Heaney and Velimir Matkovic, "Inadequate Peak Bone Mass" in Osteoporosis: Etiology, Diagnosis, and Management. Second Edition. Riggs, B. Lawrence and Melton III, L. Joseph, eds. (Philadelphia and New York: Lippincott-Raven, 1995), p. 115.

<sup>31</sup>Holden, p. 366.

<sup>32</sup>Trevor Stamp, "Grey Hairs, False Teeth and Bad Bones," The Lancet Vol. 345 (April 8, 1995), p. 876.

<sup>33</sup>Forbes, p. 131.

<sup>34</sup>Charles R. Scriver, "1992 Genetics Society of Canada Award of Excellence Lecture: Genes, Science and Society," Genome Vol. 36 (4) (August 1993), p. 631. Underlining added. 'Phenotype' is the totality of



In addition to differences in population age and sex, fracture sites and rates of bone remodeling characteristic of its sufferers, it is increasingly apparent that the underlying biological mechanisms for osteoporosis are heterogeneous.<sup>85</sup> The level of endogenous hormones circulating in a woman's body during her lifetime is also a factor.<sup>86</sup> Thus, a woman's full reproductive history in terms of dates of menarche and menopause, as well as number of pregnancies and breast feeding patterns have also been considered pertinent contributors to risk of osteoporosis.<sup>87</sup> This biological reality, which is mediated by socio-economic and cultural differences among women around the world, has been considered important for explaining epidemiological variations between populations.<sup>88</sup>

Lifestyle behaviours, especially nutrition, physical exercise level, propensity to fall, smoking, caffeine, phosphates and alcohol intake, are now known to be significant contributors to the development of osteoporosis.<sup>89</sup> Both too much exercise as well as

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characteristics of an individual: 'genotype' refers to the total genetic constitution of an organism. Mayr, pp. 958-959. See Milhous for a description of the theory that aging processes, in general, are genetically programmed, p. 209.

<sup>85</sup> Dequeker and Geusens, p. 2.

<sup>86</sup> Richard D. Wasnich, "Epidemiology of Osteoporosis," Primer on the Metabolic Bone Disease and Disorders of Mineral Metabolism, 3rd Edition. (An Official Publication of the American Society for Bone and Mineral Research), Murray J. Favus, ed. (Philadelphia: Lippincott-Raven, 1996), p. 249.

<sup>87</sup> Stevenson and Marsh, p. 23-24.; Kleerekoper and Avioli, p. 65.

<sup>88</sup> Heather Cook, "Hot Flash on Menopause," The Nature of Things, David Suzuki producer (March 5, 1998). CBC TV. A medical anthropologist living with Mayan women explored their complete unfamiliarity with hot flashes and other physical dimensions of menopause and no osteoporosis, despite early menopause, low amounts of dietary calcium. The conclusion was that the lower amounts of estrogen due to their almost continual pregnancies and breast feeding till menopause, in addition to constant weight-bearing activity through the lifecycle "protected" them from the disease.

<sup>89</sup> Interview with Dr. E. R. Yendt, July 21, 1997.

minimal levels of activity present a high risk of osteoporosis: female athletes, who become amenorrheic for long periods of time, are said to "get thin bones."<sup>90</sup>

### **What About the Men?: Populations "At Risk"**

According to endocrinologist Dr. R.W. Hudson at the Queen's University Faculty of Medicine, men are also at risk, especially those who are testosterone deficient.<sup>91</sup> Male sex hormones decline after age 60. Some men may experience a faster and more significant rate of fall in their hormones. Men also lose 3 - 5% of their bone mass per decade after age 40, which Dr. Hudson attributed to "a fall in muscle mass that starts typically when men between 25-30 years old stop exercising." As well, men affected by alcoholism or other drug dependencies as well as chronic diseases already mentioned, are considered at higher risk of developing this disease. Moreover, clinical symptoms may differ between males and females making diagnosis in the former group more difficult.<sup>92</sup> Lastly, few epidemiological studies exist which directly compare male and female prevalence rates.<sup>93</sup>

Geographical and climatological factors such as latitude and exposure to sunlight have been determined to play a significant environmental role in determining populations at risk. Dr. Hudson estimated that up to 40% of the population in Ontario are Vitamin D

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<sup>90</sup>Dr. A. Garcia, November 12, 1997 Public lecture, Queen's Gerontology Project.

<sup>91</sup>All information in this paragraph is from my interview with Dr. R.W. Hudson, August 1, 1997.

<sup>92</sup>G. Jones, C. White, T. Nguyen, P. N. Sambrook, P. J. Kelly, and J. A. Eisman, "Prevalent Vertebral Deformities: Relationship to Bone Mineral Density and Spinal Osteophytosis in Elderly Men and Women." Osteoporosis International Vol. 6 (1996), p. 233. These authors assert "vertebral deformities [my underlining] are at least as common, if not more so, than in women, suggesting that vertebral osteoporotic fractures are overlooked in men."

<sup>93</sup>Ibid., p. 238.

deficient due to our latitude, climate and sun avoidance.<sup>94</sup> Finally, an acknowledged side effect of twentieth-century space travel is the development of osteoporosis by astronauts due to lack of activity and/or loss of the pull of gravity on bones.<sup>95</sup>

### **Aging Women: Undiagnosed Disease Waiting to Happen, 1960's - 1990's**

Two recent European sources demonstrated clear examples of how aging has been socially constructed as undiagnosed disease awaiting discovery.<sup>96</sup> I argue that they also demonstrate how cultural prejudices about aging women have affected the way women and "their" illnesses have been depicted in medical discourse. The first example stated

Osteoporosis is not now regarded as a disease but a syndrome which manifests itself as a fracture resulting from minimal trauma in a person with reduced skeletal mass. Analogous syndromes include congestive heart failure, renal insufficiency, hepatic failure, mental deficiency, arterial insufficiency and respiratory insufficiency. All of these syndromes have a common physiopathology, namely insufficient organ reserves to meet intercurrent minor stress. Physiological aging gradually reduces tissue 'reserves', a process which might be accelerated temporarily or permanently by concomitant diseases affecting bone, such as hyperthyroidism, gastrectomy, immobilization, arthritis, etc.<sup>97</sup>

The second example was written by Dr. P. van Keep, citing Robert Wilson as his inspiration. "Robert Wilson rendered women aged over 45 a great service. He provoked a line of research which has in 25 years resulted in a sensible approach towards the use of medication in treating the climacteric and post-menopausal oestrogen deficiency."<sup>98</sup> Van

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<sup>94</sup>Interview with Dr. R. Hudson, August 1, 1997.

<sup>95</sup>Dr. E. R. Yendt, Oct. 15, 1997 at the Public Information Forum "Let's Talk About It: Menopause and Osteoporosis."

<sup>96</sup>Both articles were published in Belgium where the International Menopause Society is headquartered in Brussels.

<sup>97</sup>Dequeker and Geusens, p. 1.

<sup>98</sup>van Keep, p. 163. van Keep's own research about menopause was sparked by the publication of Robert A. Wilson, R. E. Brevetti and Thelma Wilson, "Specific Procedures for the Elimination of the Menopause."

Keep's explanation for the delayed recognition of a "Hormone Deficiency Syndrome" until the 1960's is that for "all menopause-related disorders (with the exception of vasomotor symptoms) there is a latent period between the time of the menopause and the moment that the oestrogen-deficiency-related disorder manifests itself. For some disorders this latent period is short, whereas for others it may be several years."<sup>99</sup> This analysis was graphically illustrated in van Keep's reductionist diagram of the aging menopausal woman (Figure 4.5).

### Conclusion

Medicine cannot explain why only some post-menopausal women develop osteoporosis.<sup>100</sup> Yet physicians and pharmaceutical companies have, since the 1960's, urged routine use of estrogen as an appropriate preventative for menopause and osteoporosis to all North American females. In part, the embracing of hormone therapy by the public and the medical profession may have been a by-product of the drug's use in the contraceptive pill which also started in the 1960's.<sup>101</sup>

In the 1970's and 1980's, medicine came under attack by a powerful feminist critique for its depiction of menopausal women, the widespread use of estrogen, and the modern construction of porous bone disease. (See Chapter 7). For those women newly liberated by feminist thinking during the 1960's and 1970's, the appeal to take drugs to please men by retention of one's youthful appearance and sexuality, would be less convincing than taking

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Western Journal of Surgery, Obstetrics and Gynecology Vol. 71 (May 1963), pp. 110-121.

<sup>99</sup>van Keep, p. 164.

<sup>100</sup>Khosla, Riggs, and Melton III, p. 205.

<sup>101</sup>Jeannine Locke, "Medicine's New Boon to Women: A Pill that Prolongs the Prime of Life," Maclean's Vol 78 (August 7, 1965), p. 30.

# The Ageing Woman

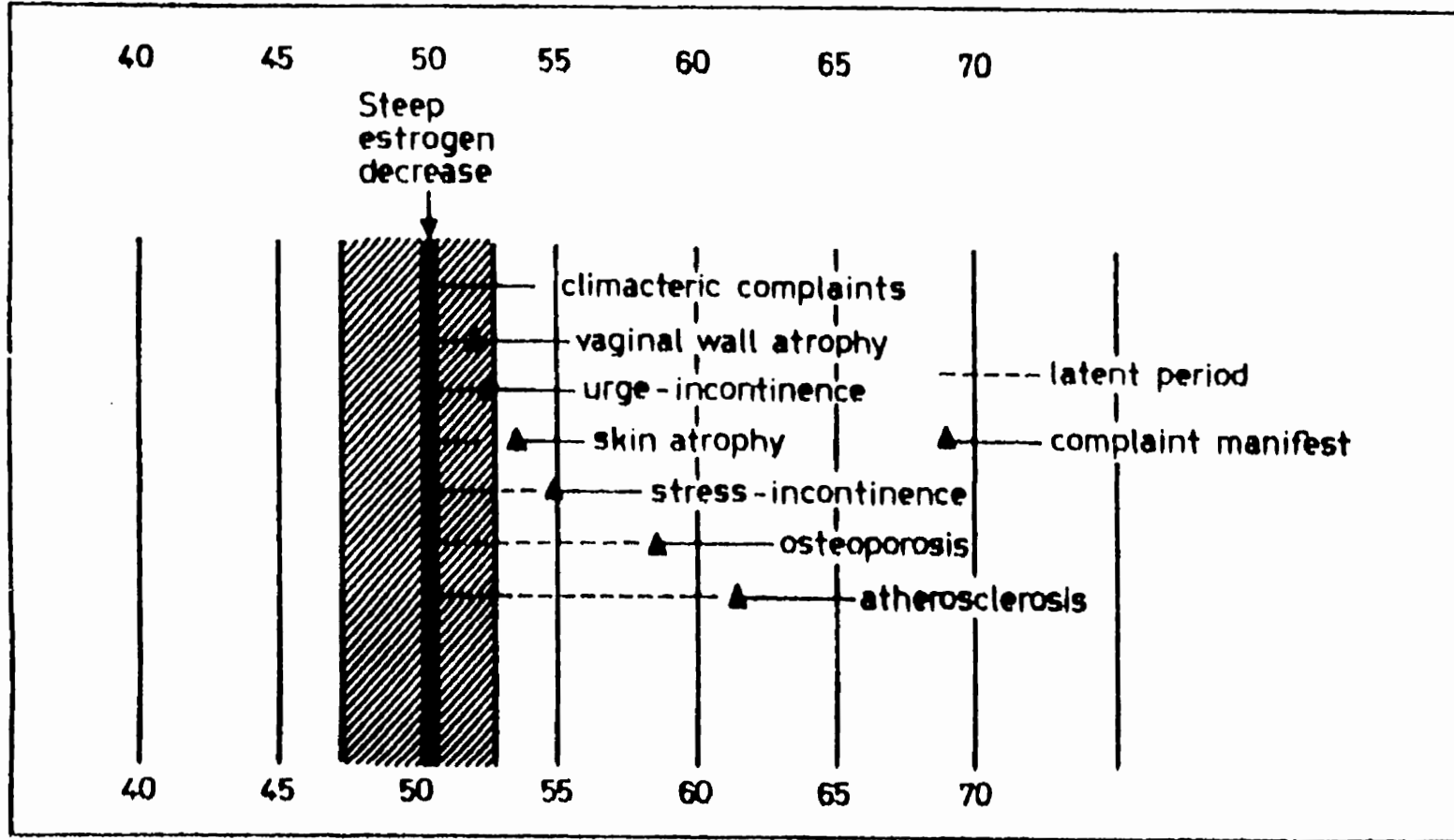


Figure 4.5 Graph of Aging Women as Latent Disease

## Estrogen deficiency symptoms and age, a schematic approach.

Oestrogen-deficiency symptoms and age, a schematic approach. (Reproduced from Van Keep and Kellerhals [10] by kind permission of the publisher, S. Karger, Basel).

Source: P.A. van Keep, "The History and Rationale of Hormone Replacement Therapy," *Maturitas* Vol. 12 (1990), p. 164.

action to prevent future disease. In Chapters 6 and 7, I will discuss in more detail how osteoporosis became an important justification for extending the therapeutic imperative to deal with menopause, especially in the 1980's. Millions of women, however, took estrogens to prevent the depredations of aging, spurred on by the mainstream values of a youth-obsessed and death-denying culture.

Osteoporosis, however, had become firmly entrenched in medical ideas correlated with gender. In Chapter 5, I will introduce the issues and milestones which, during the mid-1980's, led to an explosive growth in awareness about osteoporosis in medicine, government, the media and the public at large.

## Chapter 5: Introduction to Part 2 (Chapters 6-8) The Hip Bone's Connected to A New Epidemic

Medicine is a social science and politics [is] nothing else but medicine on a large scale. **Rudolf Virchow**, German pathologist and statesman, 1848<sup>1</sup>

In Part 1 I have shown that by the early 1980's, scientific discoveries had produced: increasingly sophisticated explanations of bone metabolism: several drug therapies which might be effective in halting the rate of bone loss: and technology for early detection of reduced bone mass. Medical thinking connected osteoporosis with postmenopausal women during the 1940's and continued as the dominant line of scientific inquiry about the disease. In Part 2 (Chapters 5-8), I will focus on the political, socio-economic, cultural and ideological factors which made osteoporosis a disease, i.e., the non-medical factors which affected medical practice, and irrevocably altered the relationship between patients and physicians.

Once named as entities, specific diseases (i.e. ideas about illness) experience peaks and troughs in the attention they attract in science, society and in patients' experiences. "Perceptions of disease are context-specific but also context-determining."<sup>2</sup> The mass media also played a crucial role in the transition of this disease from obscurity to a household word.

### **Patients With Asymptomatic Chronic Disease: The "Potential Sick Role"**<sup>3</sup>

According to Roy Porter, "what most perturbs sufferers is less actual symptoms or quanta of pain, but sickness contrary to expectation. Even major diseases can be shrugged off by cultural conditioning as natural--i.e., appropriate to the stage of life or season."<sup>4</sup> The

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<sup>1</sup>Rosenberg, Explaining Epidemics, p. 299. Virchow made this statement in an editorial.

<sup>2</sup>Rosenberg, "Introduction," Framing Disease, p. xx.

<sup>3</sup>R. Crawford, "Healthism and the Medicalization of Everyday Life," International Journal of Health Services Vol. 19 (1980), p. 379.

<sup>4</sup>Porter, p. 184.

moment of diagnosis may utterly change a patient's perspective about themselves and their future. Ideas about who is old are culturally as well as biologically determined. Today, many women who consider themselves in their prime, aged in their late 40's to late 50's, are seen as a major target group for diagnosis of osteoporosis.

"Concepts of disease and its causation and possible prevention always exist in both social and intellectual space."<sup>5</sup> In earlier eras, illness was sought in visible body signs; but in the late nineteenth and early twentieth centuries, medical science greatly altered the "body as text of illness."<sup>6</sup> By the late twentieth century, Western society has become dependent on medical technologies to discover "premonitions of potential illnesses."<sup>7</sup> Many of these so-called "silent" diseases are chronic ailments prevalent in aging populations, such as heart disease, cancer, diabetes, arthritis, and osteoporosis. Moreover, both medical and lay literature promote the importance of early diagnosis of asymptomatic disease, which is the "cornerstone of preventative medicine."<sup>8</sup> Avoidance of regular checkups by well adults may be depicted as a dereliction of personal responsibility, accompanied by blame for avoidance of opportunity to nip potential disease in the bud:

The process requires that anxiety levels be raised high enough in people who have experienced no symptoms so that they seek testing. In so doing, it requires that individuals question the veracity of their own assessment of their health and rely upon medical intervention (usually facilitated by high technology) to detect the invisible signs of disease.<sup>9</sup>

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<sup>5</sup>Rosenberg, "Introduction," Framing Disease, p. xx.

<sup>6</sup>Lupton, p. 98

<sup>7</sup>deSwaan, p. 60.

<sup>8</sup>Lupton, p. 99, quoting J. Daly, "Innocent Murmurs: Echocardiography and the Diagnosis of Cardiac Normality," Sociology of Health and Illness Vol. 11 (2) (1989), p. 100.

<sup>9</sup>Lupton, p. 99.



Anxious anticipation facing patients who await the results of such tests, especially in the case of hidden illness, creates the "potential sick role" noted earlier, in which "societal expectations are imposed on behalf of prevention and early diagnosis, and failure to act preventively" is also considered socially irresponsible.<sup>10</sup> An individual's failure to act to prevent chronic disease may become framed as a costly familial and societal burden as well as personal misfortune. In the mid-to-late 1980's, it became technologically possible to diagnose osteoporosis when the patient is asymptomatic. Until very recently, the majority of family physicians in Canada did not warn or screen otherwise healthy perimenopausal women patients about the dangers of osteoporosis.<sup>11</sup>

Environmental causes of disease have mostly deflected blame away from the patient and towards external forces or society in general.<sup>12</sup> Experts who advocate for prevention strategies believe "In general for each patient, the more risk factors present and the longer the duration of their presence, the greater the risk of future problems."<sup>13</sup> However refined the attempts have been to create a list of risk factors, "overall they are of modest use clinically in predicting fracture risk." As well, it has been acknowledged that evidence for some risk factors varies in quality as does the interplay of factors for individuals.<sup>14</sup>

Indeed, there are physicians who have come to believe that the extent of the "silent

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<sup>10</sup> *Ibid.*, p. 99.

<sup>11</sup> Interview with the late Dr. Thomas Mackenzie, July 9, 1997.

<sup>12</sup> Risse (1978), p. 584. However, a strong tradition of blaming social conditions such as poverty on its victims exists, so that not all environmental (ontological) causes of disease are universally accepted as not being the individual's 'fault'.

<sup>13</sup> Lindsay (1996), p. 257.

<sup>14</sup> Lindsay (1992), p. 4.

epidemic" has been overstated:

The osteoporosis that causes pain and disability is a very rare disease. Only 5% to 7% of 70-year-olds will show vertebral collapse; only half of these will have two involved vertebrae; and perhaps one fifth or one sixth will have symptoms. I have a very big referral practice, and I have very few bent-over patients. There's been a tremendous hullabaloo lately, and there are a lot of worried women--excessive testing and administration of medications.<sup>15</sup>

### **Transition in Awareness of Osteoporosis in the mid-1980's**

The profile of the disease osteoporosis appeared to change dramatically around 1984-85. Availability of therapeutic and diagnostic options contributes to how modern medicine perceives specific disease entities.<sup>16</sup> According to American bone specialists Drs. B.

Lawrence Riggs and L. Joseph Melton III, osteoporosis was

a disease whose time has come. Not long ago there was little interest in osteoporosis. Most physicians thought that it was a boring disease, and many believed it to be untreatable and the inevitable consequence of old age. Treatment of osteoporosis, when it occurred, was largely confined to patients with the vertebral fracture syndrome. Hip and Colles' fractures were usually ignored. Diagnosis of osteoporosis was limited to patients with nontraumatic vertebral fractures because there was no effective way to measure bone density.<sup>17</sup>

This analysis was echoed by Dr. Edmund R. Yendt, a well-known Canadian clinician and researcher on osteoporosis, who said family physicians' interest in the disease had been piqued only within the last ten to fifteen years. "There was lots of negativism about osteoporosis until the early 1980's because there was little evidence that you could do anything good for it." Dr. Yendt mentioned an article about osteoporosis in The Medical Letter during the 1980's which, he believed, resulted in "practicing doctors being turned off

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<sup>15</sup>Dr. Bruce Ettinger, Associate Clinical Professor of Medicine at the University of California and an endocrinologist at Kaiser Permanente Medical Centre, as quoted in Coney, p. 129.

<sup>16</sup>Pellegrino, p. 253; Hudson, p. 193.

<sup>17</sup>Lawrence B. Riggs and L. Joseph Melton III, eds. Osteoporosis: Etiology, Diagnosis, and Management. 2nd Edition (Philadelphia and N.Y.: Lippincott-Raven, 1995), p. xiii. Riggs and Melton are at the Mayo Clinic.

[diagnosing and treating it]. However, once bone was able to be measured, this could be used to diagnose and prove that treatment worked."<sup>18</sup>

A prominent Kingston family physician, the late Dr. Thomas MacKenzie, educated at Queen's University in the latter half of the 1970's, reported that during his medical education "osteoporosis was only an obscure radiologic finding." Even in the early years of his practice during the 1980's, "osteoporosis was a risk factor." His Queen's instructor with the greatest expertise in osteoporosis, Dr. Yendt, "gave it a couple of minutes in regard to calcium chemistry."<sup>19</sup> MacKenzie also claimed that the lag time in diffusion of knowledge between specialist physicians, such as rheumatologists and endocrinologists, and general practitioners was one reason for slow recognition of the extent of osteoporosis in the population. Dr. R. W. Hudson also confirmed this disinterest in the disease by family doctors: "Although for a number of decades specialists were aware of the epidemiology of osteoporosis for females who are less than at ideal weight and who have been deficient in hormones, this knowledge was not widely dispersed."<sup>20</sup>

### **Governmental Endorsement for Medical Interventions**

Ingrained medical attitudes that osteoporosis was an irrevocable and incurable effect of aging for which nothing could be done were changing between 1960 and 1980, but elite members of the profession believed that this knowledge was not widely disseminated among

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<sup>18</sup>Interview with Dr. E. R. Yendt, July 21, 1997. The article which Yendt recalled may have been "Drugs for Postmenopausal Osteoporosis," *The Medical Letter* Vol. 22 (11) (Issue 558) (May 30, 1980), pp. 45-46 which concluded "Postmenopausal osteoporosis remains a therapeutic problem. Estrogens and dietary calcium supplements can retard bone loss, but the use of estrogens is hazardous and the effectiveness of calcium supplementation appears to be limited."

<sup>19</sup>Interview with the late Dr. T. Mackenzie, July 9, 1997.

<sup>20</sup>Interview with Dr. R. W. Hudson, August 1, 1997.

ordinary doctors or the general public. Drs. Riggs and Melton, located the awakening of critical recognition for osteoporosis as a major medical concern to the U.S. National Institutes of Health's Consensus Development Conference on Osteoporosis in 1984. Other primary and secondary sources have confirmed that this event was vital to the transformation of osteoporosis to its profile as an important disease category.<sup>21</sup> Significant increase in media attention, public awareness, new avenues for broader public education and expansion of funding for research followed closely on the heels of the conference. By 1985, the U.S. Government had passed a resolution designating an annual National Osteoporosis Week.

### **The Osteoporosis Phenomenon Takes Off**

By the early 1980's, recognition of osteoporosis as a preventable and treatable condition was beginning to be more widely accepted by mainstream scientific opinion. A feature article in the authoritative journal Science in February 1980 explained the latest hypotheses about bone formation and dissolution, followed by a detailed description of a range of experimental therapies derived from research in estrogen, calcitonin, stanolozol (a male sex hormone derivative), a recently discovered hormonal form of Vitamin D, fluoride, and calcium supplementation.<sup>22</sup> It noted side effects and that clinical trials had not shown that these therapeutic substances could actually prevent fractures by increasing bone density without necessarily increasing strength. Because bones weakened by osteoporosis were not believed to be reparable, the article concluded with the importance of prevention strategies.

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<sup>21</sup>Riggs and Melton III, p. xiii; Maryann Napoli, "Disease of the Week," New Republic Vol. 195 (December 1, 1986), p. 17. (Napoli is a writer of an American consumer advocacy newsletter HealthFacts [sic] based in New York); many articles cited in popular periodical literature (see Chapter 6); Interview with Dr. Joan Harrison, January 8, 1998.

<sup>22</sup>Jean Marx, "Osteoporosis: New Help for Thinning Bones," Science Vol. 207 (February 8, 1980), pp. 628-30.

Donald Whedon, then Director of the National Institute of Arthritis, Bone Metabolism, and Digestive Diseases, was quoted as saying "We need a major effort to educate middle-aged people to manage their lives to prevent this thinning of bone tissue."<sup>23</sup>

To confirm the impressions of Dr. Yendt and other sources concerning the chronology of events in relation to drug therapies, I surveyed references to osteoporosis through the entire corpus of The Medical Letter on Drug and Therapeutics from 1959 to 1996. This publication is sponsored by an independent, non-profit organization, supported entirely from subscription fees and receives no advertising revenue.<sup>24</sup> Its swift growth in influence can be documented by an increase in subscribers from approximately 5,000 to 30,000 within six years of its inception.<sup>25</sup> Well into the mid-1980's, The Medical Letter contained several negative or equivocal reviews about the efficacy of commonly prescribed treatments for osteoporosis.<sup>26</sup>

### **Demographic Imperatives and the "Cost Burden" of Osteoporosis**

At the same time, factors other than medical interest were propelling concern about osteoporosis. Legislation established the U.S. Medicare program for the elderly population in

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<sup>23</sup>Ibid., pp. 628-30.

<sup>24</sup>The former head of the Queen's University Department of Pharmacology, Dr. Gerald Marks, called The Medical Letter "the most authoritative unbiased source of information on drugs in North America." (Interview with Dr. Gerald Marks, November 16, 1997.)

<sup>25</sup>The Medical Letter on Drugs and Therapeutics Vol. 1-6 (January 1959-1964) (New York: Drugs and Therapeutics Information Inc., A Non-profit Organization, 1965), p. unpaginated introductory page.

<sup>26</sup>Two examples: In The Medical Letter Vol. 24 (Issue 623) (November 26, 1982), p. 105: "Although the relationship between dietary calcium and osteoporosis is not entirely clear, many Medical Letter consultants believe that a daily calcium intake of 1000-1500 mg per day may retard bone loss and reduce the incidence of fractures in women with postmenopausal osteoporosis. Prophylactic supplementation with calcium beginning years before menopause might prevent osteoporosis in some women, or at least make it less severe." And after the NIH Conference, The Medical Letter Vol. 27 (Issue 700) (November 8, 1985), p. 92 said: "Limited clinical studies suggest that concurrent use of estrogen plus a progestin might decrease postmenopausal osteoporosis without increasing the risk of endometrial cancer, but large-scale, long-term, well-controlled studies of the effectiveness and safety of such regimens are not available." [my underlining]

the mid-1960's, while by 1971, Canadian provincial governments backed by federal transfer payments had assumed insuring the bulk of physician and hospital costs for all age groups. During the 1960's to 70's, health policy debates were most concerned about access to care, but by the 1980's costs of care had become dominant.<sup>27</sup> The recession of the early 1980's and perceptions of burdensome costs for care of the elderly reinforced the obsession with funding issues.<sup>28</sup> The proportion of the GNP in both countries spent on health care expenditures was rising rapidly: in the U.S., health care increased from 8% to 12% of the GNP between 1970 and 1990, while in Canada it had grown to about 10% by 1990, despite differences in the policy environment.<sup>29</sup>

Important demographic changes occurred in developed industrial societies in the postwar era. Since the 1960's, life expectancy has increased, birthrates have plummeted, and the proportion of older persons (especially those 85+ years) in the population has climbed.<sup>30</sup> These social realities also affected attitudes about illness, especially diseases associated with aging. A large constituency of concerned older consumers was growing. (See Chapter 7). Fears about the costs of fractures to society were raised during the 1980's, in public fora such as the NIH Conference and the U.S. Congressional Hearings on Osteoporosis in 1985. The

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<sup>27</sup>Robert Crawford, "Individual Responsibility and Health Politics," in The Sociology of Health and Illness: Critical Perspectives, Peter Conrad and Rochelle Kern, eds. (New York: St. Martin's Press, 1981), p. 469.

<sup>28</sup>Rashi Fein, Medical Care, Medical Costs: The Search for a Health Insurance Policy (Cambridge, Mass.: Harvard University Press, 1986), pp. 162-163.

<sup>29</sup>The U.S. data is from Norman J. Temple and Denis P. Burkitt, "Towards a New System of Health: The Challenge of Western Disease," Journal of Community Health Vol. 18 (1) (February 1993), p. 39 and the Canadian figures are from "The Canadian Health Care System: Myths and Realities," Expression (newsletter of the National Advisory Council on Aging, Government of Canada) Vol. 8 (2) (Spring 1992), p. 2.

<sup>30</sup>Robert Evans, "Canada: The Real Issues," Journal of Health Politics, Policy and Law Vol. 17 (4) (Winter 1992), p. 753.

implication was that care required by aging persons with osteoporosis would be a major factor in undermining the financial viability of the health care systems. (See Chapter 8).

### **Political and Ideological Imperatives**

During the late 1970's, concerns about medicine's overemphasis on curative measures and the stinting of efforts on prevention were raised in international and national deliberations. A new "mentalité," health promotion, emerged to become more influential during the 1980's, through the efforts of organizations such as WHO, and scholars, health reform activists and other policy makers. Health promotion advocates argued that in addition to avoiding pain and suffering, disease prevention and health promotion would save money.<sup>31</sup> Canadians have been world leaders in theorizing about, developing and implementing health promotion policy initiatives.

Health promotion ideology encompasses progressive public health strategies and adopted the so-called "broad determinants of health" analysis of health and disease causation: the combination of biological and health care system influences, along with socio-economic, cultural, and environmental factors. Health promotion strategies link these influences in multi-dimensional campaigns incorporating legislative change, public awareness, community development and risk factor modification (behavior change). (See Chapter 6). Advocates

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<sup>31</sup>A huge literature on health promotion exists. A broad definition of 'health' as defined by WHO in 1948 was the root of WHO's philosophical commitment to health promotion. See Chapter 6 for the Lalonde Report of the Canadian Federal Government in 1974. Some recent Canadian writing on the subject include Trevor Hancock, "Developing Healthy Public Policy at the Local Level," in A. Evers *et al.* eds. Developing Local Healthy Public Policy (Frankfurt/Boulder: Campus/Westview, 1990); Ron Labonte, Health Promotion and Empowerment: Practice Framework (Toronto: Centre for Health Promotion, University of Toronto and ParticipAction, 1993); Ann P. Pederson, Health Promotion in Canada: Provincial National and International Perspectives (Toronto and Philadelphia: Saunders, 1994). Some examples of recent health promotion policy documents in the U.S. and Canada are Healthy People 2000: National Health Promotion and Disease Prevention Objectives (Boston: Jones and Bartlett, 1992); Nurturing Health: A Framework on the Determinants of Health (Toronto: Premier's Council on Health Strategy, 1991).

argued that money spent on health services would have less impact on health status of the population than resources invested in improving factors related to the broad determinants of health, i.e. education, nutrition, social supports, etc.<sup>32</sup> By 1984, the European office of WHO issued a concepts paper on health promotion, and in 1986, the Ottawa Charter on Health Promotion was promulgated.<sup>33</sup> Thus an ideology profoundly rooted in understanding disease and health as influenced by social factors arose to challenge the narrow biological perspective.

Medical interest in preventive strategies related to osteoporotic fractures has surged, within roughly the same time frame (the mid-to-late 1980's) as has the awareness of osteoporosis.<sup>34</sup> Table 5.1 reveals a parallel emergence of interest in prevention and control of falls and hip fractures. A number of other prevention messages, as well as fears of aging, disability and death, became important components in the media coverage of osteoporosis during the 1980's, which also will be reviewed in Chapter 6.

Medical opinion on osteoporosis was not monolithic. Some medical experts, feminist and non-feminist alike, questioned the mainstream approach to osteoporosis, suggesting that consensual medical definitions have been problematic. In particular, the specificity of the disease and its gendering have been scrutinized. A 1986 British medical text stated that "all

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<sup>32</sup>Premier's Council on Health, Well-being and Social Justice, Nurturing Health: A New Understanding of What Makes People Healthy (Toronto: Queen's Printer for Ontario, 1993), pp. 2-3. (Brochure Summary of original Nurturing Health document.)

<sup>33</sup>Interview with Ronald Labonte, March 22, 1998. Labonte is an internationally renowned consultant on health policy and the author of a paper in 1979 upon which WHO based its definition of health promotion.

<sup>34</sup>No history of the medical interest in falls prevention has as yet been written.



### History of Medical Interest in Prevention of Falls and Hip Fractures

**Table 5.1:** Medical Citations on Accidental Falls and Falls Prevention.  
In Medline, 1966-1997

<u>Years</u>	<u>Total Citations on Accidental Falls</u>	<u>Prevention and Control of</u>		<u>All Trauma Citations</u>
		<u>All Falls</u>	<u>Hip Fractures</u>	
1966-75	0	0	3	6.600
1976-80	3	1	8	2.850
1981-86	42	6	19	3.867
1987-92	964	228	62	4.999
1993-97	1,040	246	133	4.821

Source: Medline Searches, October 18, 1977; and  
March 5, 1998 for Prevention and Control of Hip Fractures

present definitions of osteoporosis are arbitrary."<sup>35</sup> Similarly, Dr. Susan Love remarked recently:

We've redefined osteoporosis. It used to be defined as having fractures in your 80's, and now it's defined as having an abnormal test [i.e., an increased risk of fracture]. It's like saying that high cholesterol is the same thing as heart disease. When they redefined it, they made the parameters so broad that every woman who gets a fracture will fit the definition. So, it means that a lot of women are being told "You have osteoporosis" and they're afraid they're going to crumble tomorrow. And it leads you to the idea that you have to take something<sup>36</sup>

The association of osteoporosis as a women's health issue has proved crucial to the social construction of the disease. Chapter 7 describes the ideological and political importance of the second wave of feminism, the consumer and grey power movements in the 1960's through the 1980's. Consumer, feminist and senior advocates contributed to the formation of the women's health movement and gave rise to powerful voluntary associations with interests in osteoporosis during the 1980's.<sup>37</sup>

### **The Profit Motive**

Estrogen received the blessing of the U.S. F.D.A. for the treatment and prevention of osteoporosis in 1984, just prior to its endorsement by the NIH panel.<sup>38</sup> After the NIH conference, commercial opportunities exploded or re-opened, as the recommendations of experts to treat osteoporosis patients with calcium and estrogen were bruited in medical and lay literature. Dairy and drug industry manufacturers were able to ride the wave of media

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<sup>35</sup>Peter A. Revell, Pathology of Bone (Berlin/Heidelberg: Springer-Verlag, 1986), p. 185.

<sup>36</sup>Julie Felner, "Dr. Susan Love Cuts Through The Hype on Women's Health," Ms ( July/August 1997), p. 38.

<sup>37</sup>See Rosenberg, Explaining Epidemics, pp. 298-302 for a discussion of the anti-reductionist tendencies, including the role of ideologies, in modern disease construction.

<sup>38</sup>"U.S. Agency Approves Estrogens to Aid Bones," New York Times Vol. 10 (May 21, 1984), p. 5.

popularity. "Reporters eagerly disseminated the calcium message, knowing the public's receptiveness to the idea of a disease that can be prevented with dietary changes. Far less attention was given to the objections raised by [some] osteoporosis researchers who view the NIH recommendations to adults as premature: the few studies showing any benefit to calcium supplementation were short-term ones."<sup>39</sup> The specialized field of diagnostic imaging for osteoporosis, the bone densitometry industry, also blossomed commercially after the NIH meeting. In Chapter 8, I will discuss the financial and other benefits to various stakeholders attendant upon the construction of osteoporosis as a late twentieth-century epidemic.

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<sup>39</sup>Napoli (1986), p. 17.

## Chapter 6: "A Household Word:" Images of Osteoporosis in the Popular Media, 1950-1990

The 'natural' evolution of disease has been decisively influenced by such human factors as population, density, agricultural productivity, and communications. Guenter B. Risse, historian and physician<sup>1</sup>

I will now examine how the media interpreted the medical messages that emerged from 1950 to 1990: and how lay and medical voices affected the disease's imagery.

Consequences of the media flurry in the mid-1980's also will be explored, especially the popularization of the medical notion of osteoporosis as a women's health issue. The chapter will conclude with an analysis of some contradictory ideas which remain part of the lay discourse about the disease in the 1990's.

Ideas about disease in the popular imagination are created by the interplay between medical discourse and the lay culture.<sup>2</sup> Deference to expert knowledge has characterized modern sensibilities, although the translation of scientific facts into accessible information is often fraught with epistemological problems, including the inability of most lay persons to correctly interpret statistical data. For example, commonly used concepts in scientific journals, such as lifetime risk and actual length of prolonged life attributable to one or another therapeutic intervention, are not well understood.<sup>3</sup> A recent study at the University of Michigan conducted among students showed that "the overall rate of reader misunderstanding approached 40%," or lower for articles on health topics.<sup>4</sup>

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<sup>1</sup>Guenter B. Risse, "Epidemics and Medicine: The Influence of Disease on Medical Thought and Practice," Bulletin of the History of Medicine Vol. 53 (1979), p. 507.

<sup>2</sup>Porter, p. 175.

<sup>3</sup>Powell and Leiss, especially Chapter 2 "A Diagnostic for Risk Communication Failures," pp. 26-40.

<sup>4</sup>William H. Yeaton, Dawn Smith, Karen Rogers, "Evaluating Understanding of Popular Press Reports of Health Research," Health Education Quarterly Vol. 17 (2) (Summer 1990), p. 223.

The so-called Information Age has given birth to both a demand for health information and a proliferation of sources.<sup>5</sup> Some social scientists, medical experts, and governmental officials believe that the health of individuals in modern Western society is demonstrably improved by having such information.<sup>6</sup> A major source of information about health and disease has been the mass media, both print and broadcast.<sup>7</sup> For example, at the October 1997 Osteoporosis Society of Canada's Public Forum on Menopause and Osteoporosis at the Grand Theatre in Kingston, 53.8% of the audience attributed their main source of health information to the print media compared to only 25.6% who received their knowledge from physicians, 6% from the public health unit, radio, and TV, and only 1.5% from pharmacists. Survey responses of audiences at two of ten other sites, Fredericton, N.B. and Quebec City, Que., also indicated that print media was their first or second most frequent source of health information.<sup>8</sup>

Historians have explored the depiction of various diseases using 19th and early 20th

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<sup>5</sup>See for the increasing media and public interest and sources in medicine and science during the 1980's, William J. Broad, "Science Magazines: The Second Wave Rolls In," *Science* Vol. 215 (January 15, 1982), pp. 272-273; and Barbara J. Culliton, "Science Sections in U. S. Newspapers Increase Dramatically in Past 2 Years," *Science* Vol. 235 (January 23, 1987), p. 429. On the growth of health-oriented magazines c. 1979-82, see Phil Titolo, "Revolutionary?" *Health* (February 2, 1982), unpaginated inside cover. Titolo attributed the strength of this development to an "outgrowth of the renewed interest in more healthy living."

<sup>6</sup>See for example Yeaton, Smith and Rogers, p. 223. They attribute the growth in sources to the consumer demand for medical news and advice.

<sup>7</sup>North Americans also obtain information about medicine, health and health care from family and friends, self-help groups, libraries, the internet, and the drug industry. Direct advertising to consumers for prescription drugs is permitted in the U. S. but not in Canada. A change in the present Canadian policy is under consideration, possibly due to the NAFTA agreement. Interview with Professor Patricia Peppin, December 18, 1997.

<sup>8</sup>In Kingston, data from the audience choices was instantaneously aggregated and flashed on the screen by an electronic touchpad device. According to survey results compiled and provided by the Osteoporosis Society, 45% of Fredericton's audience relied on magazines or newspapers, 14% from TV or radio sources, and 31% on 'your doctor'. Interestingly, the responses of the audience in Quebec City were not as skewed in favour of media information: 38.5% of these respondents relied on their doctors, 34.6% on print media, and 7.7% from public health, radio and TV.

century popular literature.” In contrast, popular knowledge about health issues in the late 20th century, such as that contained in magazines and newspapers, has been less studied.<sup>10</sup> Critical appraisals of issues such as health promotion, which focuses on preventing disease by proactively addressing the environment and lifestyle habits in healthy populations, have been neglected. In addition, the difference between lay and expert health knowledge has been blurred in magazines and media.<sup>11</sup> Medical experts have been almost universally cited as sources of information in mass media coverage of health and disease, especially in feature articles.<sup>12</sup>

Medical specialists and policy makers intentionally use the media to reach ordinary physicians and the public.<sup>13</sup> Controversies between biomedical authorities about treatments

<sup>10</sup>For example, see Naomi Rogers, “Germs with Legs: Flies, Disease, and the New Public Health,” Bulletin of the History of Medicine Vol. 62 (1989), pp. 599-617; Katherine Arnup, Education for Motherhood: Child-rearing Advice for Canadian Mothers (Toronto: University of Toronto Press, 1994).

<sup>11</sup>I found a handful of secondary sources which studied how health issues are depicted in mass media. In addition to those on health in general cited in this chapter, see Joan C. Chrisler and Karen B. Levy, “The Media Construct a Menstrual Monster: A Content Analysis of PMS Articles in the Popular Press,” Women & Health Vol. 16(2)(1990), pp. 89-104. Marjorie Ferguson’s study of women’s magazines in Britain and America from 1954-80, Forever Feminine: Women’s Magazines and the Cult of Femininity (London and Exeter, N. H.: Heinemann, 1983) does not directly mention health as a theme in her content analysis. Ferguson’s neglect of health may be a reflection of a considerable change in emphasis reflected in the popular media in the decades before 1980 and those afterwards. Ferguson did not even allude to R. A. Wilson’s book about estrogen, although the two books share almost the same title-- the two words are in different order. On class differences in health messages, see Connie M. Kristiansen and Christina M. Harding, “A Comparison of the Coverage of Health Issues by Britain’s Quality and Popular Press,” Social Behaviour Vol. 3 (1988), pp. 25-32.

<sup>12</sup>Robin Bunton, “Popular Health and Advanced Liberalism,” in Foucault, Health and Medicine, Alan Petersen and Robin Bunton, eds. (London: Routledge, 1997), pp. 231-232.

<sup>13</sup>See for example, Ehrenreich and English; Emily Martin, Women in the Body: A Cultural Analysis of Reproduction (Milton Keynes: Open University Press, 1989); Mariamne Whatley, The Ideology of Images in Educational Media: Hidden Curriculums in the Classroom (New York: Teachers College Press, Columbia University, 1990).

<sup>14</sup>John D. Winkler, David E. Kanouse, Laurel Brodsley, Robert H. Brook, “Popular Press Coverage of Eight National Institutes of Health Consensus Development Topics,” Journal of the American Medical Association Vol. 255 (10) (March 14, 1986), p. 1323.

have been routinely debated in the mass media. Such disagreements add to public confusion about causation, prevention, diagnosis or treatment issues for specific maladies.<sup>14</sup>

Academic pressure to publish for status and financial rewards have motivated individual scientists and teams to release information quickly. Institutional pride and anxiety to please funders have been other factors leading to releasing medical research prematurely, preferably with a big splash on page one. Although few research findings could be classified as final, the rush to make headlines may increase the likelihood of misunderstood or misleading information.<sup>15</sup>

In turn, the media has pursued health beat miracles because it makes compelling human interest stories. Moreover, our culture has exalted science and medicine with prestige and awe. Such incentives make it understandable that most of the reporting on medical news in lay sources I reviewed celebrated the progress of modern medicine. Notably, medicine has been honoured for its ability to help the afflicted with new cures; or alert potentially affected but unaware members of the public with detection or prevention strategies.

The advice to “consult your doctor” has persisted as an important refrain in most coverage. Patient-physician relationships, moreover, have been affected; for example, patient demands for appointments to discuss concerns about diseases, testing, and drugs, have been unleashed by stories in the popular press. Dr. E. R. Yendt cited a 1986 Newsweek cover story

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<sup>14</sup>Yeaton, Smith, Rogers, p. 224.

<sup>15</sup>Jerry Rapp, “Reporting on Science”. Letter to the Editor, Week in Review Section, New York Times (January 18, 1998), p. 16. The writer, identified as a professor of biological sciences at SUNY State College of Optometry, noted how the ability to attract private funds may increase the tendency to publicize bioscientific breakthroughs early, especially because of the declining proportion of government financing for research.

about calcium. as an example of the 1980's "media flurry."<sup>16</sup>

### **Popular Images of Osteoporosis c. 1960's-1990's**

Osteoporosis may have been an obscure condition known to medical professionals in the early post-war period, but it was invisible as a disease in the popular imagination until the third quarter of the twentieth century. Images of osteoporosis emerged in the late 1970's and exploded in the 1980's; they were of an insidious and dangerous epidemic disease, especially likely to be lurking inside the brittle bones of millions of older women. The long-term prognosis for osteoporosis sufferers was to expect a reduction in physical attractiveness from shrinking height and deformed posture due to "dowager's hump." It brought the specters of pain and disability from fractures, and decline into dependency on family and society, and finally death, especially from hip fractures. Military metaphors abound in the osteoporosis literature, expressing concepts of disease as the enemy, with battles to overcome suffering. Such language is typical of the way other diseases are also depicted.<sup>17</sup>

Iconography used to portray osteoporosis in the mass media (and in professional journals via drug advertisements) has often shown silhouettes of younger women declining into aged, deformed humpbacks (Figures 6.1 and 6.2). In the 1960's, some ads for osteoporosis remedies were gender neutral. By the 1980's advertisements used by pharmaceutical and other commercial interests, as well as by organizations such as the U.S. National Osteoporosis Foundation, showed anxious aging women, or crutches and wheelchairs (Figure 6.3). The Osteoporosis Society of Canada, in conjunction with the Eli

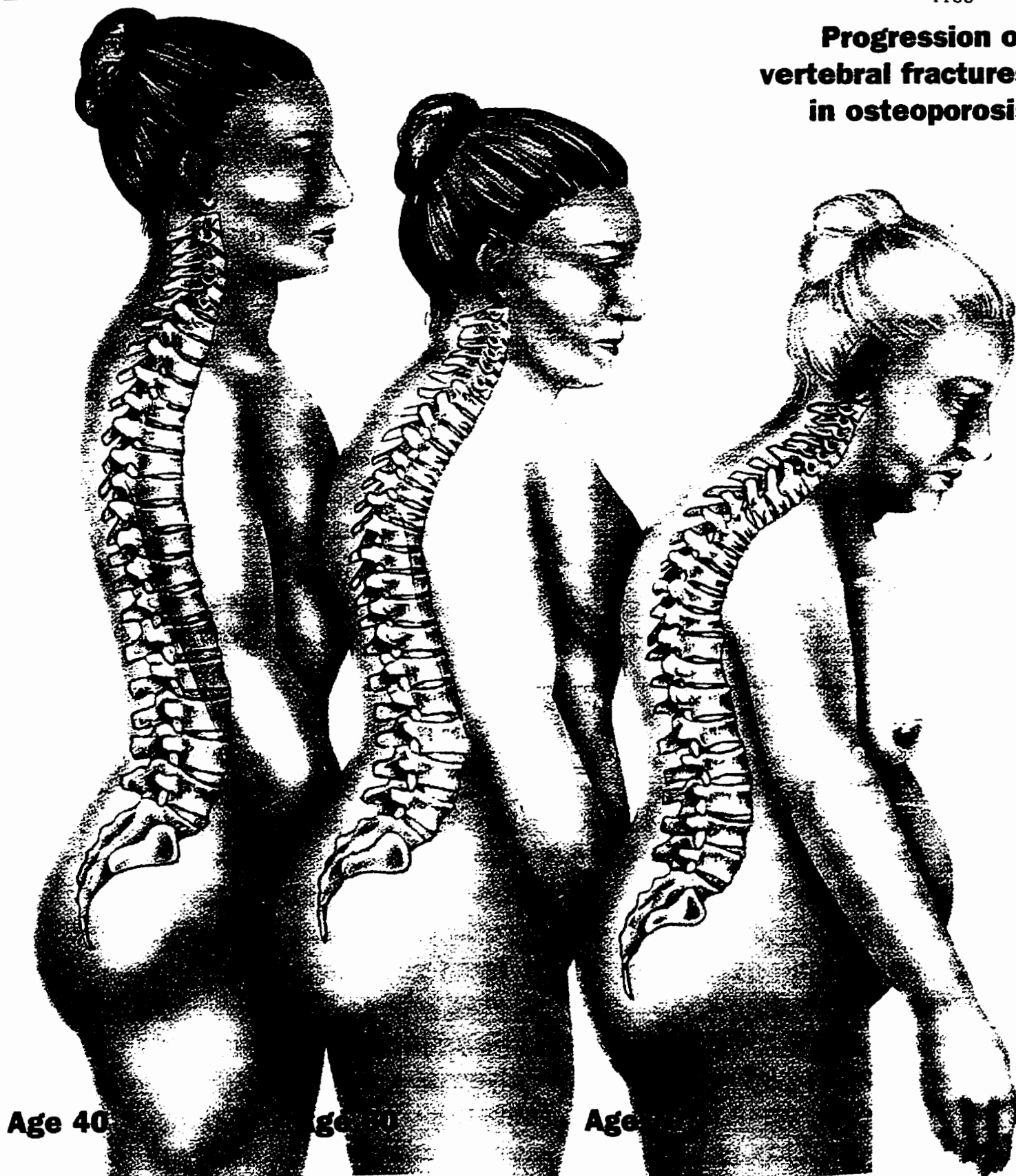
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<sup>16</sup>Interview with Dr. Edwin R. Yendt, July 21, 1997. The article was a cover story by Matt Clark, "The Calcium Craze: The Miracle Mineral Builds Up Bones, Teeth--And Perhaps False Hopes," Newsweek Vol. 107 (January 27, 1986), pp. 48-52.

<sup>17</sup>Lupton, pp. 61-64; Martin (1990), p. 411.




**Progression of  
vertebral fractures  
in osteoporosis**




Source: Wojtek Olszynski and Tibor Harmathy, "The Medical Post's Q & A Osteoporosis," The Medical Post, (May 6, 1997), p. Q1.

**A CHOICE FOR LESS CHANCE**

IF YOU GIVE YOUR MENOPAUSAL PATIENT ONE OF THESE ...



THERE'S LESS CHANCE YOU'LL HAVE TO GIVE HER BOTH OF THESE.



**PROGYNOVA**  
THE NATURAL CHOICE OF ESTROGEN.  
CONVENIENT CALENDAR PACK.

**PROGYLTON**  
THE NATURAL ADVANTAGES OF  
PROGYNOVA WITH THE PROTECTION OF  
CYCLICAL PROGESTOGEN.

**HORMONE REPLACEMENT THERAPY:  
EFFECTIVE PROTECTION AGAINST THE DANGERS OF OSTEOPOROSIS.**

**TAKE A PILL OR GET A WHEELCHAIR.**

**WHICH WOULD YOU  
RATHER PRESCRIBE TO  
A POTENTIAL  
OSTEOPOROSIS SUFFERER?** 118c



TAKE A COURSE OF PREMARIN-C7

OR LET NATURE TAKE ITS COURSE

A case of 28 convenient  
tablets and 14 days of the natural  
estrogen of Premarin-C7. It's the  
most effective way to take  
estrogen. Premarin-C7 is the  
only natural estrogen available  
in a convenient, easy-to-take  
form.

Estrogen is nature's way of  
keeping you young and healthy.  
It's the natural way to prevent  
osteoporosis. Premarin-C7 is  
the only natural estrogen  
available in a convenient, easy-to-  
take form.

Estrogen is nature's way of  
keeping you young and healthy.  
It's the natural way to prevent  
osteoporosis. Premarin-C7 is  
the only natural estrogen  
available in a convenient, easy-to-  
take form.

**Wyerle**

Figure 6.3 Take a Pill or Get a Wheelchair.  
1990's Ads

In these advertisements from the 1990s, the wheelchair and crutches are emerging as the new symbol for osteoporosis being used by the makers of hormones, in this case Schering (above) and Ayerst (right). The emphasis is now on hip fracture, allowing the prospect of preventing deaths to be called up on behalf of estrogen. These advertisements encourage long-term use—but ironically, studies indicate that length of use may increase breast cancer risk.

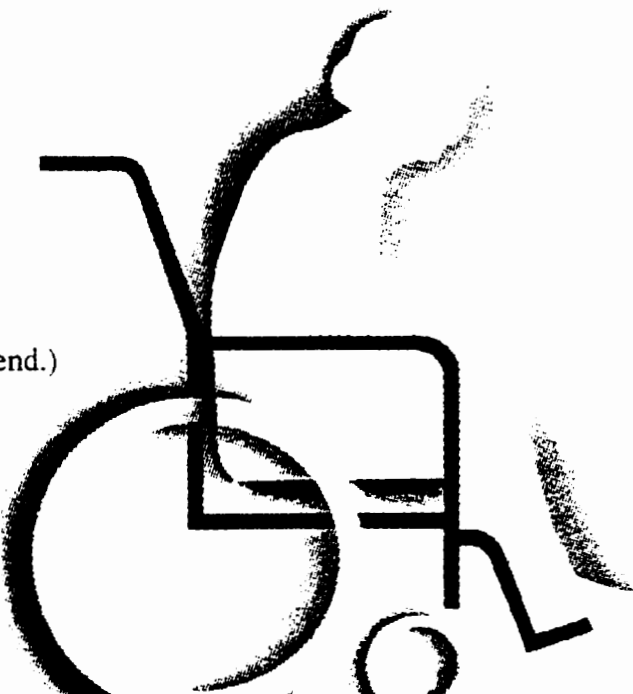
(The text is Coney's comments on this 1990's advertising trend.)

This year almost 200,000 women will break a hip because of it<sup>1</sup>

Up to 20% of hip fracture patients die within one year<sup>2</sup>

Many hip fracture survivors lose their independence<sup>3</sup>

**OSTEOPOROSIS PREVENTION**  
**Without estrogen, it's a losing battle**



Source: Sandra Coney, *The Menopause Industry: How the Medical Establishment Exploits Women* (Alameda, Ca.: Hunter House, 1994), between pp. 246-247.

Lilly Company and the Society of Obstetricians and Gynaecologists of Canada. recently produced an advertisement packaged as an educational booklet and inserted in mainstream Canadian magazines. It used perplexing and inconsistent images of women in the attempt to soften the traditional stereotypes of their target group, perimenopausal women, who might become future osteoporotic sufferers (Figure 6.4).<sup>18</sup>

Osteoporosis was increasingly portrayed as an estrogen and calcium deficiency disease requiring treatment, preferably with both agents, despite the number and complex interaction of possible causative factors which were being reported simultaneously in the lay literature of the early 1980's. Injunctions to eat a balanced diet and participate in weight-bearing exercise, both beneficial habits for prevention of bone loss and maintenance of healthy bone, were advised for women throughout their life span. Women younger than 35 were enjoined to "bone up" in many articles after 1984.<sup>19</sup>

### **Osteoporosis in Periodical Literature: Methodology**

As we have seen, the term osteoporosis and concerns about it were relatively obscure until the last 20 years, except in the esoteric world of certain medical specialists. Using the Reader's Guide to Periodical Literature, the New York Times Index, and the Canadian Periodical Index, I searched the lay media from 1940 to the present to track awareness of the

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<sup>18</sup>Figure 6.4 was in Canadian Living (October 1997) and in Maclean's (January 12, 1998). Its language contradicted the images: "This woman is smart. And Full of Life. She also has the power to Change Your Mind," but the superimposed photo was of an attractive, youngish (mid- 30's-40's years of age), scantily clad woman. The message focussed on healthy behaviours, and the need for calcium and possibly estrogen, to ensure well being at the change of life. It concluded with a warning about the "greatest risks of estrogen loss:" osteoporosis and heart disease.

<sup>19</sup>See for example, "Boning Up on Osteoporosis," Science News Vol. 124 (August 27, 1983), pp. 140-41.; "Boning Up on Osteoporosis," Ladies Home Journal Vol. 101 (September 1984), p.121; S. C. Finn, "Bone Up on this Article [Older Women]," 50 Plus Vol. 25 (February 1985), pp. 53-57; and C. Hacinli, "Boning Up on the Calcium Crises," Mlle Vol. 94 (October 1988), p. 136. (I did not locate copies of the latter two articles.)

She's 51 and she's going through menopause. And somewhere  
doing the same. It's the ideal time to remind yourself you still

## IT'S THE CHANGE OF LIFE. NOT THE END OF LIFE.

always had. The only thing y  
is simply a biological turni  
themselves experiencing sy

sweats, it's actually the silent symptoms of estrogen depleti  
long-term health. As your estrogen exits stage left, your risk  
But you can do something about it.

## KEEP YOUR TICKER TICKING.

Most people don't rea  
is by far the  
What

out if there's a fa  
your phys:

Source:

Estrogen has always protected your heart. As it depletes,  
your vulnerability to heart disease and stroke ris  
Jointly Sponsored by the Osteoporosis Society of Canada,  
The Society of Obstetricians and Gynaecologists of Canada,  
and Eli Lilly. Canadian Living (October 1997) and  
Maclean's (January 12, 1998).

## 6 REASONS TO EAT A HIGH-CALCIUM DIET.

206 bones in your body will thank you. Estrog  
demic known as osteoporosis. Many women don't re

Your bones can become so fragile  
a hug, may become impossible w  
questions to assess your risk in

osteoporosis? Do you eat a calcium-rich diet? Are you physically  
active? Do you smoke? Once you've assessed your risk there  
are changes you can make to ensure healthier bones: Exercise  
regularly. Eat right ("right" means 1000 to 1500 mgs. of calcium  
daily if you're over 50). And consider calcium supplements  
if you're getting insufficient calcium in your diet at any age.  
If you're at increased risk your doctor may suggest a test to  
measure your bone density and recommend hormone therapy  
or other preventative measures.

Many women benefit greatly from hormone replacement ther  
hot flashes, and helps to prevent osteoporosis and heart d

## THE HRT DEBATE.

breast cancer. While the jury's still out, the  
about breast cancer - risk increases with  
to protect yourself is to do monthly breast self-examinatio

And if you're 50 years of age or older, or have a family history of breast cancer, talk to your physician about a mammogram.

Figure 6.4 Osteoporosis and Menopause Booklet (4 pages).

Some women find menopause gives them an enormous sense of freedom because they no longer have to worry

**THE STORK  
TAKES A BREAK.**

about getting pregnant. However, to prevent an unexpected arrival of the stork you should continue to use birth

control for 1 year after your last period if you're older than 50. If you're younger than 50, use it for 2 years after your last period.

Feel like menopause is some weird joke Mother Nature is playing on you? Your body's thermostat is going

**A MENOPAUSAL FLASH:  
YOU CAN DO  
SOMETHING ABOUT  
YOUR "PERSONAL  
SUMMER."**

crazy, and so are your moods. Fortunately the symptoms aren't experienced by all women. And while they are life-threatening or perma-

nent, these symptoms can be quite disruptive. Although not scientifically proven, some women find relief with alternative remedies like diets rich in soybeans and flax seeds. Others note an easing of symptoms with lifestyle changes such as increased exercise, relaxation and a reduced caffeine intake.

Not only will this change the way you think about menopause, it will likely change the way you live. Now

**THANK YOU  
FOR READING.**

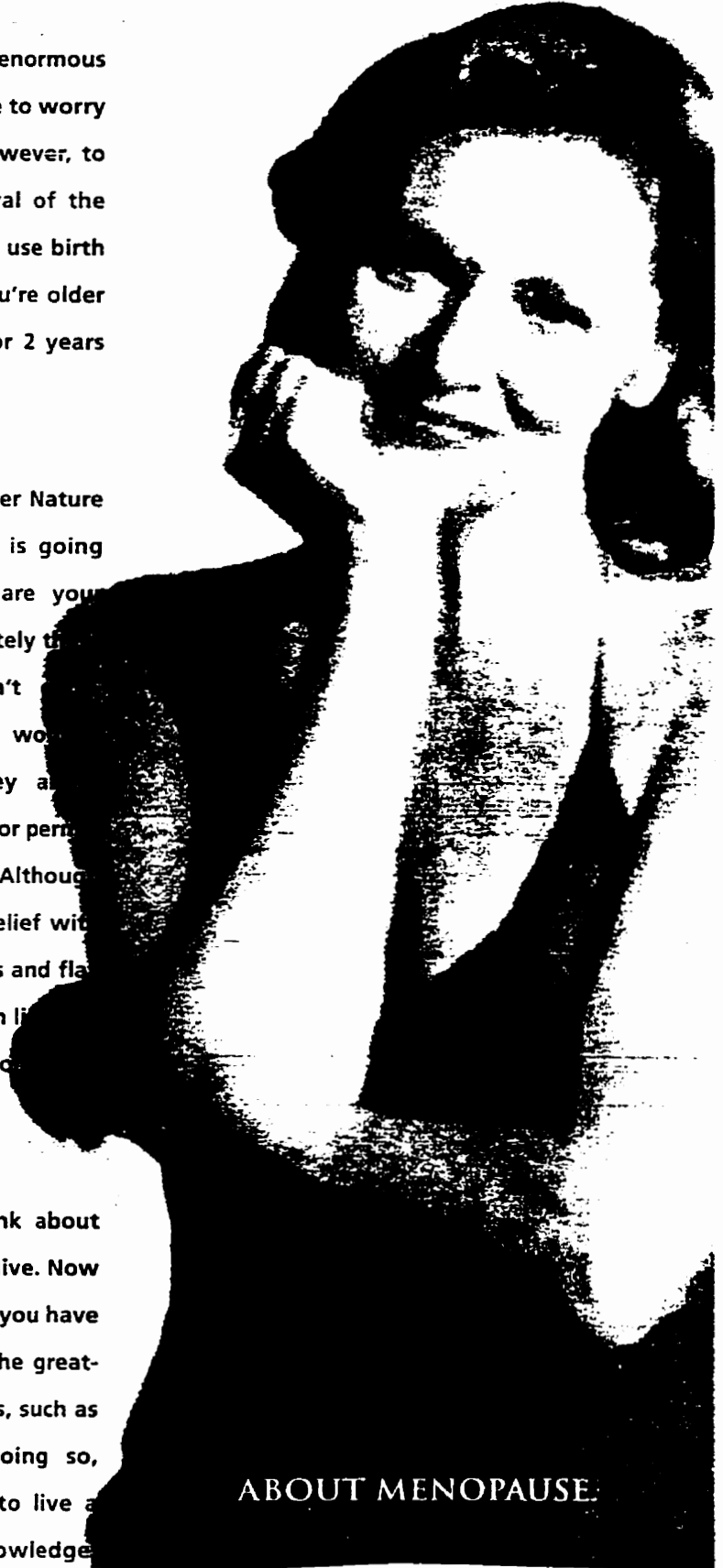
that you have the facts, you have the power to manage the greatest risks of estrogen loss, such as

heart disease and osteoporosis. And by doing so, chances are pretty good that you're going to live a long and healthy life after menopause. Knowledge

It's powerful medicine.

Source:

Jointly Sponsored by the Osteoporosis Society of Canada, The Society of Obstetricians and Gynaecologists of Canada, and Eli Lilly. Canadian Living(October 1997) and Maclean's (January 12, 1998).



**ABOUT MENOPAUSE.**



If you found this booklet helpful,  
please pass it along to a friend or family member  
who could also benefit from it.

Other helpful resources:

THE SOCIETY OF  
OBSTETRICIANS AND  
GYNAECOLOGISTS OF  
CANADA



LA SOCIÉTÉ  
DES OBSTÉTRICIENS  
ET GYNÉCOLOGUES  
DU CANADA

*Committed to informed reproductive health care for Canadians.  
Pour des choix éclairés en matière de reproduction au Canada.*



Osteoporosis  
Society  
of Canada

La Société  
de l'Osteoporse  
du Canada

*The Osteoporosis Society of Canada is committed to improving the  
bone health of women in midlife and preventing post-menopausal osteoporosis.*

The Osteoporosis Society of Canada and the Society of Obstetricians  
and Gynaecologists of Canada are working together to promote awareness  
and understanding of menopause and osteoporosis.  
For more information please call 1-800-463-6842, a toll-free women's health  
information line provided for you as a free public service.



*Dedicated to advancements in postmenopausal health.*

Jointly Sponsored by the Osteoporosis Society of Canada,  
The Society of Obstetricians and Gynaecologists of Canada,  
and Eli Lilly. Canadian Living (October 1997) and  
Maclean's (January 12, 1998).

**Source:**

disease osteoporosis and trends in issues. I looked at examples in a variety of print media: newspapers, weekly magazines, women's and seniors' magazines, and some health- and science-oriented journals aimed at general audiences. Unfortunately, copies of back issues of many popular publications are difficult to obtain.<sup>20</sup> While the majority of my sources were deliberately chosen from big circulation periodicals to explore how osteoporosis was depicted in the most influential and accessible publications, a few more specialized health or science magazines were also examined.

Another methodological problem arose from the paucity of references to the key term "osteoporosis" using titles of articles in popular literature from 1940 to 1970. I broadened the search with key words such as bone, bone disease, menopause, broken hips, calcium and estrogen. I was most interested in documenting the shift in perceptions about osteoporosis from a rare condition to a "media disease" during the 1980's.

### **Osteoporosis in Popular Media, 1940-1969<sup>21</sup>**

During the first three decades after Fuller Albright's discovery, allusions to osteoporotic characteristics or associations were found in a few articles, even if the word "osteoporosis" was not used. For example, in an article on broken hips written in a 1946

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<sup>20</sup>Metro Toronto Reference Library has been a treasure trove of sources unavailable at Queen's University. Nevertheless, many runs of popular magazines are broken or have not been preserved. I attempted to find more examples from the 1930's, but the issues containing articles with intriguing titles were not available.

<sup>21</sup>Bunton, p. 239. Bunton's study of health messages in Good Housekeeping magazine between 1959-1980, showed the typical format of articles about health in popular periodicals during the early part of the post-war era as advice columns or features in which "The subject of 1959 discourse was very much the docile body of the 'sick man/woman' (Jewson, 1976) of the medical gaze. The subject is the passive receiver of medical advice from doctors or the purchaser of a limited set of goods that are designed to care for individual and family health and cleanliness." This held true for the articles I found on osteoporosis or related subjects of this era.

Hygeia, the AMA's popular magazine, a cause of fracture in the elderly was "brittle bones."<sup>22</sup>

The paternalistic tone of the article reassured about the benefits of modern medicine: "Should a fractured hip occur in your family, remember that if the attending surgeon suggests operating, he is doing it in the best interests of the patient."<sup>23</sup>

Among the articles on menopause, fractures, or estrogen, I found only one which directly named the disease "osteoporosis." In a feature article touting estrogen therapy for menopause in a 1965 issue of Maclean's, Jeannine Locke called osteoporosis the "loss of protein and calcium from the bones causing a thinning and weakening of the bone structure;...the condition...is at the root of the acute back pains suffered by many women past middle age." The news in the article was the transformation in medical beliefs about menopause: it was no longer a "temporary upset," when menopausal woman became:

essentially sexless, deprived of the hormones that sharply distinguish her from the male. This deprivation can age her abruptly, affect her physical health and drain the color from her personality. It can turn a joyous woman into a poor thing, ailing and apprehensive, a nuisance to her doctor, her family and herself.<sup>24</sup>

In the popular media, just as in the medical literature, menopause became a deficiency disease, not a normal physiological process: "it is the beginning of deep and damaging metabolic changes due to her deprivation of sex hormones."<sup>25</sup> Locke cited Robert

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<sup>22</sup>Louis Carp, "Broken Hips," Hygeia Vol. 24 (5) (May 1946), pp. 350-51.

<sup>23</sup>No bona fides were attached to the articles in Hygeia, but since the journal was produced by the AMA, I assumed its authors were mostly physicians.

<sup>24</sup>Jeannine Locke, "Medicine's New Boon to Women: A Pill that Prolongs the Prime of Life," Maclean's (August 7, 1965), especially pp. 30-31. She used a 1951 quote from Dr. C. Lee Buxton, Chair of Obstetrics and Gynaecology at Yale University and a 1955 quote from Dr. Marion Hilliard of Toronto, both of whom regarded menopause as a transitional state, in contrast with the new 1960's experts' belief in menopause as the cusp of serious physiological degeneration.

<sup>25</sup>Ibid., p. 7.



A. Wilson as the major contemporary expert and echoed Wilson's depiction of the majority of physicians as a conservative group, unwilling either to change their views on menopause or to adopt the widespread use of estrogen. Osteoporosis appeared here in its debut in the lay literature as medical justification for the widespread use of estrogen: it was one of four potentially long-term health problems associated with aging, along with heart disease, premature senility, and degenerative alterations to skin and mucus membranes (especially vaginal changes).

### **Osteoporosis in Popular Media, 1970- Early 1980's**

A paucity of articles identified by the key word "osteoporosis" continued into the decade of 1970 to the early 1980's; however, among articles on estrogen or menopause of this period all except one directly mentioned osteoporosis.<sup>26</sup> (See Bibliography Part II). In contrast to the earlier post-war period, most of these articles were either unsigned or did not list the author's credentials. Nevertheless, biomedical expertise was invariably invoked, sometimes appearing in an interactive question-and-answer format between reporter and medical authority.

Many articles presented medical breakthroughs for sufferers of osteoporosis, with emphasis on recently released studies on therapies, such as calcium, calcitonin, and the newly synthesized parathyroid hormones (1970) and vitamin D (ca.1971).<sup>27</sup> Accounts of alternatives

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<sup>26</sup>Robert Reinhold, "Scientists Create Hormone That Aids in Bone Formation," New York Times (November 20, 1970), p. 1+.

<sup>27</sup>"Strengthening Brittle Bones," Time Vol. 196 (August 17, 1970), pp. 43-44; Enid Nemy, "Nutritional Problems of Women Discussed by Medical Experts," New York Times (November 22, 1975), p. 34. Nemy interviews Dr. L. Avioli and mentions osteoporosis.; "Make Your Bones Last a Lifetime," Vogue Vol. 172 (July 1982), p. 244; "Promising Rx for Brittle Bones," Newsweek Vol. 94 (December 10, 1979), p. 124; Jane E. Brody, "Vitamin D Used to Treat Bone Disease," New York Times (February 26, 1980), Section III, pp. C1-C2; Diana Benzaia, "The Calcium Connection," Health Vol. 14 (February 1982), pp. 20-21.

to estrogen therapy were welcomed both by prescribers and patients, especially in the last half of the 1970's when controversy about estrogen peaked, and its usage fell. In 1979, a Consensus Development conference sponsored by the National Institutes of Health in Bethesda, Md. determined that estrogen was effective only for two conditions associated with menopause--hot flushes and genital "atrophy."<sup>28</sup>

In the 1970's and early 1980's, genetic factors of the disease such as race, family history, and bone structure began to be mentioned frequently; these were not amenable to human intervention. But a new emphasis on preventative intervention strategies beyond the realm of drugs and vitamins had begun to appear. Inspired by the work of the WHO and the 1974 landmark Canadian government report by Federal Health Minister Marc Lalonde, this new paradigm stressed the importance of lifestyle behaviours, environment, and public policy to the biological origins of disease.<sup>29</sup> Health promotion ideology created a tension that persists to the present: between praise for the empowerment of individuals and communities who choose to take responsibility for their health status and the censure that falls on those who do not. A critique of the Lalonde report and subsequent early health promotion messages was its tendency to "blame the victim" when an individual's choices were perceived to have contributed to the onset of disease.<sup>30</sup>

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<sup>28</sup>Nancy Worcester and Mariamne H. Whatley, "The Selling of HRT: Playing on the Fear Factor," Feminist Review No. 41 (Summer 1992), pp. 3-4.

<sup>29</sup>Bunton, p. 227. Marc Lalonde, A New Perspective on the Health of Canadians (Ottawa: Information Canada, 1974).

<sup>30</sup>For a discussion of the origin of victim-blaming in modern medical discourse, see Robert Crawford, "You Are Dangerous to Your Health: The Ideology and Politics of Victim Blaming," International Journal of Health Services, Vol. 7 (4) (1977), pp. 663-680.

The first article I found relating osteoporosis to the importance of public policy for health promotion and disease prevention was published in 1977. It reported that once Ohio state bureaucrats had recognized osteoporosis as a major concern for the elderly, they had implemented state-funded programs in nutrition and exercise, and encouraged biological research in medical schools and universities.<sup>31</sup> Interestingly, this same article contained the following contradictory statement regarding the definition of osteoporosis:

Osteoporosis is one of the most severe, crippling diseases affecting the elderly, yet few laymen are even familiar with the term. Technically defined, it is a "bone disease characterized by a reduction in bone density accompanied by increasing brittleness, associated with loss of calcium from the bones....*Scientists have not yet resolved whether osteoporosis is a disease or a result of the aging process.*"<sup>32</sup> [my italics]

The latter article also emphasized the importance of healthy behaviours: determinants of disease were within the control of the individual. In the mid-to-late-1970's, when osteoporosis was emerging as an issue in the popular press, discussions of lifestyle appeared more frequently<sup>33</sup> and promoted habits believed to positively affect bone formation, such as a higher daily intake of calcium and physical exercise.<sup>34</sup> Changes in patterns of employment, availability of modern conveniences, and diets in industrial societies were infrequently

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<sup>31</sup>"Ohio Commission on Aging Works to Combat Effects of Bone-Crippling Disease," Aging Vol. 277 (November/December 1977), p. 22.

<sup>32</sup>ibid., p. 22.

<sup>33</sup>Louise C. Weston and Josephine A. Ruggiero, "The Popular Approach to Women's Health Issues: A Content Analysis of Women's Magazines in the 1970's," Women & Health Vol. 10(4) (Winter 1985/86), p. 55. This trend in articles about osteoporosis was consistent with the patterns for health-related themes in the women's magazines surveyed by these authors. They found dieting/exercise/nutrition articles comprised 31% of the total number of articles and features, a rate double that of each of the other two high coverage themes: mental health (16%) and reproductive health (also 16%). In the established women's magazines (Ladies' Home Journal, Women's Day, Cosmopolitan) 34% of the health articles were about dieting/exercise/nutrition, while in the newer women's magazines established after 1970 (Working Woman, Ms. and Essence) mental and reproductive health comprised 30% of all health-related articles.

<sup>34</sup>Nemy, p. 34; Aging (1977), p. 22; "Your Body," Vogue Vol. 168 (October 1978), p. 384.

implicated:

The human body is built for hard work. To keep rebuilding and maintaining strength, bones must have stress....we tend to avoid stress as much as we possibly can. Instead of walking, we ride around in cars, which even have power steering to save effort. We don't push up our garage doors; we push a button instead. This mechanized way of living has contributed to bad bone conditions. America has an alarming rate of bone-wasting disease: the combined result, I believe, of inactivity and excessive use of high-protein foods such as meat, which for some reason, we think of as 'strengthening.' Protein produces acid that tends to leach some calcium out of the bones.<sup>35</sup>

During this period, more emphasis was given to dieting/nutrition and exercise, i.e., those habits related to appearance, than to heavy smoking and/or excess drinking, which were also reported to be linked to osteoporosis.<sup>36</sup>

By the late 1970's to early 1980's, the suffering and cost burden associated with osteoporotic hip fractures and spinal crush fractures were introduced as issues in the press.<sup>37</sup> Preventative measures to reduce the incidence of falls among seniors were proposed, such as reduction in clutter, putting in safety rails, exposure to sunlight especially in winter, and proper nutrition. But because "no real cure for osteoporosis" existed, prevention was deemed essential.<sup>38</sup> A number of articles delivered the optimistic message that the inevitability of developing osteoporosis was reduced for older males and females, because therapeutic and preventative lifestyle strategies now existed. During the 1970's, articles about osteoporosis were introduced in women's fashion and lifestyle magazines such as Vogue and House and

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<sup>35</sup>Vogue (October 1978), p. 384. The quote was from Grant Gwinup, Professor of Medicine, Division of Endocrinology and Metabolism, University of California, Irvine.

<sup>36</sup>See for example, Gael MacDonald Wood, "Osteoporosis--Bone Degeneration--is Preventable, if We Get Enough Calcium and Exercise," House and Garden Vol. 154 (November 1982), p. 60.

<sup>37</sup>Vogue (1978), p. 384+; and Wood, p. 60+.

<sup>38</sup>Wood, p. 64.

Garden. Younger women were targeted with contradictory messages about the implications of developing osteoporosis: on the one hand, they were warned of poor health, loss of attractiveness, and potential loss of independence; but on the other, they were given hope that suffering was not inevitable if "healthy" habits were followed.<sup>39</sup>

In the early 1980's, new methods of measuring bone density became significant to the depiction of osteoporosis; and an ability to detect its presence in high-risk but otherwise asymptomatic individuals increased the number of victims. Frighteningly vivid language was used to describe the hidden dangers: "Unfortunately, most people didn't know they have a problem until they're crippled by broken hips or left shrunk or hunchbacked when fragile vertebrae crumble. About 55,000 people die each year from the complications of osteoporosis injuries."<sup>40</sup> The reporting of serious and debilitating disease symbolized a major shift for women's magazines, which in the 1970's had avoided such topics "in keeping with their 'entertainment' function and in order to maintain or increase readership."<sup>41</sup> Yet alarms about the dangers of alcohol and tobacco remained scarce, given the dominance of these interests in advertising copy in popular women's magazines.<sup>42</sup>

In 1982, reports surfaced about Dr. Morris Notelovitz's introduction of a new bone densitometry technology (SPA) which detected osteoporosis in early stages among high-risk

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<sup>39</sup>Vogue, 1978, p. 38 and Wood, p. 64.

<sup>40</sup>D. R., "The Thin-Bone Detector," Health Vol. 14 (August 1982), p. 15.

<sup>41</sup>Weston and Ruggiero, p. 61.

<sup>42</sup>Ibid., p. 61, who cited the following article: J. Guyon, "Do publications avoid anti-cigarette stories to protect ad dollars?" Wall Street Journal (November 1982), pp. 1 and 22.

post-menopausal women.<sup>43</sup> Early detection was said to enable "successful treatment." and the test was reported to be quick, simple, and painless. The "brand-new" machine costing \$20,000 was available only at a few medical centers in the U.S.; it was also used to distinguish effectiveness between several drugs which slowed bone loss.<sup>44</sup>

In 1983, Science News predicted that other bone measurement technologies were "likely to revolutionize the management of osteoporosis." CT scanning, a new technology for measuring mineral content of trabecular bone in the vertebrae, was announced at an international symposium on disorders of bone and mineral metabolism in Dearborn, Michigan by Harry K. Genant.<sup>45</sup> Fifty centres in the United States and Europe were already using this technique, but more than 2,000 hospitals world-wide would be able to adapt their existing CT equipment "relatively inexpensively." Given the acknowledged cancer risk associated with estrogen treatment, physicians would be able to "routinely" select only those "postmenopausal women [who] are losing dangerous amounts of spinal trabecular bone" to determine who should receive estrogen replacement therapy for bone loss.<sup>46</sup> Scientists using CT scanning of spinal bone were reported to be establishing benchmarks for "normal and abnormal" postmenopausal bone loss and predictions of the quantity of loss necessary for

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<sup>43</sup>D. R., "The Thin-Bone Detector", p. 15. Notelovitz, a gynecologist at the University of Florida was also director of its Center for Climacteric Studies established in 1980.

<sup>44</sup>Ibid., p. 16.

<sup>45</sup>Dr. Genant was a radiologist at the University of California Medical School in San Francisco. He used the technology to study women who had had artificial menopause from the removal of both ovaries. Maximilian A. Dambacher was reported in the same article to be comparing levels of bone mineral in premenopausal, healthy postmenopausal and osteoporotic postmenopausal women.

<sup>46</sup>J.A. Treichel, "CT Scanning and Osteoporosis Prevention," Science News Vol. 123 (May 21, 1983), p. 325.

fractures to occur.<sup>47</sup>

### **Osteoporosis: A Gendered Media Disease, 1984 and After**

A champion of the consumer perspective, Maryann Napoli, identified criteria for spotting a new "media disease."<sup>48</sup> She described osteoporosis as the most recently discovered disease among other examples from the 1970's and 1980's, including hypoglycemia, anorexia nervosa, chlamydia, toxic shock syndrome, herpes, and PMS. In alternatively serious and muckraking tones, she noted "diseases which predominantly, but not necessarily exclusively" affected women were likely candidates for media focus; "an element of mystery" helped pique public interest; and "clinic potential" (i.e. economic impact) also spurred media fascination.<sup>49</sup>

Portrayals of osteoporosis as a major public health problem become more frequent in mid- 1980's popular literature, despite uncertainties about bone metabolism and contradictions in medical advice about prevention and treatment. Osteoporosis became "an overnight sensation" after Dr. Robert Heaney published his 15 year- long study of 200 middled-aged nuns, according to one writer. At a 1982 American Society for Bone and Mineral Research press conference, Heaney reported findings on calcium and "explain [ed] that osteoporosis was an incurable--but treatable--fragile bone disease affecting half of American women over age 45. Virtually overnight, osteoporosis became a household

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<sup>47</sup> *Ibid.*, p. 325. Dambocher was located at the University Clinic of Zurich. B. E.C. Nordin had been the first to determine the levels of bone mineral content below which hip fractures occurred. Nordin, the British scientist mentioned in earlier chapters, was by 1983 working in Adelaide, Australia.

<sup>48</sup> Napoli, "The Latest in Getting Sick: Disease of the Week," *New Republic* Vol. 195 (December 1, 1986), pp. 17-18. *Health Facts* [sic], edited by Napoli, was the monthly newsletter published by the Center for Medical Consumers in New York City.

<sup>49</sup> *Ibid.*, p. 17.

word."<sup>50</sup> Most academic and popular writers, however, situate the transformation in public attention about osteoporosis in the aftermath of the 1984 National Institutes of Health conference in Bethesda, Maryland.<sup>51</sup>

The U.S. NIH convened a 14 member panel of experts on osteoporosis in April 1984, headed by Dr. William A. Peck.<sup>52</sup> Through its Consensus Development Program, the NIH gathered experts "to synthesize and report the best current evidence on a particular topic to assist the medical profession in clinical decision making" and "to improve the assessment and dissemination of information about medical technologies" to lay and medical communities.<sup>53</sup> Later in 1984, the U.S. Surgeon-General cited conference panelists in a news release on the prevention and treatment of osteoporosis.<sup>54</sup>

Of 24 popular articles I reviewed published between August 1984 and 1989, only five failed to mention the NIH conference. At a 1985 Congressional Hearing on Osteoporosis

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<sup>50</sup> Peggy Mann, "The Truth About Calcium," Readers Digest Vol. 134 (March 1989), p. 71. Heaney was a professor at Creighton University in Omaha, Nebraska.

<sup>51</sup>See Chapter 5, for relevant quotes by Drs. Riggs and Melton and Ms. Napoli.

<sup>52</sup>On the origins of the NIH see Victoria A. Harden, Inventing the NIH: Federal Biomedical Research Policy, 1887-1937 (Baltimore: The Johns Hopkins Press, 1986). For specifics on the media and the NIH 1984 Osteoporosis Conference, see Itzhak Jacoby and Susan M. Clark, "Direct Mailing as a Means of Disseminating NIH Consensus Statements: A Comparison with Current Techniques," Journal of the American Medical Association Vol. 255(10) (1986), p. 1328. The NIH is the leading sponsor of biomedical research and provider of a third of the total funding for all health research and development in the U. S. Dr. William Peck was Physician-in-Chief at the Jewish Hospital in St. Louis in 1984.

<sup>53</sup>Jacoby and Clark, pp. 1328-1329. The protocols developed for disseminating consensus statements by the time of the 1984 NIH osteoporosis panel included electronic media releases at the conference and publication of the consensus statement in full in Journal of the American Medical Association. Other general and "controlled-circulation journals" printed the statement in whole or in part. The NIH distributed the 1984 osteoporosis consensus statement to a mailing list of 21,000 physicians including those in family practice, general internal medicine, obstetrics/gynaecology, orthopedic surgery, and geriatrics. Winkler, Kanouse, Brodsky, Brook, p. 1323.

<sup>54</sup>C. Everett Koop, "Surgeon General Talks About Osteoporosis, the Bone-Thinning Disease," Aging No. 347 (1984), pp. 30-32.



before the Sub-committee on Aging. House Representative Olympia Snowe of Maine acknowledged the conference's success in drawing media and public attention to the disease.<sup>55</sup> By the mid-to-late 1980's, critics of medical and commercial interests from consumer and feminist perspectives began to denounce fear-mongering about the disease, a method used to urge women to buy products and be tested.<sup>56</sup> According to Dr. Riggs in 1987, "Five years ago only 15% of Americans knew of the existence of osteoporosis, and now about 85% do. Although people are better informed, some have become needlessly frightened."<sup>57</sup> (See Chapter 7).

A few key messages from the 1984 NIH Panel dominated the reportage in the popular media. Osteoporosis' serious impact on individuals and society was generally the starting point. For example, a 1985 Reader's Digest article stated osteoporotic fractures were the 12th leading cause of death in the U.S. of people 45 and older; and that American society faced a \$3.8 billion estimated cost in lost productivity and medical bills. The title of the article, "The Hidden Health Risk Most Women Face"[underlining added] was clearly an attention-getting exaggeration.<sup>58</sup>

Increasingly detailed lists of at risk groups of women accompanied reports from the NIH conference. In addition to those believed at highest risk, women with artificial

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<sup>55</sup>Hearing on Osteoporosis before the 99th Congress, 1st Session Reviewing the Diagnosis and Treatment of Osteoporosis before the U. S. Senate Sub-Committee on Aging's Committee on Labor and Human Resources, June 20, 1985, Washington: U. S. Government Printing Office, pp. 12-13. Snowe's remarks included a tally of the change in numbers of articles in popular magazines.

<sup>56</sup>Napoli (1986), p. 17; Worcester and Whatley (1992), pp. 9-10.

<sup>57</sup>Giovanna Breu, "The Calcium Controversy: An Expert Warns that Supplements are Not the Cure-All for Dowager's Hump," People Vol. 27 (April 13, 1987), p. 70.

<sup>58</sup>John Pekkanen, "The Hidden Health Risk Most Women Face," Reader's Digest Vol. 127 (November 1985), p. 72.

menopause or postmenopausal women with other genetic or lifestyle factors. a growing emphasis on younger women became evident in the popular press. In part, more sensitive technologies for defining bone loss could explain a new focus on younger women. Another reason may have been the heightened interest in prevention. Also likely, was the potential new market provided by a huge cohort of financially well-off baby boomers advancing towards menopause. "Women always seem to be faced with health worries, from toxic shock syndrome to breast cancer. Now, attention is being focused on osteoporosis, a concern even for yuppies who couldn't suffer from the disease for another 30 to 40 years."<sup>59</sup>

Dr. Joan Harrison, a distinguished Canadian research scientist and physician, provided a personal perspective on the Consensus panel's advice, a view which differed from reports in the popular press and scientific proceedings. Harrison claimed that divergent views expressed publically at the NIH conference by some researchers who were not part of "the panel of 14" were not reflected in the proceedings. She also noted that lifestyle determinants responsible for osteoporosis were deliberately downplayed both at the conference and in the written record.<sup>60</sup> Increased attention paid to exercise and diet in the popular press might have had more to do with the media's own agenda and interests, especially its relationship with advertisers of food, cosmetics and clothing, than with NIH's scientific recommendations.

Magazines reported still other women at risk. In 1985, Vogue reported that researchers had identified osteoporotic bone loss in young women, such as professional

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<sup>59</sup>"Osteoporosis, The 'Silent' Disease, Strikes One in Four Women Over 65, An Expert Warns," People Vol. 23 (April 1, 1985), p. 129.

<sup>60</sup>Interview with Dr. Joan Harrison, January 8, 1998. Dr. Harrison is retired from the University of Toronto's Bone and Mineral Research Unit. In addition to her academic and other professional honours, Dr. Harrison recently received the Order of Canada for her work on nuclear medicine technology to diagnose osteoporosis. (See Chapter 7).

female athletes, dancers with suppressed menstrual cycles, and anorexics.<sup>61</sup> This data might appear confusing, given enjoinders to "exercise" for purposes of osteoporosis prevention. A 1987 article set off alarms for women with long, irregular menstrual cycles and those in their thirties with endometriosis.<sup>62</sup> Another article cited "emotional stress" as a "bone robber," with evidence from research showing increased amounts of calcium in the urine of those who were stressed.<sup>63</sup> Such opinions invoked 1950's medical attitudes toward menopause as a psychological disease, with implied or explicit blaming of women for their own misfortunes.

### **Impacts of the NIH Conference**

The result was an economic bonanza for physicians, pharmaceutical companies, the food and dairy industries, and makers of bone scanning technologies (See Chapter 8). Early detection, calcium, and estrogen were watchwords promulgated by the NIH experts for diagnosis and management of osteoporosis. According to Consumer Reports, NIH statements reignited the estrogen controversy,<sup>64</sup> by recommending estrogen for postmenopausal white women, advising its use with progestrin for those with hysterectomies.<sup>65</sup> Consumer Union's medical consultants deemed estrogen a "highly effective" means of preventing osteoporosis, but concluded that only those at high risk of osteoporosis should be given the drug. Other

<sup>61</sup>Melva Weber, "Osteoporosis: Cancelled," Vogue Vol. 175 (October 1985), pp. 558-59.

<sup>62</sup>S. Weisburd, "New Bone-Loss Risk Factors in Young Women," Science News Vol. 132 (November 28, 1987), p. 347.

<sup>63</sup>People (1985), p. 132.

<sup>64</sup>"Osteoporosis," Consumer Reports Vol. 49 (October 1984), p. 580. Consumer Reports is the independent, non-profit publication of the Consumers Union. (See Chapter 7).

<sup>65</sup>"Consensus Conference: 'Osteoporosis,'" Journal of the American Medical Association Vol. 252 (6) (1984), p. 799. The statement noted that the studies used to recommend estrogen's efficacy were "based almost exclusively on studies in white women. Therefore, the following recommendations on therapy for osteoporosis pertain to that group." p. 801.

media sources reported the qualifiers for taking estrogen therapy, citing panel statistics, which contrasted the risk of endometrial cancer with hormone replacement therapy (1%), with the greater risk of hip fractures (9%).<sup>66</sup> Most feature articles usually stated that the decision to take estrogen was “best decided between patient and doctor.”

For “likely” prevention of osteoporosis in both sexes, the NIH panel recommended higher daily levels of calcium intake than previously had been accepted.<sup>67</sup> U.S. Public Health Department studies in the mid-1970's discovered that the newly recommended level was twice the amount that most American adults actually consumed; moreover, adolescent women's calcium intake had actually dropped by 10%.<sup>68</sup> Many articles from 1984 onwards reproduced charts of leading food sources of calcium, as well as information on supplements, along with warnings to “consult your doctor” regarding individual doses of calcium.

As a direct result of the influence of the NIH conference and subsequent media interest “Calcium fever soon swept the country.”<sup>69</sup> The dairy, food and drug industries rode the wave of media popularity for several years. Consumer Reports, in a 1984 feature article about osteoporosis, supported the suggestion that calcium could “retard or arrest it [bone loss], but not reverse it.”<sup>70</sup> Its consultants, however, were “not enthusiastic about calcium

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<sup>66</sup>Pekkanen, p. 77.

<sup>67</sup>Consensus Conference, Journal of the American Medical Association, p. 801. The National Research Council's expert advisors' estimates for daily intake of calcium had been used as the U.S. national standard.

<sup>68</sup>Pekkanen, p. 75. Dr. Robert Heaney was reported as stating that during the 1970's two independent studies conducted by the U. S. Public Health Service at 6 year intervals, showed a drop in adolescent calcium intake, and evidence for continuing decrease in calcium consumption in this population. No explanation was proffered in the article for this trend. (See later references to milk consumption at the end of this chapter.)

<sup>69</sup>Anastasia Toufexis, “Going Crazy over Calcium,” Time Vol. 129 (February 23, 1987), pp. 88-89.

<sup>70</sup>Consumer Reports (1984), p. 576.

supplements. People should be getting their nutrients from the grocery store and not the drugstore."<sup>71</sup> Calcium ingredients were added to a huge range of processed foods, and touted in food industry advertisements. "Reporters eagerly disseminated the calcium message, knowing the public's receptiveness to the idea of a disease that can be prevented with dietary changes."<sup>72</sup>

A number of articles with more critical attitudes towards calcium appeared in the media from 1986 onward, contributing to yet another therapeutic controversy.<sup>73</sup> One article related that at the NIH meeting, eight calcium studies cited "found extra calcium had little or no effecting in slowing bone loss, even when the dosage was as high as 3,000 mg per day."<sup>74</sup> Some of the calcium issues aired included warnings about too much calcium causing kidney stones,<sup>75</sup> reliance on supplementation rather than dietary sources of the mineral,<sup>76</sup> concerns about incomplete or partial absorption of supplements,<sup>77</sup> and quality control.<sup>78</sup> Accusations were made that calcium therapy was a "hoax on the public" perpetrated by advertisers, doctors, and drug companies, spread by "unwitting" journalists.<sup>79</sup> Contradictory messages

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<sup>71</sup>Ibid., p. 578.

<sup>72</sup>Napoli (1986), p. 17.

<sup>73</sup>Sarah Boxer, ed., "New Bones to Pick About Osteoporosis and Calcium Supplements," Discover Vol. 7 (October 1986), pp. 8-9; Napoli (1986), pp. 17-18. Toufexis, pp. 88-89. Breu, pp. 69+; Mann, pp. 70-74.

<sup>74</sup>Toufexis, p. 89.

<sup>75</sup>Ann Finlayson, "New Aid for Bone Victims," Maclean's Vol. 99 (April 7, 1986), p. 43.

<sup>76</sup>Boxer, p. 8.; Toufexis, p. 89.

<sup>77</sup>Breu, p. 71; and Mann, p. 74. That is, the calcium is flushed down the toilet.

<sup>78</sup>Mann, p. 74.

<sup>79</sup>Boxer, p. 9.

pervaded lay articles: "overblown..benefits of calcium" and "may not do any good." but "it is inexpensive and safe, so why not take it anyway." Ultimately, a moderating message about calcium was issued by Panel Chairperson, Dr. William Peck. At a follow-up conference in 1987, he warned that researchers "concerned by the overselling of calcium" had asserted that "Calcium is not a panacea for osteoporosis....The ads promise more than calcium is going to deliver."<sup>30</sup> In light of the calcium controversy, the idea that prolonged estrogen therapy was the only effective treatment for osteoporosis was reinforced.<sup>31</sup>

A disease has much more appeal as scientific news if it is not easy to explain or cure quickly.<sup>32</sup> Furthermore, the media's "'gee whiz' attitude toward medical reporting and a fascination on the out of the ordinary," especially about technology, has also been documented.<sup>33</sup> Following the NIH conference, the importance of early detection was underlined in the media by expressions of the hidden or silent nature of osteoporosis; the complex and mysterious nature of disordered bone metabolism, which as yet is not totally understood by scientists, also added to its frightening image. A 1985 People article began: "this 'silent', debilitating bone disorder produces no symptoms until the victim is irrevocably afflicted."<sup>34</sup> Surgeon-General C. Koop's 1984 news release cited the NIH, declaring that "mild" osteoporosis could not yet be detected except by tests for bone density or bone mass done on patients with a "typical fracture syndrome." He said "women suffering from

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<sup>30</sup>Toufexis, p. 88.

<sup>31</sup>Breu, p. 71. She quoted Dr. Riggs as her authority.

<sup>32</sup>Napoli, p. 17.

<sup>33</sup>Winkler, Kanouse, et al., p. 1327.

<sup>34</sup>People (1985), p. 130.

osteoporosis could look perfectly healthy on the outside for years before a fracture might occur or a curvature of the back become obvious." Koop noted that newer techniques had been developed in the previous two years "but they are expensive and not yet widely available."<sup>85</sup>

Given the new possibilities of treatments with estrogen and calcium, and emerging diagnostic technologies, all pushed by the 1984 conference, "early detection became the rallying cry and screening centers began opening across the country." (Figure 6.5). By December 1986, 500 screening centers had been established, of which

one-fourth to one-third are owned by doctors and are not affiliated with hospitals. They offer the standard advice regarding calcium and exercise, but the moneymaker is testing. Normally people do not undergo testing without their physicians' advice. However, the media attention, not to mention the prospect of a dowager's hump, has motivated many women to bypass their doctors and seek the early detection possibilities offered by these clinics. Many advertise directly to women, suggesting that everyone between 45 and 70 be screened.<sup>86</sup>

Research published in June 1986 critiqued "indiscriminate screening" because "no test can accurately predict who will suffer a hip fracture in old age."<sup>87</sup> Napoli analysed journalists' interest in bone scanning technology as follows:

What began as a media effort to educate the public...has generated an enthusiasm for mass screening that is clearly premature. And it will be a long time before the public receives a more balanced view of whether the tests have any value. Health editors prefer positive reports on the virtues of calcium and eschew complex medical controversies, especially those concerning the inadequacies of a popular test....they want to recommend something that allows people to take control of the situation. Screening tests have traditionally served this purpose. Ideally, osteoporosis research physicians would have established guidelines for SPA

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<sup>85</sup>Koop, p. 31.

<sup>86</sup>Napoli, p. 17. These figures likely pertain to the United States.

<sup>87</sup> Ott, pp. 874-876.

**Figure 6.5**     Gettysburg, Pa. Osteoporosis Clinic Photograph

**Source:**        Photograph credit: Dr. Jacalyn Duffin. Gettysburg, Pa.. May 1997.



before the average gynecologist and radiologist began offering them.<sup>33</sup>

### **Mixed Messages about Osteoporosis**

The popular media disseminated a number of attitudes about osteoporosis which contributed to the construction of osteoporosis as a disease. Fear of a widespread new epidemic disease was combined with optimism about new diagnostic technologies and available treatment and prevention strategies. Therapeutic modalities remained controversial both in the medical and lay communities. Journalists tried to provide the public with balanced and accurate information, but both headlines and iconographic images may have sensationalized or subliminally fostered fears about this "sneaky" and "baffling," epidemic for those at low risk. The popular media helped educate the general public about medical issues, but their selection of hot topics differed from what was deemed "important and timely" by the medical community.<sup>39</sup>

In 1987, Dr. John H. Renner presented results of a survey of physicians, consumers and journalists, confirming the mixed messages in the medical and public domains: "Physicians and the public have been deluged in recent years with information about osteoporosis, but at times that information has been contradictory, confusing, or incomplete."<sup>40</sup> Respondents to Renner's survey included 761 primary care physicians, 733

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<sup>33</sup>Napoli., p. 18.

<sup>39</sup>Winkler, Kanouse, Brodsely, Brook, pp. 1324 and 1327. N.B. These Rand researchers conducted this study on behalf of the Office of Medical Applications of Research of the NIH. That department was established within the Office of the Director of the NIH in October 1978 "to foster and coordinate technology assessment activities," according to Jacoby and Clark, p. 1328.

<sup>40</sup>John H. Renner, "The Awareness of Osteoporosis Among Health Professionals, Consumers, and Journalists." Proceedings of the National Conference on Women's Health Series; Special Topic Conference On Osteoporosis, October 30, 1987, Bethesda, Maryland, Public Health Reports Vol. 104 (1989 and Supplement September-October ), pp. 87-90. This conference was co-sponsored by the F. D. A. and the Public Health

consumers, 15 journalists, and 7 experts on osteoporosis. Of those respondents, 87% of consumers, and 90% of percent of primary care physicians believed that osteoporosis was a "serious" disease. Two-thirds of the journalists who participated had written an article on osteoporosis: all of the journalists thought it was a serious condition. Calcium and exercise were believed to prevent osteoporosis by "nearly all" of the four categories of respondents. Most journalists believed that calcium was "effective in preventing osteoporosis," but that medical experts were not in agreement on the calcium prophylaxis. They also thought that most women do not get enough from their diets, and food, not supplements, were preferable sources because "calcium in tablet form may not be completely absorbed."<sup>91</sup>

Renner reported that "consumers...were slightly less informed about the risks and factors associated with osteoporosis than were the professionals," but their opinions about osteoporosis varied only slightly, with the exception of the estrogen replacement issue. Approximately 90 percent of the primary care doctors believed estrogen was important for the prevention of osteoporosis: they and all the experts believed it was a safe therapy. Consumers, however, differed substantially. Renner reported: "48 percent of postmenopausal women felt that estrogen helps prevent osteoporosis, but 41 percent expressed some doubt. 11 percent actually disagreed. Clearly, many consumers are not convinced that osteoporosis is not an inevitable part of aging."<sup>92</sup>

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Service Coordinating Committee on Women's Health Issues. Renner was the Director of Community Health at Trinity Lutheran Hospital in Kansas City, Missouri.

<sup>91</sup>Renner, p. 89.

<sup>92</sup>Ibid., p. 87.

## Summary

From 1940 to 1969, few direct references to a disease called osteoporosis existed in popular literature. During the 1950's and 1960's, a shift in popular imagery of menopause was recorded, from a transitory and psychologically difficult phase in women's lives to a deficiency disease. Stories on menopause from the mid-1960's began stressing estrogen loss, resulting in the onset of osteoporosis and other chronic diseases in aging females. Thus women began to be the major target audience for information about osteoporosis, for epidemiological and cultural reasons.

Such media trends accelerated during the 1970's and early 1980's, as new experimental therapies and diagnostic tools for osteoporosis were developed. In most articles from this period, the tone was low-key, because of uncertainty about the biological underpinnings of the disease, lack of early detection methods, and ongoing controversies about estrogen. Health promotion, a new paradigm emerging during the 1970's, urged proactive prevention strategies for healthy populations. Media and commercial interests in appearance and food, combined with the new health promotion approach: thus more frequent diet and exercise advice surfaced in the coverage of osteoporosis by the late 1970's to the early 1980's. After the 1984 NIH conference, osteoporosis became a household word, propelled by medical optimism that early detection and potentially effective treatment strategies were at hand. Menopause and female-gendered associations had become inextricably entwined with the discourse on osteoporosis, in large part because estrogen was the drug of first choice.

During the past decade, lifestyle determinants appeared regularly in the popular media but have been less emphasized than the medical management of osteoporosis. Controversies

about osteoporosis within medical circles and critiques from consumer/feminists have also persisted, contributing to the public's confusion and misinformation. (See Chapter 7).

### **Osteoporosis: A New Image at the End of the Twentieth Century?**

Men are a footnote in discourse about osteoporosis, when they are mentioned at all in either popular or medical literature. During the entire 1940 to 1997 period, I found no article that featured this disease in any lay publication which aimed at male audiences, such as Gentleman's Quarterly, Playboy, or Esquire. Napoli explained the preponderance of media diseases as affecting women because: "They live longer, oversee the health care of others, read women's magazines, and are generally more receptive to the idea of going to doctors."<sup>93</sup> Obviously, for both epidemiological and socio-cultural reasons, osteoporosis has remained associated with aging women.

Some media analyses have begun to reflect attitudes expanded beyond the victim-blaming of individuals, typical of the 1970's and early 1980's, to indictments of the affluent society. Creeping into the popular literature have been suggestions that osteoporosis may be caused more by a range of social factors rather than by hormonal deficiency. In the late 1980's, several articles asserted that technology, and socioeconomic attributes of Western industrial nations conditioned the so-called "unhealthy choices" of individuals. Dr. Pamela Jensen explained the "lower-than-normal" bone mass of younger women (in their 30's) due to factors such as smoking, dieting, and "strenuous exercise regimens that halt menstruation, among other things that may lead to bone loss."<sup>94</sup> Food fads and fat phobia, spurred on by various commercial interests have also been a factor. Gender differences have continued to be

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<sup>93</sup>Napoli (1986), p. 17.

<sup>94</sup>Weisburd, p. 347. Dr. Jensen was a radiologist at Yale University when the article was written.

significant contributors in this regard.

The problem is that milk and milk products have become unpopular among many of today's teenagers. Part of the reason is that large numbers of young girls are obsessed with watching their calories. Moreover, with the beverage industry pushing consumption of soft drinks, even at breakfast, the 'milk is babyish, soda is cool' credo is becoming more pronounced among adolescents.<sup>95</sup>

A recent academic study on the epidemiology of hip fracture reviewed lifestyle determinants said to contribute to osteoporosis. Its authors concluded that the most significant factor causing osteoporosis and its resulting fractures is the increasingly sedentary habits of populations dependent on the automobile.<sup>96</sup> According to Dr. Robert Heaney, "Osteoporosis is a total life-style problem. You can't cure a bad life-style with a pill, and it's a terrible strategic mistake to encourage people to think you can. If I'm sitting all day, don't walk to work, don't carry loads or work in the garden on the weekend, I'm going to lose bone. You can give me all the calcium in the world, and it's not going to stop it."<sup>97</sup>

New scientific theories will continue to explore the physiological and external causes of osteoporosis. A psycho-neuro-endocrino-immunological linkage between bone loss and depression was reported in *The Economist* in November 1996, citing an article in the *New England Journal of Medicine* about this research carried out by the NIH.<sup>98</sup> The average age of the depressed women studied was 41 years, but their bone density was said to be that of 70

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<sup>95</sup>Mann, p. 72. In addition to decline in milk consumption cola drinks which have replaced milk contain phosphorus: phosphorus in large quantities is believed to contribute to bone loss.

<sup>96</sup>Alan D. Martin, Kelly G. Silverthorn, C. Stuart Houston, Steven Bernhardson, André Wajda, and Leslie L. Roos. "The Incidence of Fracture of the Proximal Femur in Two Million Canadians From 1972 to 1984: Projections for Canada in the Year 2006," *Clinical Orthopaedics and Related Research* No. 266 (May 1991), pp. 111-118. The authors reviewed cross-national data from U.S., Canada, Britain, and Hong Kong. Dr. Joan Harrison brought this article to my attention.

<sup>97</sup>*Time* (Feb.23, 1987), p. 89.

<sup>98</sup>"Do Broken Hearts Lead to Broken Bones?" *The Economist* Vol. 341 (November 23, 1996), p. 99.

year olds. Given society's fears and biases of mental illness, and in particular women experiencing mental illness, it is difficult to predict whether blame or sympathy will result from this association. The avoidance of fractures, especially of the hip was mentioned as the major risk to these women. Curiously enough, no allusion was made to their risk of suicide. And the title "broken hearts" implies a stereotype of women depressed over disappointed relationships rather than by other factors, biochemical or otherwise.

Everyday choices have become rife with feelings of sin and guilt, reducing enjoyment of meal planning and socializing, in the hope of avoiding risk. Yet, recommendations for warding off osteoporosis may contradict with advice about lifestyle dangers correlated with other illnesses. For example, osteoporosis may be the only disease of aging for which heavier body weight is believed to be beneficial. Urging the population to get more exposure to sunlight for stimulating production of Vitamin D conflicts with advice to avoid the sun because of skin cancer. The expectations and fervent hope for a magic bullet to eradicate diseases such as osteoporosis has been an obsession reflected in North American media. Almost every day an article or broadcast about breakthrough cures can be found to reinforce this belief. When premature announcements of a miracle are later deflated by revelations of side effects or failure, disappointments are created for sufferers (and for producers of the vaunted substance).

In Chapter 7, I will discuss the potent ideological forces of the new social movements of the late twentieth century, and how they, too, influenced the construction of osteoporosis.

## Chapter 7: Self-Help, Empowerment and Informed Choice: Challenges to and Collaboration with Medical Authority, 1960's - 1990's

In the face of the many emotions surrounding even normal adaptation to osteoporosis.... clinicians may feel that they must 'do something.'...Pressure to overuse medications may come from patients and from patients' families; but pressures often stem from the physician's own sense of helplessness in response to their patient's suffering. Glen Swogger, Jr., American physician <sup>1</sup>

### Challenges to The Medical Expert

By the end of the nineteenth century, biomedical professionals had achieved prominence as spokespersons for opinions based on new types of knowledge. sciences believed to be at the forefront of progress and modernization. Biomedical reductionism became a valid and respected conceptual position. This prestige allowed the medical and scientific professions to take on the role of legitimate experts, pronouncing upon the social and economic dimensions of women's lives, which were assumed to be linked to their reproductive organs. Without such expertise it was posited. women/patients could not independently maintain their health.<sup>2</sup>

In this chapter. I will discuss the impacts of new social movements which originated in the 1960's-70's in North America in respect to their intersection with the medical construction of osteoporosis. Feminism, consumerism, and grey power, with additional critiques adopted from social constructionist and new left perspectives, challenged the traditional medical model and the authority described above, especially in regard to the effects of sexism, agism, and the unequal power of doctor/patient relationships. Empowerment, self-help, and informed choice have been nurtured, cross-fertilized,

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<sup>1</sup>Glenn Swogger Jr., "The Emotional Effects of the Osteoporotic Syndrome," in The Osteoporotic Syndrome: Detection, Prevention, and Treatment. 3rd Edition. Louis V. Avioli, ed. (New York: Wiley-Liss, 1993), p. 188. Swogger practices at the Menninger Clinic, Topeka, Kansas.

<sup>2</sup>Mitchinson, pp. 14-17; Ehrenreich and English, p. 28.

reinforced and given respectability by these social movements. "The 'magic' of esoteric authority" was questioned;<sup>3</sup> however, collaborative and mutually agreeable alliances have been forged between patient/consumer advocates and the medical establishment. In turn, these alliances influence how diseases, such as osteoporosis, have been constructed. Self-help philosophy had additional impetus from government. During the last two decades, government pressures to reduce social spending and the private sector resistance to absorbing direct costs have resulted in an "ideology that tells people they must rely less on the medical system and more on themselves."<sup>4</sup> (See Chapter 8).

A significant outcome of the new social movements was the growth of powerful organizations which were established to serve both the general public interest and patient goals. These included pursuit of improved women's and senior's health status, consumer access to information and protection, mutual aid, and advocacy. Massive lobby groups and hundreds of grass-roots organizations were formed to pressure government for policy and legislative changes, resource allocation for enhanced services, and research related to treat or prevent disease among millions of people.<sup>5</sup>

### **The "Public Interest" Consumer Revolution**

The twentieth-century U.S. consumer movement emerged slowly from earlier efforts to advance "the position and authority of the consumer as a means of raising the standard of

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<sup>3</sup>The phrase "magic of esoteric authority" is from Long Hall, p. 93.

<sup>4</sup>Crawford (1981), p. 471.

<sup>5</sup>Lupton, p. 129. She used examples from the AIDS activist movement.



living for all consumers” during the late 1920's.<sup>6</sup> Consumer information services to provide the public with impartial knowledge were founded just prior to the Depression by Consumers' Research and the Consumers Union. Economic hardships in the 1930's encouraged more people to adopt the consumer identity; and consumer testing services were then initiated.

During the 1930's, the U.S. Food and Drug Administration (FDA) was established as part of the federal Department of Agriculture, and the previous regulatory legislation (1906) was modernized by the 1938 Food, Drug and Cosmetic Act. In Canada, the federal Health Department acquired regulatory authority for misbranded drugs in 1927. Also in the 1930's, a "fledgling consumer movement" began to take shape in Canada under the leadership of women volunteers.<sup>7</sup> During the Second World War and the first fifteen years of the post-war period, however, consumerism was quiescent.<sup>8</sup>

The modern public-interest consumer movement was reactivated in the 1950's, by John Kenneth Galbraith, Vance Packard, and consumer protection issues such as the thalidomide scandal. In the 1960's, Ralph Nader dramatically propelled the movement forward.<sup>9</sup> By the end of the 1970's, a "consumer vanguard," with clients and professionals seen in opposing camps, was in high gear. A host of special consumer movements followed, driven by the perceived needs of client groups, such as women, students, minorities, the aged,

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<sup>6</sup>Lucy Black Creighton, Pretenders to the Throne: The Consumer Movement in the United States (Lexington, Mass.: Lexington Books, D.C. Heath and Company, 1976), p. 1.

<sup>7</sup>Veronica Strong-Boag, The New Day Recalled: Lives of Girls and Women in English Canada, 1919-1939 (Toronto: Copp, Clark, Pitman Ltd., 1988), pp. 118-119. Women also assisted in 'selling' domestic technology to their sister consumers. Dianne Dodd, "Women in Advertising: The Role of Canadian Women in the Promotion of Domestic Electrical Technology in the Interwar Period," in Despite the Odds: Essays on Canadian Women and Science, Marianne Gosztonyi Ainley, ed. (Montreal: Véhicule Press, 1990), pp. 134-151.

<sup>8</sup>Creighton, p. 2 and p. 22.

<sup>9</sup>Ibid., p. 32.

and persons with disabilities. Powerful allies such as organized labour bolstered Nader and other consumer champions.<sup>10</sup>

Since in 1975, 'Health' spending was second only to 'Defense' in the U.S. economy, it is not surprising that the former sector figured prominently as a focus of activist critiques.<sup>11</sup> In addition, the life and death consequences of medical practice and their pharmaceutical products, guaranteed a focus on consumer safety and rights, access to information, and freedom from exploitative pricing.<sup>12</sup> The 1960's and 1970's were deemed the "Golden Age" of the consumer movement, but neo-conservative political forces successfully joined with business interests in a counteroffensive. As a result during the 1980's and 1990's, those interests have neutralized, limited or rolled back some progressive consumer protection regulations.<sup>13</sup>

### **Grey Power: Potent Lobbies Emerge to Fight Agism**

Deep fears about loss of attractiveness, wealth and productivity, and the disability and death associated with growing older have combined to create prejudice against and marginalization of the aged in North American society, especially in the post-World War II era. "A common view of old age is to see health problems overriding economic and social

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<sup>10</sup>Creighton, pp. 72-74. Leftist interpretations have deemed this trend as a transformational phase in the battle for control of post-industrial capitalist society as it shifts from manufacturing to services-based economies. Ruzek, p. 5. Ruzek cited such authors as Marieskind and Ehrenreich (1975), as well as Illich (1976) as proponents of the view that the women's health movement would assist in the socialist transformation of American society.

<sup>11</sup>Claudia Dreifus, "Introduction", in Seizing Our Bodies: The Politics of Women's Health, Claudia Dreifus, ed. (New York: Vintage Books, Random House, 1977), p. xvii.

<sup>12</sup>On the pharmaceutical industry, see Chapter 8.

<sup>13</sup>Bykerk and Maney, pp. x-xi.

restraints."<sup>14</sup> Paradoxically, medical research on aging and services for the elderly only began to coalesce during this same era, stimulated by the increase in the aging population.<sup>15</sup>

Definitions of old age differ culturally and historically. "Indeed, self-perceived status and notions of quality of life and functional capacity remain socio-economically, as well as socio-culturally, determined."<sup>16</sup> A common myth existed that most older persons were burdened by ill health: in fact, recent data from both the U.S. and Canada shows that only about 15 - 20% of seniors experience serious health problems.<sup>17</sup> Mortality rates have been decreasing more rapidly among this sub-set of the over-60 population, so that an increase in the absolute numbers and the relative proportion of the 'old old' is projected for the coming decades.<sup>18</sup> Policy-makers and planners have described resulting social and economic implications for society as a "nightmare scenario," with inter-generational struggles expected for scarce resources.<sup>19</sup>

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<sup>14</sup>Chris Phillipson, Capitalism and the Construction of Old Age (London: The MacMillan Press Ltd., 1982), p. 11.

<sup>15</sup>Marvelu Peterson and Charles L. Rose, "Historical Antecedents of Normative vs Pathologic Perspectives in Aging," Journal of the American Geriatrics Society Vol. 30 (4) (April 1982), p. 293. For example, in terms of research, The Journal of Gerontology was founded in 1945 and the Journal of the American Geriatrics Society in 1953. A separate National Institute of Aging was established only in 1974 at the NIH. Similarly, enabling legislation for a national network of service agencies for seniors began with the Older Americans Act of 1965 and Administration on Aging. See, for the difference between geriatrics, a medical sub-specialty, and gerontology, a multi-disciplinary field studying aging: W. Andrew Achenbaum, Crossing Frontiers: Gerontology Emerges As a Science, (New York: Cambridge University Press, 1995), pp. 14-20.

<sup>16</sup>Kasturi Sen, Ageing [sic]: Debates on Demographic Transition and Social Policy (London: Zed Books, 1994), p.11.

<sup>17</sup>C. G. Gifford, Canada's Fighting Seniors (Toronto: James Lorimer and Company, 1990), p. 10.

<sup>18</sup>Mark Rosenberg, "Restructuring Canada's Health Care System: What Does it Mean for an Aging Population?" lecture at Queen's University, November 20, 1997.

<sup>19</sup>Daniel Callahan, Setting Limits: Medical Goals in an Aging Society (New York: Simon and Schuster, 1987); Sen, p. 13. See Charlotte F. Muller, Health Care and Gender (New York: Russell Sage Foundation, 1990), pp. 224-226 for the position of poor elderly women and their particular disadvantages within the U. S. Medicare system.

Canadian author C.G. Gifford found little information relating to seniors' organizations in North America and Europe when he began research on the topic in the early 1980's: he deemed this period the "pioneer phase" of the seniors' empowerment movement.<sup>20</sup> Gifford credited the movement's modern incarnation to Maggie Kuhn, the convener of the U.S. Grey Panther Movement during the late 1970's. In 1985, a Canadian seniors' protest movement exploded in response to the Conservative Government's attempt to change old age pensions. This effort was preceded, however, by 50 years of grassroots organizing by Canadian pensioners and senior citizens, and by the development of provincial federations. The first federation of pensioners was formed in British Columbia in 1932.<sup>21</sup> Older North Americans organized to explode myths about seniors' health status, stereotyping, and for advocacy.

According to Adele E. Clarke, there was a dearth of historical research about the health, aging and deaths of older women.<sup>22</sup> Furthermore, old age has been "the most stigmatized stage in a woman's life cycle," and poverty is a major fact of life for many elderly North American women.<sup>23</sup> Older women are thus thrice devalued by prevailing age, sex, and

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<sup>20</sup>Gifford, pp. 1-2.

<sup>21</sup>Ibid., pp. 19-24.

<sup>22</sup>Adele E. Clarke, "Women's Health: Life-Cycle Issues" in Women, Health and Medicine in America: A Historical Handbook, Rima D. Apple ed. (New York: Garland Publishers Inc., 1990), p. 36. Two well-known books which deal with the concerns of poor older women in North America published in the mid-eighties are: Ruth Sidel, in Women and Children Last: The Plight Poor Women in Affluent America (New York: Viking, 1986); and Leah Cohen, Small Expectations: Society's Betrayal of Older Women (Toronto: McClelland & Stewart, 1984).

<sup>23</sup>For stigmatization, see Pearsall, p. 1. On women's poverty in old age see Gifford, p. 16. Although the relative economic position of elderly Canadian women has improved in the last two decades, more than half of single elderly women still live below the poverty line. Women's previous limitations in workforce participation and subsequent low or non-existent pensions have been a central issue in this respect.

class biases.<sup>24</sup>

In the 1930's U.S. senior's groups "often rose and fell with the changing fortunes of a single charismatic leader."<sup>25</sup> The decades of the 1950's and 60's saw the formation of national lobbying for the elderly on a scale large enough to influence federal legislation. In 1958, the American Association for Retired People (AARP) was established by seventy-six year old Dr. Ethel Percy Andrus.<sup>26</sup> The Canadian Association of Retired Persons (CARP) based in Toronto was founded in 1986, and currently has a membership of over 250,000 members.<sup>27</sup> By the 1990's, AARP had become the most powerful lobby group in the United States. It has been described as "A Warm and Fuzzy Eight-Hundred-Pound Gorilla,"<sup>28</sup> and its political power as "the field artillery in a liberal army."<sup>29</sup> In February and March 1997, The AARP Bulletin ran a two part series on osteoporosis, its causes, prevention and treatments. The power of the AARP to be heard nationally as the voice of seniors' concerns about healthcare was exemplified by the appearance of Bernice Long, the AARP Health Advocacy State Coordinator for Tennessee, who spoke as the single patient representative at the 1985 U.S.Senate Hearing on Osteoporosis. In her testimony, she explained that AARP's national

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<sup>24</sup>Pearsall, p. 5.

<sup>25</sup>Phillipson, p. 133.

<sup>26</sup>Charles R. Morris, The AARP: America's Most Powerful Lobby and the Clash of Generations, (New York: Times Books/Random House, 1996), pp. 9-10. Andrus was California's first woman high school principal and founder of the National Retired Teachers Association in 1947. A co-founder was business-man, Leonard Davis, who had less altruistic objectives. He became involved with AARP for the purposes of enhancing his mail-order insurance business.

<sup>27</sup>Data from a form letter soliciting membership in C.A.R.P. received January 1998.

<sup>28</sup>Morris, p. 4.

<sup>29</sup>ibid., p. 43.

campaign "to save and strengthen our Nation's health care system, called Healthy US, intended to promote "better understanding of osteoporosis by women of all ages."<sup>30</sup>

### **Feminism and Rise of the Women's Health Movement**

Historians have remarked upon the close linkages between the first wave of feminism and early popular health movements which developed in North America during the 1830-1870 protests against orthodox medicine.<sup>31</sup> The birth of the second wave of American feminism is usually dated from the publication of Betty Friedan's Feminine Mystique in 1963. Feminist ideological and activist conjunctures in the 1970's led to the rise of what has become known as the Women's Health Movement. Demands for participation in patient decision-making were sought by all feminists, while radical activists also sought to expand the role of para-professionals and build community clinics. A third group of reformers demanded lay control over health services through self-help and patient participation mechanisms.<sup>32</sup> Health care, in its traditional guise, was depicted as ignoring preventative services, in addition to being expensive and hazardous.<sup>33</sup> Some critics saw lay health services as substitutes for paternalistic medicine, but most women regarded self-help groups as an

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<sup>30</sup>Proceedings of the U. S. Hearing on Osteoporosis, 1985, p. 18.

<sup>31</sup>Ehrenreich and English, pp. 48-58; Regina Markell Morantz, "Nineteenth Century Health Reform and Women: A Program of Self-Help," in Medicine Without Doctors: Home Health Care in American History, Guenter B. Risse, Ronald L. Numbers and Judith Walzer Leavitt, eds. (New York: Science History Publications/U.S.A., 1977), p. 74; Richard H. Shryock, "The Interplay of Social and Internal Factors in Modern Medicine: An Historical Analysis," in Medicine in America: Historical Essays, (Baltimore: Johns Hopkins Press, 1966), pp. 111-125; Helen I. Marieskind, "The Women's Health Movement: Past Roots," in Seizing Our Bodies: The Politics of Women's Health, Claudia Dreifus, ed. (New York: Vintage Books/Random House, 1978), pp. 10-12; and Robert H. Abzug, Cosmos Crumbling: American Reform and the Religious Imagination (New York: Oxford University Press, 1994), pp. 181-182.

<sup>32</sup>Sheryl Burt Ruzek, The Women's Health Movement: Feminist Alternatives to Medical Control (New York: Praeger, 1978), p. 7. Ruzek called the three reform groups, respectively, liberal, radical and visionary.

<sup>33</sup>Dreifus, p. xvii.

adjunct to professional care.<sup>34</sup> Feminist criticism attacked structural problems, including quality of care; undertreatment of the poor; and fee-for-service pay policies, especially in the context of for-profit systems. In addition, class analysis pointed to the maldistribution of health services in relation to various marginalized subsets of population.<sup>35</sup> The vaunted objectivity of medical knowledge was also targeted; "bad science" was another argument aimed at the medical establishment. Various medical practices which had never been scientifically validated were debunked, particularly those affecting women. The first academic use of these critiques in respect to osteoporosis appeared in 1987.<sup>36</sup>

Sexism, in all its dimensions, was a central issue for feminists, whether it was the reality of women health-care workers as "hand-maidens" to the male medical establishment or the unhealthy power differential of the patient/physician relationship. Initially, the major focus of the women's health movement was reproductive health issues. According to feminist analysis, women's health was particularly at risk because of the pathologization of female physiology and life-functions, and because of women's heavier dependency on the health care system during the young adult years for services needed for reproduction.<sup>37</sup> Undertreatment of women has been a more significant problem in the United States, where access issues to care are linked to inequities in income and insurability, resulting in lack of access to health care services by 40 million Americans. Undertreatment as lack of research about conditions

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<sup>34</sup>Janine O'Leary Cobb, Understanding Menopause: Answers & Advice for Women in the Prime of Life (New York: Plume Book, Penguin, 1993); p. 279. Cobb of Montreal, known as "The Menopause Lady," founded a monthly menopause information newsletter entitled "A Friend Indeed."

<sup>35</sup>Ruzek (1978), p. 6.

<sup>36</sup>Kathleen I. MacPherson, "Osteoporosis: The New Flaw in Woman or in Science?" Health Values Vol. II (4) (July/August 1987), pp. 57-62.

<sup>37</sup>Ruzek (1978), pp. 12 - 13.

which predominantly affect women or present different symptoms in female populations. however, has transcended jurisdictional differences.

Out of the feminist critical and activist maelstrom was created a rich and varied assortment of consciousness-raising and other support groups, classes, self-help literature, and advocacy activities for issues such as legalized abortion.<sup>38</sup> By 1970, the first self-help gynaecological examination clinic was established in Los Angeles.<sup>39</sup> Major political targets for the women's health movement were the pharmaceutical industry and the American Medical Association.<sup>40</sup>

A compelling measure of the women's health movement's influence was the widespread adoption of new paradigmatic expectations of the health care system by mainstream women's magazines in the early 1970's.<sup>41</sup> Self-help and other feminist themes were encapsulated in these traditional expressions of popular culture. *Ms* magazine, founded in 1972, established a unique niche as a mass market voice of feminism.<sup>42</sup> By the mid-1970's in the United States, recognition of women's health as politically significant stimulated federal and state sponsorship of conferences and activities, legitimating concerns and strengthening the networks. Achievement of the movement's major policy objectives was launched in the U.S. with the 1973 Supreme Court decision on the constitutional right to

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<sup>38</sup>Rachel Gillett Fruchter, Naomi Fatt, Pamela Booth and Diana Leidel of the HealthRight [sic] Collective, "The Women's Health Movement: Where Are We Now?" in *Seizing our Bodies*. Claudia Dreifus, ed. (New York: Vintage Books, Random House, 1977), pp. 271-278.

<sup>39</sup> Ruzek (1978), pp. 32-33.

<sup>40</sup>Dreifus, pp. xviii-xxviii.

<sup>41</sup>Ruzek (1978), p. 218.

<sup>42</sup>Ferguson, p. 84. *Ms*' circulation grew within 8 years to half a million readers.



abortion.

The Library of Congress has credited Barbara Seaman as the first writer to focus on sexism as a global healthcare problem.<sup>43</sup> Over the next several decades, The National Women's Health Network (NWHN), established in 1976 and co-founded by Seaman, evolved from outsider status to one of a respected liaison with officialdom in Congress, the NIH, and other powerful federal institutions.<sup>44</sup> Other U. S. groups from the women's health movement which have been leading catalysts for policy change include The Coalition for the Medical Rights of Women and The Boston Women's Health Book Collective.<sup>45</sup> Following the election of Ronald Reagan in 1980, the neo-conservative backlash created political setbacks for the feminist movement. Popular media also reflected a reversal in political climate, as women's magazines lapsed into more traditional emphases on individual self-improvement.<sup>46</sup>

### **Feminist Critiques of the Osteoporosis Phenomenon**

Since the late 1980's, several feminist writers have set off alarms in response to medical and media hoopla about osteoporosis.<sup>47</sup> Feminists are far less critical about the medicalization of osteoporosis, however, than they are about menopause; in many cases,

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<sup>43</sup>Coney, p. 8 and Ruzek (1978), p. 66. Seaman's ground-breaking research in the late 1960's-1970's was on the contraceptive pill.

<sup>44</sup>Bykerk and Maney, pp. 194-196. According to this source, during the hearings on the safety of contraceptive pills, the NWHN representatives had to "break into F. D. A. hearings." Currently the NWHN is "recognized as a source of expertise" and invited to attend such events.

<sup>45</sup>Levy, p. 108.

<sup>46</sup>Kalia Doner, "Women's Magazines: Slouching Towards Feminism," *Social Policy* (Summer 1993), p. 37.

<sup>47</sup>MacPherson (1987); Napoli (1986, 1988, 1997); and Worcester and Whatley (1992) have been the feminist critics who focused specifically on osteoporosis, and not on menopause or hormone therapies. MacPherson teaches in Maine, Napoli as already noted is a journalist and consumer advocate, and Worcester and Whatley teach women's health courses at the University of Wisconsin-Madison. Worcester has also been an activist in the U. K. and the U. S.

there is support for the medicalization of osteoporosis, with recognition of the real suffering faced by persons with severe pain and other complications. A number of persuasive hypotheses have emerged, providing critiques of the mainstream medical construction of osteoporosis. (These arguments are not necessarily unique to feminist analysis; however, the feminist critique has been the most sustained source of literature which questioned the standard medical interpretation of the disease.) A key question for feminists and other critics of the traditional social and medical order was "*cui bono*--who benefits?"<sup>48</sup>

Catherine Kohler Riessman argued that women have benefitted as well as been harmed by the medicalization of their physiology.<sup>49</sup> Beneficiaries include those unfortunate individuals (predominantly women) who have suffered severe bone loss and its sequelae. Lay and medical attention to osteoporosis, for example, has generated scientific and psychosocial research, led to investment in improved diagnostics, therapeutics, patient information, and provided other meaningful supports for patients.

Feminist critics have identified another group of primary beneficiaries from the process of medicalization and disease construction: those profiting from illness-care business and those receiving other professional rewards.<sup>50</sup> In the case of osteoporosis, those

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<sup>48</sup>Clarke, p. 9.

<sup>49</sup>Catherine Kohler Riessman, "Women and Medicalization: A New Perspective," Social Policy Vol. 14 (1983), pp. 3.

<sup>50</sup>Mariamne H. Whatley and Nancy Worcester, "The Role of Technology in the Co-optation of the Women's Health Movement: The Cases of Osteoporosis and Breast Cancer Screening," in Healing Technology: Feminist Perspectives, Kathryn Strother Ratcliff, ed. (Ann Arbor: The University of Michigan Press, 1989), pp. 199-201; Worcester and Whatley, (1992), especially pp. 9-17; Renate Klein and Lynette J. Dumble, "Disempowering Midlife Women: The Science and Politics of Hormone Replacement Therapy (HRT)," Women's Studies International Forum, Vol. 17 (4) (1994), pp. 330-331; Coney, pp. 126-147; Napoli, (1986), pp. 17-18; Maryann Napoli, "Screening for Osteoporosis: An Idea Whose Time Has Not Yet Come", in Women's Health: Readings on Social, Economic and Political Issues, Nancy Worcester and Mariamne Whatley, eds. (Dubuque, Iowa: Kendall/Hunt Publishers, 1988), pp. 115-119; and Maryann Napoli, "Bone Scam," Ms,

benefitting most include medical clinicians and researchers, hospitals, menopause clinics. pharmaceutical corporations, pharmacy chains, the dairy industry, manufacturers of diagnostic imaging devices, and the media. In addition, non-profit organizations, such as women's health centres or disease-specific charities have become beneficiaries, receiving media attention, government funding and private sector support once a disease is discovered.

Since 1980, osteoporosis, coronary heart disease and more recently Alzheimer's disease, have replaced menopausal symptoms as the main rationale for hormone therapy. Once the risks were widely understood, menopausal symptoms were insufficiently powerful as reasons to convince most women to comply with long-term hormonal therapies.<sup>51</sup> Dr. Adrienne Fugh-Berman of the NWHN deemed this transposition "disease substitution," when "the trading off possibly lower risks of one disease for higher risks of another."<sup>52</sup> It was a tactic expected to tip the risk/benefit ratio in the minds of millions of women. In addition, "This catalogue of preventable diseases implied an obligation on the physician to prescribe estrogen, regardless of whether or not the patient experiences symptoms, or whether or not she asks for therapy, and despite the risk of endometrial cancer."<sup>53</sup> Furthermore, feminist writers accused the pharmaceutical industry of deliberately emphasizing prevention of osteoporosis to regenerate and maintain flagging sales of hormones.<sup>54</sup> (Figures 7.1 and 7.2).

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March/April 1997, pp. 28-30.

<sup>51</sup>Coney, pp. 126-147.

<sup>52</sup>*Ibid.*, p. 7.

<sup>53</sup>Kaufert and McKinlay, p. 121.

<sup>54</sup>Coney, p. 128 and pp. 201-204; Kaufert and McKinlay call the efforts "a carefully orchestrated campaign," p. 134; Worcester and Whatley (1992), p. 4; Klein and Dumble, pp. 330-31.

“Every day they’re discover

155b

That’s why

RELIEVES HOT FLASHES

RELIEVES NIGHT SWEATS

RELIEVES VAGINAL DRYNESS

HELPS PREVENT OSTEOPOROSIS



Figure 7.2 Ad for Estrogen--Premarin, 1998 (2 pages)

# ing more about estrogen loss.

155c

# I'm glad I take my Premarin."

**"I started taking PREMARIN a number of years ago. My hot flashes went away, and I've felt wonderful ever since. My doctor and I agreed that I should keep taking it, not just to keep my symptoms from coming back, but also to prevent bone loss. Recently, I heard about new research. It's comforting to know that they're discovering even more about estrogen loss and menopause."**

PREMARIN offers you many benefits. It relieves the symptoms of menopause. The hot flashes that can disrupt your days. The night sweats that can interrupt your sleep and make you tired and irritable the next day. The vaginal dryness that can be uncomfortable and interfere with sexual intimacy. These symptoms may return if you stop taking your PREMARIN. PREMARIN also helps to prevent bone loss by protecting against osteoporosis, and helps to ensure you'll stay active in the years to come.

**PREMARIN has earned your confidence.** PREMARIN has been prescribed for more than 50 years. The most studied of all estrogens, PREMARIN has earned the confidence of generation after generation of women all over the world. Today, PREMARIN is taken by more than 9,000,000 women in the U.S. alone. Of the 40 billion tablets sold, not one has been recalled. Ever.

**New research keeps PREMARIN at the forefront.** Discoveries in medical science continue to reveal additional benefits of PREMARIN throughout menopause—and beyond. For example, in recent years it was learned that PREMARIN increases your levels of "good" cholesterol (HDLs) and decreases your levels of "bad" cholesterol (LDLs). And more is being learned every day.

**New research into estrogen loss and the effects of menopause.** Wyeth-Ayerst, the maker of PREMARIN, has established the Women's Health Research Institute (WHRI). WHRI is dedicated to the discovery and development of medicines that help women live longer, healthier lives, and to ongoing research into the effects of estrogen loss and estrogen replacement therapy. A heritage of confidence... a commitment to your future. Good reasons why PREMARIN is an important part of your life...now more than ever.

**There can be side effects with hormones.** One side effect of estrogen replacement therapy is the possibility of developing cancer of the uterus. If you have had a hysterectomy, you don't have this risk. Adding the hormone progestin to your estrogen greatly reduces this risk.

When you discuss hormone replacement therapy with your doctor or health care provider, be sure to discuss your personal and family history of breast cancer, breast lumps, abnormal vaginal bleeding,

abnormal blood clotting, or heart disease. Women who are pregnant should not take hormone replacement therapy because of possible risk to the fetus.

If you have any questions about your PREMARIN prescription, speak with your doctor or health care provider.

*Please be sure to read the important information on the following page.*

**"Taking my PREMARIN is something I do for myself every day. PREMARIN will continue to be my estrogen, now, more than ever."**

For me, it's **PREMARIN**<sup>®</sup>  
(conjugated estrogens tablets, USP) 0.625 mg

\*The appearance of the Premarin tablet is a trademark of Wyeth-Ayerst Laboratories.

**Figure 7.2** Ad for Estrogen--Premarin, 1998 (2 pages)

**Source:** "Spring 1998 Fashions of the Times Section," New York Times (February 26, 1998).

Other marketing forces joined the osteoporosis bandwagon, hoping for calcium supplements and dairy product sales bonanzas. Attempts to support a cautious use of hormones are said to have been silenced by the American media, despite the still controversial nature of long-term hormone treatment.<sup>55</sup> Fear, sensationalism or exaggeration about osteoporosis have been used by self-interested groups to sell stories, products, and detection services. (See Chapter 8).

Nonetheless, public awareness and "true prevention" activities have also resulted from negative promotional strategies.<sup>56</sup> A recent Australian study found that fear was a motivator in respondents' decision-making to take HRT.<sup>57</sup> Feminists also call on experts from influential medical institutions to refute positions on osteoporosis bruited in popular and medical writing with which they disagree.<sup>58</sup>

Common assumptions that all older women are at risk and that osteoporosis is synonymous with disabling or life-threatening fractures have been identified by feminist critics. Dr. Riggs' 1986 research revealed that half of women's bone loss occurred before menopause, which "threw a cloud of doubt" over medical beliefs about the importance of

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<sup>55</sup>Coney, pp. 7-8. In Seaman's "Foreword" to Coney's book, Seaman made a distinction between "evangelists" such as Wilson, and moderate medical opinion which has seen estrogen "as beneficial for many or most women" except for those precluded by pre-existing conditions, and a third more conservative group, which would prescribe a short-term regimen of hormones for relief of symptoms.

<sup>56</sup>Worcester and Whatley (1992), p. 3.

<sup>57</sup>Klein and Dumble, p. 336.

<sup>58</sup>Napoli (1997), p. 28. For example, Napoli quoted David Atkins, a former science advisor for the U. S. Preventive Services Task Force 1996 report on screening tests, who pointed out the arbitrariness of the definition of the disease; in addition, Atkins urged consideration of the multiple origins of osteoporosis to balance diagnosis based on the findings from bone density measurements, especially for women at moderate or low risk of developing the disease.

hormonal decline to osteoporosis.<sup>59</sup> In 1989, studies marshaled as evidence by the NWHN for its Hormone Education Campaign found that "women with and without hip fractures had similar bone densities, and women in other cultures have low rates of bone fractures even with low bone density."<sup>60</sup> Critics also have noted that mortality figures from hip fractures can be misleading; deaths often result from pneumonia or multiple health system problems in the very oldest cohorts of patients and are only indirectly attributable to osteoporosis.

Feminists and some medical authorities have stated that osteoporosis is an inevitable concomitant of aging, if an individual enjoys a sufficiently long life span.<sup>61</sup> Dr. Tassos Anastassiades asserted "that the new osteoporosis definition loses validity at 65- 70 years; everyone is osteoporotic after that age."<sup>62</sup> Lois Verbrugge posited that the rising rate of illness and disability are directly correlated with the "sharp downward turn" in mortality rates for both males and females since 1968. She claimed that this demographic trend has been due to improved secondary preventative measures which delay the advance of fatal illnesses and the mitigation of less serious diseases; the combined effect has led to a rise in prevalence rates.<sup>63</sup> In addition, early and more accurate diagnosis "has increased the awareness of

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<sup>59</sup>Napoli (1988), p. 116

<sup>60</sup>Worcester and Whatley (1992), pp. 10-11 cite the NWHN publication "Taking Hormones and Women's Health," 1989.

<sup>61</sup>Worcester and Whatley (1992), p. 10.

<sup>62</sup>Interview with Dr. Tassos Anastassiades, rheumatologist, Queen's University Faculty of Medicine. He was referring to the 1994 Consensus definition: a T-score of less than 2.5 SDs below a young adult's measure of peak bone mass. (See Chapter 3).

<sup>63</sup>Lois M. Verbrugge, "Pathways of Health and Death" in Women, Health and Medicine in America: A Historical Handbook, ed. Rima D. Apple (New York: Garland Publishers Inc., 1990), p. 71. Secondary prevention is defined as medical and/or lifestyle measures adopted by patients after an illness has been diagnosed.

existing disease" and "positive incentives for disability have increased."<sup>64</sup>

Contemporary Western lifestyles as essential contributors to the osteoporosis epidemic have been emphasized to varying degrees by both critics of and believers in the medical model. Germain Greer called osteoporosis "a disease of affluence."<sup>65</sup> Feminist literature has universally recommended behavioural changes, such as exercise and wholesome meal planning, in counterpoint to reliance on drugs. Socio-economic and cultural factors which differ between the experience of women in poorer non-Western nations. Such factors as number of pregnancies, infrequent consumption of red meat, routine performance of strenuous labour, and acceptance of figures deemed overweight by North American standards, have been used to explain some variations in prevalence of osteoporosis with women living in post-industrial societies.<sup>66</sup> Consequently, feminists critics believed that

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<sup>64</sup>L. Verbrugge, p. 71.

<sup>65</sup>Greer, p. 131. During the past two decades many national and cross-national research studies have shown that poverty, as measured by income of the population, can be correlated with increasing rates of ill-health for many diseases. The association between health and poverty, however, is not well understood. One of the earliest major studies was the UK 1980 Black Report which showed a statistical association between illness and social class in England and Wales. Sir Douglas Black, Inequalities of Health: The Black Report (Harmondsworth: Penguin, 1982), c. 1980. Sir Douglas Black was former president of the Royal College of Physicians. A recent Canadian source is Reg Warren, Wealth and Health, Health and Wealth, Premier's Council on Health, Well-being, and Social Justice (Toronto: Queen's Printer for Ontario, 1994). I have not found any research focussed on linking poor populations in industrialized nations with osteoporosis. According to the evidence of 2 NIH physicians, Drs. T. Franklin Williams and Mortimer B. Lipsett, who testified at the 1985 Congressional Hearing, little evidence of osteoporosis was found in China, a less affluent society, despite the supposed higher risk of osteoporosis among Asian populations. Proceedings of the U. S. Congressional Hearing on Osteoporosis, p. 62.

<sup>66</sup>Cobb, p. 115. Worcester and Whatley (1992), pp. 9-10. Differences in prevalence between North America and Europe may relate to socio-economic, cultural, as well as genetic differences in the population make-up. Worcester and Whately, commented: "Looking at cross-cultural data, we see that blaming osteoporosis on an estrogen deficiency is just a little less absurd than blaming heart attacks on a deficiency of by-pass surgery. Surgery might solve the problem for a while, but it is not a deficiency of the operation that caused the problem." W. Gifford Jones, the Canadian medical columnist, cited estimates that in Europe a quarter of the women by age 70 will experience osteoporotic fractures; in North America, his figures showed "the prevalence by age 70 is an incredible 50 percent." W. Gifford Jones, "Denying Your Kids Whole Milk? Time to Think Again." The Doctor Game Column, Kingston This Week (January 24, 1998), p. 22A.



estrogen deficiency as a cause for osteoporosis has been overemphasized.<sup>67</sup>

Feminist critics have alleged that another explanation for the increase in prevalence has been iatrogenic causes, such as surgery on the stomach and intestines,<sup>68</sup> but especially removal of reproductive organs.<sup>69</sup> During the post-war era, an escalation occurred in numbers of hysterectomies and ovariectomies, moving a sizeable group of women prematurely into menopausal cohorts. Estimates are as high as one-third of American women, although hysterectomy rates have dropped in the last decade.<sup>70</sup> Another iatrogenic danger raised by feminists has been the use of a contraceptive DMPA (depo medroxyprogesterone), the side effects of which have been said to decrease bone density.<sup>71</sup>

Feminist critiques of research methodology have raised some fascinating questions relating to estrogen usage and osteoporosis. While overall mortality figures persuade many doctors that heart disease and osteoporosis should be considered greater threats to women's health, peri- and post-menopausal women have feared more intensely hormonal replacement and its potential link to breast cancer.<sup>72</sup> Such perspectives are not illogical given the rising

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<sup>67</sup>Klein and Dumble, p. 336. They cited the following scientific authorities: John A. Kanis and F. A. Pitt, "Epidemiology of Osteoporosis," *Bone* Vol. 13 (1992), (Supplement 2), pp. S7-S15.

<sup>68</sup>Napoli (1988), p. 116.

<sup>69</sup>Removal of ovaries may double the risk of osteoporosis. Cobb, pp. 115-116. Women who have had hysterectomies are believed by medical experts to be significantly at risk for developing osteoporosis. Melton III, "Epidemiology...", p. 300.

<sup>70</sup>Felner, p. 46. Dr. Susan Love used this figure for hysterectomized woman in the U. S. No age range for this group of women was reported in the article.

<sup>71</sup>Klein and Dumble, p. 336. These critiques are solely directed at "primary" osteoporosis, not the "secondary" type which is also known to result in bone loss due to effects of or treatments for other ailments.

<sup>72</sup>Osteoporosis Society of Canada, Touchpad Survey Response, October 1997. Women surveyed at 2 of 3 locations at the OSC- SOCOG Public Fora on Menopause and Osteoporosis indicated that Breast Cancer was the condition most feared in a choice of breast cancer, heart disease, osteoporosis, and menopause symptoms. In Quebec the audience selected osteoporosis over breast cancer as their first concern.

incidence of breast cancer, the higher mortality rates from breast cancer than heart disease or broken hips in younger cohorts, and fears about ignoring past lessons from the history of hormones and reproductive system cancers.

In addition, misinterpretation of scientific data may have skewed conclusions about estrogen's preventive action against diseases of aging. A 1991 article remarked on the inattention to socio-economic differences, behaviours and utilization of the health care system, in the medical studies which evaluated the efficacy of estrogen for prevention of heart disease.<sup>73</sup> Its author, Dr. Elizabeth Barrett-Connor, argued that "observational" study data may reflect the bias that women who choose to be treated with estrogen after menopause are from the most advantaged groups, educationally and economically: these factors are also believed to be an advantage "in protection from heart disease." She also indicated that women given estrogen had better health status before treatment for blood pressure and other risk factors; and that this group were "compliant," another factor which "carries a significantly reduced risk for cardiovascular disease compared with poor adherence, even when the prescribed medication is placebo."<sup>74</sup>

Dr. Barrett-Connor's data from her study of Californian upper middle class women showed that women who never used estrogen generally had implemented the fewest healthy behaviour changes and were least likely to have had screening evaluations. She concluded that "even within a socio-economically homogeneous cohort with ready access to medical care, women taking estrogen are quite different from nonusers with regard to health

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<sup>73</sup>Elizabeth Barrett-Connor, "Postmenopausal Estrogen and Prevention Bias." Annals of Internal Medicine Vol. 115 (6) September 15, 1991, pp. 455- 456.

<sup>74</sup>Ibid., p. 455.

promotion and disease prevention measures."<sup>75</sup> In the future, similar reinterpretations might be important for studies reviewing preventative benefits of estrogen for osteoporosis.

### **Voluntary Associations for Single Diseases**

Self-help and mutual aid are responses to illness that have predominated in human history. Until the twentieth century, informal mechanisms located within the family or immediate community were the only way the majority of people had been able to obtain routine health and supportive care.<sup>76</sup> During the last 50 years, lesser dependence on traditional support systems has been due to increasing reliance on and belief in the superiority of a formal and costly professional medical establishment and the development of modern hospitals. Altruistic desires to help others with shared problems have led to the creation of vibrant, voluntary and professional cadres involved with self-help and the growth of mutual aid disease organizations for well-known as well as obscure conditions. Both in North America and globally, patient activism has varied along the political and philosophical spectrum, from militant anti-medical positions to liberal cooperative and collaborationist strategies.<sup>77</sup>

Single-disease-fighting non-profit organizations, many of which have become powerful lobbies, have proliferated in twentieth-century North America. But it appears that a broad history of this sector of the consumer/self-help movement has yet to be written. A search of familiar Canadian national societies indicated that few existed before World War II.

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<sup>75</sup>Ibid., p. 456.

<sup>76</sup>See James H. Cassedy, "Why Self-Help? Americans Alone with their Diseases 1800-1850," in Medicine Without Doctors: Home Health Care in American History, Guenter B. Risse, Ronald L. Numbers and Judith Walzer Leavitt, eds. (New York: Science History Publications/U.S.A., 1977); Ehrenreich and English, pp. 6-9.

<sup>77</sup>Lupton, p. 129.

and the majority were established from the 1960's onward.<sup>73</sup> The Osteoporosis Society of Canada (OSC) was formally incorporated in 1982 as the first national organization in the world dedicated to this disease. It incorporated elements of self-help and consumerist philosophy in its role as an advocacy organization. Its mission is "To educate, empower and support individuals and communities in the prevention and treatment of osteoporosis;"<sup>79</sup> and its goal is "to help Canadians reduce their risk of developing osteoporosis by encouraging them to build better bones."<sup>80</sup> Research, advocacy, and fund-raising activities have been the means used to achieve the organization's mission.

### **The Osteoporosis Society of Canada**

Lindy Fraser, an elderly Canadian woman of indomitable spirit who had suffered for decades from severe osteoporosis, established the first osteoporosis support group in October 1981.<sup>31</sup> From its humble all-volunteer beginnings in her modest Ottawa apartment,

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<sup>73</sup>Associations Canada 1997/98: An Encyclopaedic Directory (Toronto: Copp Clark Professional, 1997/98). A brief search of current organizations turned up 19 national societies, of which only three were established in the pre-war period: The Canadian Lung Association, in 1900; the Canadian Mental Health Association in 1918, and the Canadian Cancer Society in 1938. In a history of the Saskatchewan Anti-Tuberculosis League (1911-86), I located a fourth pre-war national group, the Canadian Association for Prevention of Tuberculosis, which was founded in 1901. Jean B. D. Larmour, A Matter of Life and Breath: The 75 Year History of Saskatchewan Anti-Tuberculosis League and the Saskatchewan Lung Association. (Regina: Saskatchewan Lung Association, 1987), p. 1.

<sup>79</sup>Osteoporosis Society of Canada, Growing Stronger Together: Annual Report 1996-97 (Toronto: Osteoporosis Society of Canada, 1997), p. back cover.

<sup>80</sup>Osteoporosis Society of Canada, Helping Canadians Build Better Bones: Annual Report 1996 (Toronto: Osteoporosis Society of Canada, 1996), p. front cover.

<sup>31</sup>Government of Canada: Departments of National Health and Welfare and the Secretary of State, "Yes You Can: The Lindy Fraser Story," a 30 minute video. (no date). Its showed Lindy Fraser's transformation from a bed-ridden, dependent invalid to an independent and mobile activist by increases in exercise and calcium intake. Previously, her prognosis had given her no hope for mitigation of her decades-long decline. Once she had improved, she reached out to others similarly affected. In 1985 Fraser was honoured at age 91 by the Department of National Health and Welfare with a Lifestyle Award given to volunteers who enhanced the health and welfare of fellow citizens. Fraser's citation said that she "changed the image of the little old lady."

O.S.T.O.P. evolved into a local chapter of the present Osteoporosis Society of Canada. Along with Fraser, two prominent Toronto physicians with professional interest in osteoporosis, Dr. Joan Harrison and Dr. Tim Murray, helped spearhead the development of a national organization with its seat in Toronto.<sup>82</sup> Later in 1981, Drs. Harrison and Murray decided to hold a public forum at the St. Lawrence Centre when Lindy Fraser was able to visit Toronto. They expected 100-150 people, but were overwhelmed by more than 500 persons, some of whom had to be turned away. Several other women at the Public Forum came together with them to form the first board for the new organization.

Mary Bowyer, the Assistant Executive Director, explained the swift growth of the OSC "to the looming epidemic" due to demographics, greater awareness, and "support from 'vested industry' which has allowed the OSC to do more than would otherwise be possible."<sup>83</sup> In 1996-97 corporate sector donations to the OSC represented 39%, individual donations equaled 36%, and government grants were 12% of its total revenues (Table 7.1).<sup>84</sup> OSC's major corporate sponsors are 12 pharmaceutical companies and the Dairy Farmers of Canada.<sup>85</sup>

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<sup>82</sup>Interviews with Mary Bowyer, Assistant Executive Director of the Osteoporosis Society and with Dr. Joan Harrison, both on January 8, 1998. Harrison and Murray were both members of the Department of Medicine at the University of Toronto and founding Board members of OSC. Dr. Harrison has retired from both but is an occasional volunteer for the OSC. Dr. Murray is still at the University of Toronto and on the OSC's Scientific Advisory Board.

<sup>83</sup>Interview with Mary Bowyer, January 8, 1998.

<sup>84</sup>Bowyer expressed relief that OSC's reliance on the corporate proportion of its revenues had fallen. "As long as they are under 50% I'm happy." Interview with Mary Bowyer, January 8, 1998.

<sup>85</sup>OSC, Annual Report, 1996-97, p. 7 and back cover. OSC's corporate donor list and sponsors for the fund-raising activity, the Osteoporosis Walk of 1996, however, showed a mixture of companies including some vested interests, such as MDS Health Group (diagnostics), Reebok (promotion of exercise), Shoppers' Drug Mart and more drug manufacturers, and some with no obvious connection: several banks, Inco, Bell Canada and Dofasco.

**Osteoporosis Society of Canada****Table 7.1** Source of Osteoporosis Society of Canada Revenues, 1996-1997

<u>Source</u>	<u>% of Total Revenue</u>
Corporations	39
Individuals	36
Government Grants	12
Research	4
Merchandising	2
Interest Income	1
Other Income*	6

\*Includes Foundations, Expense Recoveries and Special Events from Chapters

Source: Osteoporosis Society of Canada, Annual Report 1996-97

For several years after its formal incorporation, the Society remained a voluntary organization "run off dining room tables." In 1985-86, the OSC moved into donated office space from The Permanent (Trust Company) until it could afford rental premises ca. 1987. Recently, the OSC has enjoyed exponential growth: in four years, its income, staff and space have doubled every year and a half. In 1993-94, the organization relocated to allow for shipping and receiving supplies (publications). From a two-person staff in 1988 supported by a \$250,000 operating budget, the OSC in 1997 grew to an annual budget of \$2.4 million (Table 7.2), with a current staff complement at the national office of 18 full-time workers and 2 FTEs of part-time contract staff.<sup>86</sup> Part-time staff have been hired in Quebec and Alberta provincial offices, as well as in an affiliate OSTOP group in British Columbia. Interestingly, OSC's expansion in the early to mid 1990's coincided with the advent of DEXA as the gold standard for measuring bone density.

Volunteer-run provincial offices in Manitoba, New Brunswick, and Saskatchewan, and an affiliate group in Nova Scotia have been established.<sup>87</sup> Forty-seven different locales across Canada have osteoporosis support groups to meet the needs of individuals with osteoporosis.<sup>88</sup> Increasingly, contemporary medical research has confirmed the efficacy of peer support, such as that provided by the OSC, for persons experiencing serious diseases.<sup>89</sup>

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<sup>86</sup>Interview with Mary Bowyer, January 8, 1998. An astonishing growth of 70% in "consolidated revenues" between the Society's 95-96 and 96-97 fiscal years was reported in the OSC's, Annual Report, 1996-97, p. 7. Such a large staff has been needed, according to Bowyer, to manage increasing numbers of volunteers and activities.

<sup>87</sup>Osteoporosis Society of Canada, "Chapters, Affiliates and Support Groups," January 1998.

<sup>88</sup>Interview with Mary Bowyer, January 8, 1998. After three or four years some of these support groups take on education and informational roles for the wider community, thus forming new OSC chapters.

<sup>89</sup>Interview with Dr. George Linn, psychiatrist at Kingston General Hospital, November 20, 1997.

**Osteoporosis Society of Canada****Table 7.2** Growth in Osteoporosis Society Revenues, 1987-1997

<u>Year</u>	<u>Total Revenues</u>
1987-88	\$ 250.000
1994-95	\$ 965.871
1995-96	\$1,659.877
1996-97	\$2,371,254

Source: Osteoporosis Society of Canada, Annual Report, 1996-97 and Mary Bowyer



The OSC has established working relationships with 200 provincial and community organizations, and a national membership program is to be launched in the fall of 1998.<sup>90</sup> Three thousand volunteers across Canada participated in some aspect of its activities during 1997. A newsletter entitled Osteoblast, created especially for donors, has an impressive mailing list of 35,000 names.<sup>91</sup> According to Dr. Harrison, the impetus given to osteoporosis awareness by the OSC has made "the public much more nosy about osteoporosis than your average physician across the country."<sup>92</sup> In contrast to other physicians interviewed who cited the media, the pharmaceutical industry, and/or the medical profession as the main sources of awareness about osteoporosis in Canada, Dr. Harrison attributed the disease's prominent profile directly to the efforts of the OSC.<sup>93</sup> "The Silent Thief", a documentary co-produced by the OSC, was shown by 150 Canadian television stations in 1996-97.<sup>94</sup> Advertising/public awareness booklets linking menopause and osteoporosis have been inserted in mass circulation Canadian magazines (Figure 6.4).

A Board of Directors, recruited for geographical representation and a mixture of professional skills, has been responsible for the OSC's fiscal and operational accountability. Last year, only two of the twenty Board members were patient/consumers,<sup>95</sup> while three of the 1996-97 Board members were physicians. The OSC Scientific Advisory Board, with 32

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<sup>90</sup>OSC, Annual Report 1996, p.1

<sup>91</sup>Interview with Mary Bowyer, January 8, 1998.

<sup>92</sup>Interview with Dr. Joan Harrison, January 8, 1998.

<sup>93</sup>Ibid.

<sup>94</sup>OSC, Annual Report, 1996-97, p. 3.

<sup>95</sup>Interview with Mary Bowyer, January 8, 1998.

health professionals (mostly physicians), oversees the "scientific validity" of the organization's policies and publications and provides leadership in professional education about osteoporosis in Canada.<sup>96</sup>

Other non-mainstream influences inside and outside the OSC have been pushing the organization to consider sanctioning complementary preventative and/or therapeutic strategies for osteoporosis management in addition to the medical advice which "represents science as we know it." Some staff and patients have questioned the strict adherence to the advice of the medical experts, and Bowyer predicted that within the next three years, the OSC may adopt a compromise position which will provide information on alternative approaches without formal "scientific" endorsement. Values sacred to both consumer and feminist ideology have been clearly central to OSC's adherence to "informed choice upon which individuals can make their own decisions."<sup>97</sup>

The OSC has 5 priority strategies to lessen the incidence and costs of osteoporotic fractures:

(1) to increase public awareness about the disease and significant lifestyle factors, such as dietary calcium and exercise; (2) to advocate for the expansion of bone densitometry utilization and access for persons at risk to determine bone status; (3) to improve medical education about osteoporosis and highlight the central role of family physicians for prevention and treatment; (4) to enhance research on osteoporosis especially in respect to new diagnostic technologies; and (5) to help to enlarge the number of available drug therapies for

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<sup>96</sup>Ibid. According to Bowyer, not all other charitable "disease" groups, have a similar structure of a separate medical advisory board; for example the Heart and Stroke Foundation does not follow this model. In 1996/97 the Scientific Advisory Board published *Consensus Statements on the Prevention and Management of Osteoporosis and Clinical Practice Guidelines for the Diagnosis and Management of Osteoporosis* in the Canadian Medical Association Journal; both documents were sent to 60,000 specialist and generalist physicians across Canada. A fine print statement that this supplement was not peer reviewed appears on p. 1113.

<sup>97</sup>Interview with Mary Bowyer, January 8, 1998. She cited a similar policy by Breast Cancer organizations, which circulate information on alternative and complementary options with a disclaimer.

osteoporosis in Canada.<sup>98</sup>

The OSC has been a significant contributor to the construction of osteoporosis in Canada. Part of its recent public awareness strategy has been to recruit peri-menopausal women to the cause.<sup>99</sup> Staff are acutely sensitive, however, to the range of opinions expressed across political boundaries among those whom they serve and wish to serve. Bowyer described the osteoporosis phenomenon as a newly recognized epidemic: "exacerbated by the numbers of persons who are living longer; it probably always existed but only for a very few. Most of the time it is women who are involved, but it has become a women's issue because of estrogen." Therefore OSC has tried to avoid language such as "estrogen-deficient:" "I try to find words that work better for all political stripes. For example we now use the term 'ovarian hormone therapy.'"<sup>100</sup> Bowyer also asserted that the OSC rejected the use of fear as motivator in its outreach efforts during the last few years and has developed a communications manual alerting its branches to such public relations policies.<sup>101</sup>

The National Osteoporosis Foundation (NOF), the OSC's American counterpart was established in 1986. Its mission "is to irradicate [sic] the disease through comprehensive

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<sup>98</sup>Osteoporosis Society of Canada, "Osteoporosis to the Third Millennium: Priorities for Prevention and Treatment: Summary Report," p. 3. This document is an abstract from "Osteoporosis to the Year 2020: Priorities for Prevention and Early Intervention," a background paper prepared by the Osteoporosis Society of Canada, May 1996.

<sup>99</sup>Interview with Mary Bowyer, January 8, 1998. Examples of current activities which link the two issues are the Menopause & Osteoporosis public fora and the magazine inserts referred to earlier. Those are jointly sponsored with Eli Lilly and the Society of Obstetricians and Gynecologists of Canada.

<sup>100</sup>Interview with Mary Bowyer, January 8, 1998. Bowyer's own familial experience with osteoporosis was through her father's affliction with the disease.

<sup>101</sup>Fear is used in some advertising. In December 1997, Professor Jacalyn Duffin heard a 1-800 number broadcast on radio in Alberta. Its message about osteoporosis emphasized deformity, disability, and death. (Personal communication.)

programs of research, patient and public education, and advocacy." Currently, NOF has 200,000 members and donors and is governed by a 21-member Board of Trustees and a 30-member Scientific Advisory Committee. Two committees provide NOF's governing structure with expert input: an Interspecialty Medical Council and a Corporate Advisory Committee. NOF boasted that in the past decade it has encouraged a 1200% increase in federal funding for osteoporosis research, up from \$6 million in 1986 to \$90 million in 1996.<sup>102</sup> Dr. Robert Lindsay, the current National President of NOF, credited "the advent and advocacy of NOF" for the boom in research on the disease.<sup>103</sup>

NOF uses the tag line "Silent No More" in a current brochure, explaining its activist stance in the following terms: "osteoporosis has been called 'the silent disease'--and not only for the way it can progress for years without any symptoms. Osteoporosis has been silent because its victims, along with the rest of society, have accepted it as a sad but inevitable part of aging." NOF has a Patient Information Centre staffed by a registered nurse, an internet site, and two toll-free numbers, one specifically on bone density testing.<sup>104</sup> Its programmatic agenda has six priority goals:

(1) to accelerate medical research; (2) to encourage physician initiative (with their patients); (3) to alert patients and the public; (4) to champion access to quality healthcare; (5) to cultivate collaboration; and (6) to build the national network.<sup>105</sup>

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<sup>102</sup>National Osteoporosis Foundation (NOF), Fact sheet.

<sup>103</sup>NOF, Silent No More: New Promise. New Hope (Washington, D. C.: National Osteoporosis Foundation, no date ), received February 1998, p. 11. In 1975 Lindsay, according to this source, was the first researcher to report on a controlled clinical trial of the effectiveness of ERT in stopping bone loss in postmenopausal women. He is presently Chief of Internal Medicine at Helen Hayes Hospital in New York.

<sup>104</sup>Ibid., pp. 2-3.

<sup>105</sup>Ibid., pp. 14-16.

According to Joyce Gordon, the OSC's Executive Director, there has been a dramatic rise globally within the last five years in national level organizations dedicated to fighting osteoporosis, from fewer than 10 agencies in 1994/95 to 43 by 1997. In addition, a World Federation of Osteoporosis, an umbrella organization of national associations, will be established later in 1998 and located in Washington, D.C. The "big three" societies are in the United States, Canada and the United Kingdom. The U.S. Foundation is the largest in size, scope, and resources, but on a per capita basis, the Canadian and British osteoporosis societies are nearly its match. The two North American societies have a close working relationship and routinely share ideas and strategies. A European Foundation for Osteoporosis has also been formed in recent years.<sup>106</sup>

Once they move beyond grassroots origins and become bureaucratized, advocacy associations may find themselves caught in a complex web between patient/consumer, medical, and commercial beliefs, values, and interests.<sup>107</sup> Small volunteer groups tend to burn out and disappear, or become absorbed by larger, professionally staffed organizations.<sup>108</sup> Larger operations require constant infusions of resources to manage volunteers and pay the costs of public education, advertising and space rental. Vested interest groups who provide major funding and in-kind donations may create difficult dilemmas, despite their genuine altruistic and idealistic intentions to help the vulnerable.

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<sup>106</sup>Interview with Joyce Gordon, January 8, 1998.

<sup>107</sup>Lupton, p. 129.

<sup>108</sup>Phone Interview with representative of Women Against Osteoporosis (WAO), Deborah Howe, January 30, 1998. W. A. O. is an example of a local self-help group in King City, Ontario which is about to fold. According to the W. A. O. News Fall 1997, pp. 1-2, W. A. O. members have been working with the OSC national office to establish a new patient-led support service, to provide assistance to individuals, families and nascent volunteer-based self-help groups.

A disease profile becomes part of the political landscape in the policy-making process. The new social movements helped prod the U. S. and Canadian governments to recognize the disease and allocate resources for the cause. Since the mid-to-late 1980's, osteoporosis had been highlighted at a series of Women's Health Conferences sponsored by the U.S. federal government. Activists had also pushed Congress to pass a resolution declaring May 20-26, 1985 as the first National Osteoporosis Week.<sup>109</sup> NOF successfully lobbied Congress to pass the 1993 NIH Revitalization Act, which mandated a federally funded but privately run clearinghouse and established the Federal Working Group on Bone Disease.<sup>110</sup> Former U.S. Congresswoman Olympia Snowe of Maine explained her government's interest in osteoporosis as humanitarian and financial: "First, while women are living longer lives, they are not necessarily living healthier lives. Millions face diseases like osteoporosis. Second, we pay a brutal cost in lives and medical experiences. A recent report by the University of California states that osteoporosis and Alzheimer's disease are potential 'Federal Budget Busters' if we don't do something immediately."<sup>111</sup>

A major responsibility of OSC's Executive Director has been to be an advocate to Government health officials at the highest levels regarding fiscal and regulatory policies

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<sup>109</sup>Senate Resolution #61, Proceedings of the U. S. Senate Sub-Committee on Aging: Hearing on Osteoporosis, June 20, 1985 before the 99th Congress, First Session. (Washington: Government Printing Office, 1985), p. 10. Representative Olympia Snowe of Maine was one of the co-sponsors of the legislation.

<sup>110</sup>NOF, Silent No More, p. 2 and The Osteoporosis and Related Bone Diseases National Resource Center (ORBD-NRC) Fact sheets and Progress Report, October 1997. This clearinghouse is operated by the National Osteoporosis Foundation in collaboration with The Paget Foundation and the Osteogenesis Imperfecta Foundation, and is supported by the National Institute of Arthritis and Musculoskeletal and Skin Diseases, one of the National Institutes of Health. in which representatives from all federal agencies will be collaborating on action against osteoporosis.

<sup>111</sup>Ibid., p. 7.

pertaining to osteoporosis.<sup>112</sup> In Canada during the late 1980's, the federal government's attention to osteoporosis was politically driven. Federal Health Minister Monique Begin's interest in women's health pushed the Government to commit funding for osteoporosis research in 1989 through the NHRDP.<sup>113</sup> In contrast to the booming sponsorship of osteoporosis research by the U.S. NIH, the Canadian federal government recently failed to renew funding for its one large-scale osteoporosis research project.<sup>114</sup> Grants to the OSC have also fallen from 15% to 12% of total revenues between 1995-96 and 1996-97.<sup>115</sup> The last three Ontario Governments (Liberal, NDP, and Conservative) have not designated osteoporosis as a key provincial health priority.<sup>116</sup> Recent concerns about funding a growing number of bone scans may change such perceptions.<sup>117</sup> Declines in government funding may also make OSC more dependent on corporate sources to achieve its ambitious programs.

## Conclusion

Patient-centered decision-making was inspired by the philosophies of the new social movements during the past 40 years. Several paradoxes have emerged from studying their history. First, consumers/patients have been urged to balance advice of professionals with what they believe is best for them as individuals. The welter of information from mass media.

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<sup>112</sup>Interview with Joyce Gordon, January 8, 1998.

<sup>113</sup>Interview with the late Thomas Mackenzie, July 9, 1997.

<sup>114</sup>CBC announced the news on its morning radio program on February, 1998.

<sup>115</sup>OSC, Growing Stronger Together, p. 7. Government sources for the funds were not specified.

<sup>116</sup>Telephone interview with Margaret Anne McHugh, Ontario Women's Health Bureau, May 10, 1997; also interview with Dr. E. R. Yendt, July 21, 1997.

<sup>117</sup>Phone Interviews with J. Axelrad and R. Kennedy, officials at OHIP, Kingston. Data on bone scanning trends in the province were requested, but have not as yet been processed due to their workload.

commercial sources, medical literature, and consumer/patient groups, varies in quality and intent, however. Messages and images about the disease, diagnosis, prevention and treatment are sometimes contradictory, in part because medical uncertainties and controversy mixed with commercial hype become repeated in popular sources. Lack of clarity for the general public and consumer-patients has made "informed choice" difficult to achieve. Yet most consumers would prefer the overabundance of information to the dearth that existed previously.

Second, consumer /feminist critics of traditional medical practitioners have emphasized the importance of physician sensitivity to patients' holistic needs. Patients' well-being requires addressing psycho-social needs. Joyce Gordon recounted an anecdote illustrative of the persistent tension between patient and physician perspectives. At recent conferences on osteoporosis, Dr. Deborah T. Gold, an American social psychologist, has spoken on quality of life issues, such as isolation, despair, low self-esteem, and pain. Gold, usually scheduled at the end of meetings, stressed self-help values and strategies such as hiding physical signs of the disease by wearing a cape. Gordon noted "The doctors leave. They treat the entity and don't ask questions about depression and social support. The patients stay."<sup>118</sup>

Third, popular interest has contributed to the construction of osteoporosis. Consumer/feminist/grey power action has drawn attention to calls for more research about previously ignored groups such as older women. Individuals of both sexes have benefitted from resulting scientific advances and support systems. For the majority of the population,

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<sup>118</sup> Interview with Joyce Gordon, January 8, 1998.



however, existing technology still cannot easily identify those who will develop serious complications due to osteoporosis. Until longitudinal studies regarding the use of various therapies or the predictive value of bone screening become validated, some patient choices may be of little use or do harm. The biggest winners, therefore, in the osteoporosis community may be commercial interests.

In the next chapter, I will survey some economic impacts of the osteoporosis phenomenon.

## Chapter 8: "Cui Bono?" Who Benefits?: Economic Impacts of the Osteoporosis Epidemic

It is absurd to maintain that the private enterprise system is directed towards supplying consumers' needs. Rather, consumers are the pasture on which enterprise feeds. We are used to a system that is run for the benefit of producers, in which the advantage to consumers is merely incidental. **Joan Robinson**, British Economist<sup>1</sup>

Alles es ein 'business' in Amerika. **Grandma Rose Berman**<sup>2</sup>

Osteoporosis as a twentieth-century epidemic emerged from an extensive web of interlocking relationships between patients, physicians, academic scientists, advocacy groups, government, corporations, media, and the general public. Ideas about its causes, treatment, and prevention have shaped and are shaped by the socio-economic, cultural, and political context within the societies which experienced this phenomenon. This chapter analyses the economic incentives, which contributed to osteoporosis' rise as a public health concern.

### Demographics and the Economics of Health Care: Public Policy Issues

From the 1980's onward, widespread predictions of dire economic consequences due to osteoporosis arose in the face of both demographic changes and reduced social spending. Both converging and conflicting interests of the biomedical establishment, multi-national corporations, and consumer/patient advocacy groups politicized decision-making affecting quality, quantity and access to health care.

The magnitude of the estimated number of North Americans predicted to suffer osteoporotic fractures, with attendant costs to individuals and society, has been staggering. Two 1994 U.S. government reports indicated that "osteoporosis affects more than 25 million

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<sup>1</sup>Joan Robinson, *Economics: An Awkward Corner* (London: Allen and Unwin, 1966) pp. 61-62. Robinson made this comment in a chapter on monopoly and competition in capitalist systems.

<sup>2</sup>Berman family oral tradition.

Americans, 80 percent of them women."<sup>3</sup> In the U.S. there are 1.5 million fractures attributable to osteoporosis annually. "A lifetime risk of a fracture of the spine, hip, or distal radius [wrist] is 40% for white women and 15% for white men from age 50 years upward." Not including loss of income and costs of long term care at home, the annual cost to the American health care system for all fractures has been estimated at \$10 billion.<sup>4</sup> Comparable statistics for Canada are that "osteoporosis affects 1.4 million Canadians over the age of 50--one in four women and one in eight men....It is estimated that the national cost for treating femoral fractures exceeds \$600 million per year."<sup>5</sup>

Rising trends in the annual age-adjusted incidence of fractures for both male and female populations in Europe and North America between the 1950's and 1980's apparently cannot be explained solely by demographic changes.<sup>6</sup> As the incidence of hip fracture rises with age, and the elderly population grows rapidly, some experts have predicted a 200-300% increase during the next 30 years in hip and other fracture sites for the elderly in the United States, with a burden of cost estimated at \$31-62 billions.<sup>7</sup> The National Osteoporosis Foundation in the U.S. claimed that "Without interventions....the cost of treating osteoporosis in America is expected to rise to \$60 billion annually by the year 2020."<sup>8</sup> Canadian rates for hip fracture have been

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<sup>3</sup>*Public Health Reports*, the Journal of the U.S. Public Health Service Vol.110 (1) (January-February 1995), p. 112.

<sup>4</sup>Riggs and Melton, p. xv. Given the multi-ethnic and multi-racial composition of the North American population, the almost total reliance on statistics of primarily "white" populations is disconcerting. The potential for skewing both individual risk and population prevalence and incidence figures for non-white groups is notable.

<sup>5</sup>Osteoporosis Society of Canada, "Osteoporosis, A Fact Sheet," Toronto, 1996. Received Jan. 29, 1997.

<sup>6</sup>Martin, Silverthorn, Houston, Bernhardson, Wajda, and Roos, p. 117. See also Stevenson and Marsh, pp. 42-43.

<sup>7</sup>Melton, p. 304.

<sup>8</sup>National Osteoporosis Foundation, Silent No More, p. 3. Underlining in quote is added.

"conservatively" anticipated to quadruple during the next 40 years.<sup>9</sup>

North American governments during this century developed important roles in research, regulation, and reimbursement for medical technology. In 1984, the U.S. Medicare program began to crack down upon hospitalization costs. In response, U.S. hospitals "compensated by boosting their outpatient, psychiatric and rehabilitation services, for which Medicare had set no cost limits...Hospitals also stepped up their efforts to attract privately insured patients." Hospitals competed to attract both patients and doctors by providing "the newest well-reimbursed technology, whether the technology [was] needed or not."<sup>10</sup>

Coincidentally, the NIH conference on osteoporosis occurred at this time. Media attention stimulated consumer demand for prevention, detection, and treatments, especially calcium and estrogen. F. D.A. imprimatur for the latter drug's use for osteoporosis was bestowed a month after the experts met.<sup>11</sup> In addition, the conference promoted testing of millions of mature women, especially those with private insurance or Medicare. By 1985, lobbyists were pleading for enhanced public reimbursement of bone densitometry.<sup>12</sup> Amidst the confusing media messages and a rush for profits, the public's ability to discern nuances in medical advice

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<sup>9</sup>Emmanuel A. Papadimitropoulos, Peter C. Coyte, Robert G. Josse, and Carol E. Greenwood, "Current and Projected Rates of Hip Fracture in Canada," Canadian Medical Association Journal Vol. 157 (10) (1997), p. 1361.

<sup>10</sup>"Wasted Health Care Dollars," Consumer Reports (July 1992), p. 442.

<sup>11</sup>"U.S. Agency Approves Estrogens to Aid Bones," New York Times (May 21, 1984), Section II, p. 10.

<sup>12</sup>Proceedings of U. S. Congressional Hearings on Osteoporosis, p. 112. An example of intimate relationships between academia and business was shown in the testimony of Dr. Richard Mazess, Professor of Medical Physics at University of Wisconsin, Madison. He has been in his own words, "President of Lunar Corporation which has evolved into the largest manufacturer of bone densitometers today." Mazess attempted to convince the Congress to change reimbursement policies for scanning technologies to include DPA which was replacing SPA technology. "I feel that HCFA reevaluation of reimbursement is very important to prevent proliferation of bone centers using inadequate methods as well as to allow adequate methods to come into use for diagnosis and monitoring." Mazess did not question the appropriateness of touting his own product and profit incentive in this forum. pp. 112-113.

appropriate to low-risk vs high-risk populations may have been lost in the hype.

Corporate lobbying and advertising campaigns, themselves multi-million dollar enterprises, have assisted manufacturers of diagnostic imaging equipment, dairy and pharmaceutical industries in attempts to influence purchasing and reimbursement decisions by government and private institutions. U.S. professional associations such as the American College of Obstetricians and Gynecologists have their own Washington lobbyists.<sup>13</sup> Moreover, since the 1980's universities and medical schools have served increasingly as test sites and training locales for innovative technology; both institutions and individual researchers have garnered pecuniary rewards and heightened prestige from technological discoveries.<sup>14</sup>

Drug companies influenced the biomedical community as funders of research. Patient advocacy groups also try to affect government policy. For example, the Osteoporosis Society of Canada has been seeking to persuade government funders to expand bone scanning for persons at high risk, while provincial officials have capped spending to control utilization of diagnostic procedures.<sup>15</sup>

After the 1984 NIH conference, the National Institute on Aging and the Department of Health and Human Services collaborated with Pfizer Pharmaceuticals and AARP to prepare and disseminate more than one million copies of a fact sheet called "Osteoporosis: The Bone

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<sup>13</sup>Proceedings of the Congressional Hearings on Osteoporosis, p. 93. At the hearings on osteoporosis, Dr. Luella Klein, a spokesperson (she was then its past president) for the American College of Obstetrics and Gynaecology and Professor of Obstetrics/Gynaecology at Emory University School of Medicine, stated that "By far the most serious health hazard of menopause is a condition called osteoporosis."

<sup>14</sup>Kathryn Strother Ratcliff, "Health Technologies for Women: Whose Health? Whose Technologies?" in Healing Technology: Feminist Perspectives, Kathryn Strother Ratcliff, et. al. eds. (Ann Arbor: The University of Michigan Press, 1989), p. 179.

<sup>15</sup>Interviews with Joyce Gordon and Mary Bowyer, January 8, 1998.

Thinner."<sup>16</sup> A recent booklet called "Osteoporosis: Let's Talk About It! A Preventive Guide for Women" was jointly underwritten by the OSC, the Canadian Pharmacists Association, Shaw Cable and the Rogers Cable Company. Corporate gifts sometimes have self-serving dimensions; for example, Canadian pharmaceutical companies and the dairy industry have employed portable diagnostic technology at health fair and shopping mall bone screenings. Pharmaceutical companies have been interested in supplying additional diagnostic capacity to "support a growing need, because the only way a person gets treated is by being diagnosed."<sup>17</sup>

Health economists have directly correlated growth in service volumes and the introduction of new technologies with financial incentives of practitioners and institutions in fee-for-service systems.<sup>18</sup> Women who had been prescribed estrogen have been told to see a physician "at 6 - 12 month intervals," thus increasing patient visits.<sup>19</sup> In some jurisdictions, excess profits and overuse of technology resulted from conflicts of interest by doctors who provided referrals to their own clinics and diagnostic testing centres.<sup>20</sup> Thus, a chronic disease such as osteoporosis guarantees financial rewards, especially because of prescription of life-long drug therapies and routine monitoring for those diagnosed.

### **Marketing Women's Health: A Boom in Treatment and Prevention Services**

Women have been the most frequent users of the health care system for themselves or

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<sup>16</sup>Proceedings of U. S. Congressional Hearing on Osteoporosis, p.40.

<sup>17</sup>Quote from interview with Joyce Gordon, January 8, 1998. A telephone interview with Bowyer on February 9, 1998 clarified that these mall and fair screenings are as yet infrequent events in Canada.

<sup>18</sup>See for example, Robert G. Evans, Strained Mercy: The Economics of Canadian Health Care (Toronto: Butterworths, 1984), especially Chapter 1.

<sup>19</sup>Proceedings of U. S. Congressional Hearings on Osteoporosis, p. 94. Dr. Luella Klein suggested this should be the appropriate protocol.

<sup>20</sup>Napoli (1988), p. 115. Napoli cited the case of an osteoporosis screening center in New York City.

as family care givers.<sup>21</sup> Feminists have asserted that when demands for change from the women's health movement could no longer be ignored, the medical establishment took advantage of new market opportunities it created. Ruzek described this process of co-optation:

Over time, changes that do not seriously threaten physician's profession status, income or control over medicine are accepted willingly by a vanguard and reluctantly by others, partly in order to keep their clientele...Changes which *do* seriously threaten medical dominance or which affect the direct material interests of the medical establishment are fought vigorously, often by invoking the power of the state. When repressive measures fail, a final resort is to coopt programs to allow the medical establishment to reassert control over the activity.<sup>22</sup>

By the late 1980's, the women's health movement had spawned at least 100 community-controlled non-profit feminist health centers in the U.S. American hospitals and for-profit health facilities have been seeking new sources of revenue during the past decade because of government, HMO, or insurance company restrictions on average stays. Mainstream institutions responded to this economic pressure by competing with grassroots organizations and each other to establish specialized women's clinics. Feminists have charged that by co-opting superficial qualities of community-controlled women's health centres, such operations create money-making facilities in the style but not necessarily with the substance of feminist models for health care.<sup>23</sup> Moreover, health services advertising by such groups as the A.M.A. was approved by a U.S. Supreme Court decision in the mid-1980's. The latter development allowed segmented marketing strategies by American hospitals and other health care facilities to the growing numbers of

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<sup>21</sup>Muller, p. 137. Two factors that have contributed to higher usage has been women's longer life expectancy and larger percentage of the 'old old' portion of the population.

<sup>22</sup>Sheryl Burt Ruzek, "Medical Response to Women's Health Activists: Conflict, Accommodation and Cooptation," Research in Sociology of Health Care Vol. 1 (1980), p. 336.

<sup>23</sup>Nancy Worcester and Marianne H. Whatley, "The Response of the Health Care System to the Women's Health Movement: The Selling of Women's Health Centers," in Women's Health: Readings on Social Economic and Political Issues, Nancy Worcester and Marianne H. Whatley, eds. (Dubuque, Iowa: Kendall/Hunt Publishers, 1988), pp. 19-20.

perimenopausal baby boomers and older women.

In the late 1980's, a new medical organization, the North American Menopause Society, was established. At its first conference in September 1989, its goal was enunciated as the "delivery of currently acceptable levels of postmenopausal health care to the entire population at risk" to rectify a "critical gap" in preventative medical services for middle-aged women (aged 40-60 years) through the extension of menopause clinics.<sup>24</sup> Sally Rynne, a consultant to for-profit women's health centres in the U. S, asserted that 18% of women's visits to physicians are preventative, they are the predominant audience at health promotion and patient education programs, and are the major group of subscribers to prevention/wellness magazines.<sup>25</sup>

U. S. for-profit women's health centres and clinics followed the example of the pharmaceutical industry in selling profitable services to healthy (asymptomatic) women. Educational activities sponsored by such facilities have been described as effective "loss leaders;" although a seminar series was not profitable, the clinic's patient visits increased. Furthermore, provision of women's health services to underserved geographical areas or vulnerable populations, i.e. less profitable markets, have not benefitted from expansion of services. Osteoporosis, depicted as a major public health problem facing all women has been an effective "lure" for expensive screening and monitoring and promotion of drugs.<sup>26</sup> Prevention

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<sup>24</sup>Utian, p. 5. (Utian used the term 'medical' to describe the Menopause Society.) The historical origins of this group began in 1973 as the "menopause club" proposed by the author and Belgian physician P. Van Keep in Geneva. An International Congress on Menopause was held in France in 1976, followed by the formation of the International Menopause Society in 1978, whose journal, *Maturitas*, was launched in 1978. Although national societies for menopause had developed in most European, Antipodean and Latin American countries by the late 1980's, Utian remarked "the North American medical community has fallen behind its international contemporaries in this respect."

<sup>25</sup>Worcester and Whatley (1992), p. 2.

<sup>26</sup>Worcester and Whatley (1988), pp. 19-22.



has become a profit centre.

### **Drug Industry<sup>27</sup> Interests in Osteoporosis**

Pharmaceutical manufacturing's close links to medical science developed in its modern configurations from 1890 to 1930 in North America.<sup>28</sup> During World War I, American drug manufacturers began systematic research and development of biologicals, although the industry still lagged in innovation behind German companies.<sup>29</sup> Transformation of bench research into the first commercial therapeutics applicable to osteoporosis occurred during the inter-war period. In North America during the 1920's, of three pharmaceutical-academic research partnerships established for "mutual gain," two involved substances important in the history of osteoporosis: Parke-Davis in St. Louis which "exploit[ed] patents on estrogen and later vitamin K" and Steenbock who established the Wisconsin Alumni Research Foundation with resources from the patents of irradiated milk and other foods for the production of Vitamin D.<sup>30</sup>

Canadian drug production began in Toronto in 1879, but foreign-owned subsidies gained a foothold during the late 1880's when Parke, Davis and Company of Detroit moved to Windsor. By the 1940's, competitive global economics doomed locally-owned manufacturing; after World

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<sup>27</sup>For the history of the drug industry and regulatory processes globally in the pre-and early postwar era see Wyndham Davies, The Pharmaceutical Industry: A Personal Study (Oxford: Pergamon Press, 1967) ; for the U.S. see Milton Silverman and Philip R. Lee, Pills, Profits and Politics (Berkeley: University of California Press, 1974); Jonathan Liebenau, Medical Science and Medical Industry: The Formation of the American Pharmaceutical Industry (London: MacMillan Press and Business History Unit, University of London, 1987); for a radical interpretation of the Canadian drug industry see Lexchin (1984); for a study of the pharmaceutical pressure groups in Canada and Britain see Ronald W. Lang, The Politics of Drugs (Westmead: Saxon House, D.C. Health Ltd., 1974).

<sup>28</sup>Liebenau, pp. 1- 2.

<sup>29</sup>Ibid., p. 109.

<sup>30</sup>Daniel M. Fox, Marcia Meldrum and Ira Rezak, eds. Nobel Laureates in Medicine or Physiology: A Biographical Dictionary (New York: Garland Publishers Inc., 1990), p. 132. Connaught Laboratories in Toronto and Eli Lilly in Indianapolis which co-produced the commercial development of insulin were the other centres.

War II, the pharmaceutical industry in Canada became almost entirely foreign-owned. A trade association, The Pharmaceutical Manufacturer's Association of Canada (PMAC), which has represented the subsidiaries of foreign corporations, was deemed "the voice of the multi-nationals." By 1981, PMAC members controlled 90% of the dollar volume Canadian drug industry.<sup>31</sup> In addition to owning the rights for drugs used to treat osteoporosis, a number of these drug firms control Canadian rights to bone densitometry technology.<sup>32</sup>

Standard sources of information used by physicians, such as the Compendium of Pharmaceuticals and Specialties, published by the National Pharmacists Association, have some significant inadequacies in terms of evaluative information about specific brand name drugs.<sup>33</sup> Critics have argued that overtreatment with drugs for both older Canadians and women have been especially characteristic of physician prescribing patterns for these groups.<sup>34</sup>

According to one consumer advocate, the American pharmaceutical industry has spent \$12 billion per annum in recent years in the U.S. on drug promotion.<sup>35</sup> A special ad campaign

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<sup>31</sup>Lexchin, p. 31-33. PMAC estimated recently that close to \$3 billion was "injected" into the country's economy in 1996 by its member companies, which in Ontario and Quebec accounted for 88% of \$3 billion total. More than 30 companies are located in Ontario alone where PMAC claims the sector's economic and social benefits "...in hospitals, universities research institutions, and through an extensive supplier network." The figures of dollar benefits used are "Statistics Canada employment value-added contribution estimate." Pharmaceutical Manufacturers Association Of Canada (PMAC)<http://www.pmac-acim.org/industry/97facts>.

<sup>32</sup>Interview with Joyce Gordon, January 8, 1998.

<sup>33</sup>Lexchin, pp. 144-145. Lexchin noted that although the Medical Letter has been available since the mid-1960's, "as late as 1977 only one-fifth of Canadian doctors were subscribing" to it.

<sup>34</sup>A huge selection of literature from both within and without the medical sector has raised concerns re drugging issues in respect to women and older people. A few Canadian sources include: Institute for Clinical Evaluation Sciences in Ontario, Patterns of Health Care in Ontario: The ICES Practice Atlas, 2nd Edition, Vivek Goel, J. Ivan Williams, et al. eds. (Toronto: Canadian Medical Association, 1997), p. 325; Joel Lexchin, pp. 214-217; Kathleen McDonnell, ed., Adverse Effects: Women and the Pharmaceutical Industry (Toronto: Women's Educational Press, 1986); Ann Rochon Ford, "In Poor Health," in Women's Health: Readings on Social, Economic and Political Issues, Nancy Worcester and Mariamne H. Whatley, eds. (Dubuque, Iowa: Kendall/Hunt Publishers, 1988), pp. 105-108.

<sup>35</sup>Wolfe, p. 1452. I wonder if this figure is missing a decimal and really is \$1.2 billion.

by the drug advertising industry called "Straight to the Hippocampus" described a "drug prescribing centre of the brain, boast[ing] that their advertisement makes your customer [doctors] see how [not whether] your product is superior and unique."<sup>36</sup> In the late 1980's, the Canadian drug industry spent an estimated \$3,000 per physician per year to persuade prescribers to use their products.<sup>37</sup>

Brand awareness has been targeted directly at consumers in the U.S.: drug companies spent \$600 million to reach patients in 1996, a doubling of promotional spending since 1995, and an almost ten fold increase over 1991. Ironically, pharmaceutical companies have been justifying this trend on the basis of making consumers better health advocates on their own behalf.<sup>38</sup> although the rationale has been to encourage patients to ask physicians for particular brand names. Advertising of prescription drugs in Canada has restricted direct messages to the public, but the industry promises reduced health care costs with medicines to prevent hospitalization. The public understands the implications.

### **Industry, Academia and Biomedical Research**

Biomedical research and industry have become inextricably entwined in the late twentieth century.<sup>39</sup> Research grants from drug companies and other interest groups have been traditional sources for funding basic research and clinical studies. Promises of additional contributions to

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<sup>36</sup>One recent example is an exchange of letters between Jack E. Angel of the Coalition for Healthcare Communication (among whose members include the U. S. Pharmaceutical Advertising Council) and Sidney M. Wolfe of the Public Citizen's Health Research Group in The Lancet Vol. 348 (1996), p. 1452.

<sup>37</sup>Ford, p. 105.

<sup>38</sup>Abigail Zuger, "Drug Companies' Sales Pitch: Ask Your Doctor," New York Times (August 5, 1997), p. C1+.

<sup>39</sup>For the emergence of the close relationship between academia and the drug industry during the inter-war years, see J. P. Swaan, pp. 73-90.

research and development by the Canadian drug industry have become bargaining chips in federal regulatory decisions about extending the length of patents, which increase years of profit on prescription drugs.<sup>40</sup> In Canada the pharmaceutical industry "controls more than 70% of the funds spent on research, even when that research is done in a university."<sup>41</sup> In 1995-1996, PMAC claimed that private industry, mostly pharmaceutical companies, contributed \$57.6 million or 16% of the \$354.4 million in biomedical research at the five Ontario faculties of medicine.<sup>42</sup> Similarly, in the U.S. by 1990, the drug industry paid for 46% of the investment in biomedical research, while the NIH's share declined to 32%.<sup>43</sup> Scientific objectivity under these circumstances needs to be subjected to careful scrutiny, although the effects of conflicts of interest on the production of medical knowledge may be either conscious or unconscious.<sup>44</sup>

Funding alone is not really the concern...Rather, it represents a surrogate for the potential commercial influences over how data are collected, analysed and interpreted. More seriously, as was revealed in the astonishing case of a company (Boots) that impeded publication of research findings that they determined were harmful to their sales, readers need to know whether a funding source or sponsoring agency has had the right of veto over all or part of a dataset.<sup>45</sup>

In this context, the public has reason to be concerned about whether industry/academia has

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<sup>40</sup>Heather Scoffield, "Drug Firms Hold Out Investment Lure", Globe and Mail (January 30, 1998), p. B4.

<sup>41</sup>Jacalyn Duffin, Chapter 5, History of Medicine, forthcoming, University of Toronto Press, p. 24.

<sup>42</sup>Pharmaceutical Manufacturers of Canada, <http://www.pmac-acim.org/industry/97facts/ontaren.html>. (February 1, 1998).

<sup>43</sup>Mildred K.Cho, "FUNDamental Conflicts of Interest," [http://biomednet.com/hmsbeagle/1998/24/people/op\\_ed.htm](http://biomednet.com/hmsbeagle/1998/24/people/op_ed.htm), posted January 30, 1998, Issue 24, p. 1. The author is Assistant Professor, University of Pennsylvania, Center for Bioethics.

<sup>44</sup>Ibid., p. 2.

<sup>45</sup>Richard Horton, "Sponsorship, Authorship, and a Tale of Two Media," The Lancet Vol. 349 (1997), p. 1412.

delivered impartial information under fair regulatory supervision by government.<sup>46</sup>

By 1984, the NIH was sponsoring 37 osteoporosis-related projects, worth \$4.5 million.<sup>47</sup> In 1991, Canada's largest federally-funded project studying osteoporosis, CAMOS, received \$2.5 million of its total \$9 million budget from Health Canada via the Seniors Independent Research Program and the NHRDP.<sup>48</sup> Contributions from participating drug companies appear to have outweighed resources obtained from public sources of research and development. For example, Merck Frosst Canada (maker of Fosamax and distributors of two bone densitometry equipment producers), Eli Lilly Canada (PTH hormone, Raloxifene), and Procter and Gamble Pharmaceuticals Canada (Didronel, Didrocal) were reported to have donated \$1.76 million compared to \$440,000 from the Medical Research Council for this project in 1996.<sup>49</sup> CBC Radio news recently reported on "a crisis in osteoporosis funding," i.e., since the NHRDP program no longer will fund large projects such as CAMOS.<sup>50</sup> Current government policies, therefore, have the potential of further imbalancing the resource relationships between big business and the public interest in respect to osteoporosis research.

### **Drug Profits and Osteoporosis**

Drug therapies, once seen as adjuvant measures for treatment, have become central to the

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<sup>46</sup>About the dangers of "contaminated" research findings and regulatory processes, see: Jane Coutts, "'Publication Bias' May Put Patients At Risk," Globe and Mail (September 22, 1997); Cho, p. 6; Laura Eggertson, "Drug-Approval Process Criticized," Globe and Mail (May 28, 1997), p. 1.

<sup>47</sup>Proceedings of Hearing on Osteoporosis, U. S. Senate Sub-Committee on Aging, p. 83.

<sup>48</sup>W. A. O. News, Fall 1997, p. 8.

<sup>49</sup>Pharmaceutical Manufacturers Association of Canada, [http://www.pmac-acim.org/industry/97\\_facts](http://www.pmac-acim.org/industry/97_facts).

<sup>50</sup>CBC Radio News, 8 am (February 5, 1998) and phone interview with Pamela Anastassiades, a project manager for the Queen's CAMOS research, February 5, 1998. According to Ms Anastassiades, the drug company has ceased flowing new funds to the project and a separate application to the MRC failed to gain approval.

care of patients with many diseases. Late twentieth-century trends in day surgery and community care, as well as cures for previously untreatable conditions have led to higher rates of growth in prescription drug utilization than other health care expenditures. For example in 1975-87, total health care expenditures increased by 83.4% while spending on drugs grew by 128.9% in Canada. As a result, patient co-payments and other policies which restrict access to drugs for some consumers have been adopted to reduce public spending on drugs.<sup>51</sup>

For osteoporosis sufferers, surgery is an option only when a repairable fracture has occurred. Drugs for relief of pain, prevention and retardation of bone loss, and most recently, regeneration of bone, have helped millions of patients, and at the same time created huge profits for pharmaceutical interests. Joyce Gordon of the OSC articulated concerns about pharmaceutical company "information" used to market drugs, which may conflict with patient need for objective knowledge for personal decision-making. PMAC has been pushing hard for changing regulations to allow direct consumer advertising. She commented, "You can't trust the corporate sector to do this in an objective way--they want market niche."<sup>52</sup>

Large drug retail chains also have taken advantage of the osteoporosis epidemic. Shoppers Drug Mart placed a "news brief" in a local paper for the "Ostéobus" [sic], a mobile osteoporosis information centre which was to provide "visitors with an individual risk assessment and information, staffed by a pharmacist and dietician." A two-day visit was scheduled with stops planned at two Shoppers Drug Marts in local malls.<sup>53</sup>

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<sup>51</sup>Paul K. Gorecki, "Introduction," Controlling Drug Expenditure in Canada: The Ontario Experience (Ottawa: The Economic Council of Canada and the Ontario Ministry of Health, 1992), p. 2.

<sup>52</sup>Interview with Joyce Gordon, February 8, 1998.

<sup>53</sup>Kingston This Week (June 7, 1997), p. 3A.

## Estrogen

Estrogens have been the most profitable drug associated with the history of osteoporosis and the drug industry.<sup>54</sup> As we have seen, estrogen altered the importance of menopause from "a side issue of nuisance complaints to an issue central to...aging in women."<sup>55</sup> Its use boomed from the mid-sixties until the mid-seventies when the cancer controversy broke. Subsequently, post-menopausal related estrogen sales peaked in the U.S. in 1975,<sup>56</sup> followed by a decline of 18% between 1975 and 1976, and a further loss of another 10% in 1976 to 1977. During the early 1980's, the public relations firm Burson-Marsteller was hired by Ayerst to boost estrogen's falling sales, by deliberately substituting osteoporosis for menopause. A successful media blitz was implemented to reach women through print and broadcast media.<sup>57</sup> Estrogen's sales rose again during the 1980's. During the past two years, Premarin has been the top seller among the 200 most frequently prescribed drugs in the U.S.,<sup>58</sup> while in Canada, the sales of hormone replacement drugs are estimated to be \$70 million per year in the late 1990's.<sup>59</sup> Table 8.1 summarizes data on the extent of estrogen sales from a number of sources.

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<sup>54</sup>Barbara Seaman, "Introduction" in Coney, pp. 3-4. Seaman noted: "Premarin is the #1 best-selling prescription drug in the United States, and ...has remained in the top 50 since 1966...(Only one other pharmaceutical has stayed in the top 50 as long...--Dilantin, an anti-convulsant.)"

<sup>55</sup>Howard Judd and Wulf Utian, "Introduction" What We Hope to Learn. Current Perspectives in the Management of the Menopausal and Postmenopausal Patient," American Journal of Obstetrics and Gynecology Vol. 156 ( 5) (1987), pp. 1279-80.

<sup>56</sup>McCrae, p. 114.

<sup>57</sup>Coney, pp. 197-202; Worcester and Whatley (1989), pp. 204-205.

<sup>58</sup>Patricia Peppin and Elaine Carty,"What Drug Advertising Tells About Women, their Doctors and Menopause,"paper on a survey of advertisements in the Journal of the Society of Obstetricians and Gynecologists of Canada, 1997, and presented at the 5th National Health Promotion Research Conference in Halifax, July 5, 1997 by Carty and at the World Conference on Breast Cancer in Kingston on July 15, 1997 by Peppin. The statistic is from "Top 200 Drugs of 1995," Pharmacy Times (April 19, 1996), p. 27.

<sup>59</sup>Lila Sarick, "Life After Menopause a Mystery for Many," Globe and Mail (October 1, 1997), p. A7.

**Table 8.1** Estimates of Estrogen's Usage as a Menopausal Treatment. 1966-1996

<u>Year</u>	<u>Author</u>	<u>Country</u>	<u># or % of Users</u>	<u># of Prescript.or \$ Value</u>
1966	Marshall <sup>1</sup>	Can		\$4 million (in Canada)
1966	Wilson <sup>2</sup>	USA	6,000 -12,000	
1963-75	Census Bureau <sup>3</sup>	USA		sales quadrupled
1975	Fausto-Stirling <sup>4</sup>	USA	6 million	
1975	Hoover et al <sup>5</sup>	USA		26.7 million prescriptions
1975	Weiss et al <sup>6</sup>	USA	51% of all post-menopausal women surveyed in Seattle-Tacoma	
1976	Weiss et al <sup>7</sup>	USA		\$70 million
1977	Waldron <sup>8</sup>	USA		+130% in prescriptions per capita between 1950-1972
1980	Fausto-Stirling	USA	2 million	
1990-94	Brink <sup>9</sup>	USA	5.8 to 12.7 million (200+% increase )	
1996	Immen <sup>10</sup>	Can		2.86 million prescriptions

<sup>1</sup>Douglas Marshall and Milan Korcok, "Old Grey Mare Worth Millions Now," Maclean's Vol. 79 (August 6, 1966), p. 1.

<sup>2</sup>Wilson (1966), p. 15. On page 21 Wilson estimated that the number of women using hormones for menopause would grow to more than 14,000 by 1967.

<sup>3</sup>McCrae, p. 114 cites U. S. Census Bureau data published in 1979.

<sup>4</sup>Fausto-Stirling, p. 112 The six million estimated were specifically women who had started long-term treatment with Premarin (Ayerst Labs' brand name for estrogen), making it "the fourth or fifth most popular drug in the United States."

<sup>5</sup>McCrae, p. 114 cites Hoover et al in the New England Journal of Medicine.

<sup>6</sup>McCrae, p. 114 cites Weiss's study also published by New England Journal of Medicine in 1976.

<sup>7</sup>Kaufert and McKinlay, p. 114.

<sup>8</sup>Kaufert and McKinlay p. 114.

<sup>9</sup>Brink (1995), p. 90. The number of estrogen users was compiled from those women aged 45-64, combining the peri and post menopausal age groups. The author estimated however that 3 out of 4 women in that cohort did not take estrogen, because of contraindications such as breast cancer or because they are "paralyzed by uncertainty".

<sup>10</sup>Wallace Immen, "Unexpected Result in Menopause Survey," Globe and Mail (October 8, 1997).



### Calcium: Supplement Mania

Calcium supplement sales skyrocketed after the NIH conference in 1984, despite its appeal as a substance "as sexy as a slice of Velveeta."<sup>60</sup> Table 8.2 charts the sales of calcium supplements during the 1980's from several sources. In 1984, a Harvard Medical School professor complained "Two years ago, there was only one calcium supplement on the market. Now there's such a quagmire, my patients are confused."<sup>61</sup> Consumer Reports evaluated the range of prices per 1000 mg for 4 types of calcium tablets, with Tums Antacid (made by Thayer-Norcliff) nominated as the 'best buy' of products surveyed at only U.S. \$0.12 per day.<sup>62</sup>

Competing calcium carbonate tablets were said only to differ in tablet size, price and their source of calcium from ground-up oyster shells, despite wide price variations (Table 8.3).<sup>63</sup> Dr. Robert Heaney, the calcium researcher commented, "The pharmaceutical industry is selling products on the basis of calcium content alone. Sometimes that is sheer fraud."<sup>64</sup> To assist consumers in discerning between these products, a multi-million dollar advertising campaign was launched in a "calcium-tablet retailing war" by three large companies, Lederle Laboratories, Miles Laboratories, and Marion Laboratories. The latter company, which in the early 1950's pioneered manufacturing of modern calcium supplements with Os-Cal, was spending \$5 million on advertising its product by the mid-1980's. Norcliff-Thayer recast its \$7-10 million advertising

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<sup>60</sup>Clark, p. 48.

<sup>61</sup>Ibid., p. 48.

<sup>62</sup>Consumer Reports (1984), p. 579. A dose of 1000 mg was estimated to be the daily supplemental regimen.

<sup>63</sup>Eli Lilly was listed as a company which produced a mid-range priced calcium carbonate.

<sup>64</sup>Toufexis, p. 89.

## Calcium

**Table 8.2** Growth Trends in Calcium Supplement Sales<sup>1</sup>

<u>Year</u>	<u>Source</u>	<u>Growth in Sales(\$)</u>	<u>% Growth</u>
1980-85	Finlayson <sup>2</sup>	\$25.7-180 million	700% in 5 years
1983-86	Clark <sup>3</sup>	\$47.0-125 million	266% in 3 years
1980-86	Toufexis <sup>4</sup>	\$18.0-240 million	1300% in 6 years

**Table 8.3** Highest and Lowest Daily Cost Per 1,000 Mg of Selected Calcium Preparations (1984)

<u>Type of Tablet</u>	<u>\$Low Price</u>	<u>\$High Price</u>
Calcium Carbonate (40% calcium)	0.12	0.34
Calcium Lactate	0.26	0.55
Calcium Gluconate (9% calcium)	0.56	1.51
Chelated Calcium	0.35	2.33

Source: Consumer Reports, 1984

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<sup>1</sup>None of the calcium trade trends specified whether sales included all of North American, just the U. S. or were worldwide. The Maclean's article attributed its figures to U.S. calcium supplement manufacturers.

<sup>2</sup>Ann Finlayson, "New Aid for Bone Victims," Macleans Vol. 99 (April 7, 1986), p. 42.

<sup>3</sup>Clark, p. 48.

<sup>4</sup>Anastasia Toufexis, "Going Crazy over Calcium," Time Vol. 129 (February, 1987), p. 88.

budget to emphasize the high percentage of calcium carbonate in its 55-year-old product Tums.<sup>65</sup> Pharmacologist Ralph Shangraw concluded in a 1987 study that half of 80 brands of calcium investigated did not disintegrate, indicating that the calcium in the tablet would not have been absorbed by the body.<sup>66</sup> As of 1997, dietary supplements still had not been subjected to testing for safety or usefulness in the US.<sup>67</sup>

### Food and Dairy Industry

In the late 19th century, brand name advertising of foods was introduced by Quaker Oats. Subsequently in the 20th century, advertising became an important source of nutritional information for some North Americans.<sup>68</sup> From the 1970's onward, most popular and medical literature on osteoporosis mentioned the importance and superiority of increased intake of calcium through healthy food choices.<sup>69</sup> Dairy associations and grocery chains also became involved, therefore, in activities which promoted osteoporosis awareness. For example, a 1984 article listing available resources drew attention to "a pamphlet outlining the proper nutritional approach to fighting osteoporosis" available through Safeway Stores.<sup>70</sup> For both cultural reasons and medical fears about saturated fat, dairy product sales had declined in the West during the

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<sup>65</sup>Mark D. Uehling, "Cashing in on a Booming New Market," Newsweek (January 27, 1986), p. 52. Finlayson, p. 43. Uehling estimated \$7 million spent on the campaign while Finlayson reported \$10 million.

<sup>66</sup>Mann, p. 74.

<sup>67</sup>Jane Brody, "In Vitamin Mania, Millions Take a Gamble on Health," New York Times (October 26, 1997), p. 29.

<sup>68</sup>Nancy Worcester, "The Obesity of the Food Industry," in Women's Health: Readings on Social, Economic and Political Issues, Nancy Worcester and Mariamne H. Whatley, eds., (Dubuque, Iowa: Kendall/Hunt Publishers, 1988), p. 231.

<sup>69</sup>Toufexis, p. 89. The writer explained the higher rate of calcium's bio-availability in dairy products as compared to those in supplements.

<sup>70</sup>"Young Women, Take Care of Your Bones," Changing Times Vol. 38 (December 1984), p. 78.

1980's. By the mid-1980's, the U.S. National Dairy Board was spending \$17 million to promote milk sales, using calcium to prevent osteoporosis as the rationale.<sup>71</sup> At the same time, to cash in on the opportunity to boost sales, the U.S. food industry fortified with calcium common food basket items such as milk, juices, and cereals, and a wide range of other processed goods. In Britain by 1989, the dairy industry had spent £10 million on a new promotional campaign in which one of the target audiences was "the gray consumer who can suffer from irreparable bone damage through lack of calcium."<sup>72</sup>

In Canada, fortification has been a hotly contested policy. Current standards permit only the restoration of substances removed in the processing of foods. Concerns about fortification revolve around the upper limit of safety of calcium levels for all groups of people who are ingesting these foods. Joyce Gordon described the assumptions behind the policy differences as the U.S.'s "We'll put it out there and let the buyer beware," while the Canadian government has shown a more "paternalistic attitude of 'We'll make decisions for you'." OSC has been concerned that Canadians have to drive across the border to buy fortified orange juice, because they want consumers to have the choice to purchase such products at home. Other food-related regulatory issues important to osteoporosis constituencies are the harmonization of required daily intakes between Canada and the U.S. and labeling issues for various products.<sup>73</sup>

Dr. Joan Harrison argued that "pushing milk as a public health policy is different from pushing pills."<sup>74</sup> Donna Shalala, the Secretary of the U.S. federal department of health, has

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<sup>71</sup>Uehling, p. 52.

<sup>72</sup>Coney, p. 127.

<sup>73</sup>Interview with Joyce Gordon, January 8, 1998.

<sup>74</sup>Interview with Joan Harrison, January 8, 1998.

recently appeared as the celebrity of the day to encourage drinking milk because: "This may be the land of plenty, but there's something Americans, especially teenagers, aren't getting enough of--calcium. This could lead to osteoporosis" (Figure 8.1).<sup>75</sup>

### **Money Makers of the late 1990's: Bisphosphonates & SERMs**

An estimated three-quarters of the "non-compliant" peri- and postmenopausal women aged 45-64<sup>76</sup> have been targeted as a potential market for several new breakthrough pharmaceutical treatments which were approved for use in the U.S. and in Canada during the 1990's.<sup>77</sup> Procter and Gamble's Didronel (etidronate) was the first bisphosphonate released said to reduce fractures due to osteoporosis. This drug was estimated to cost \$300 per annum in 1990, before F. D. A. approval had been obtained for use in osteoporosis.<sup>78</sup> Fosamax (alendendrate), another bisphosphonate manufactured by Merck, which acts by coating the bone surface and inhibiting bone resorption, was approved by the U.S. F. D.A. in 1995, by Canada Health in 1997, and in approximately 40 other countries (Figure 8.2). Joyce Gordon called it the "wonder drug of the century."<sup>79</sup> Fosamax costs US\$50 per month, making it a more expensive treatment than estrogen. Merck estimated in 1996 that more than 1.9 million patients worldwide were already

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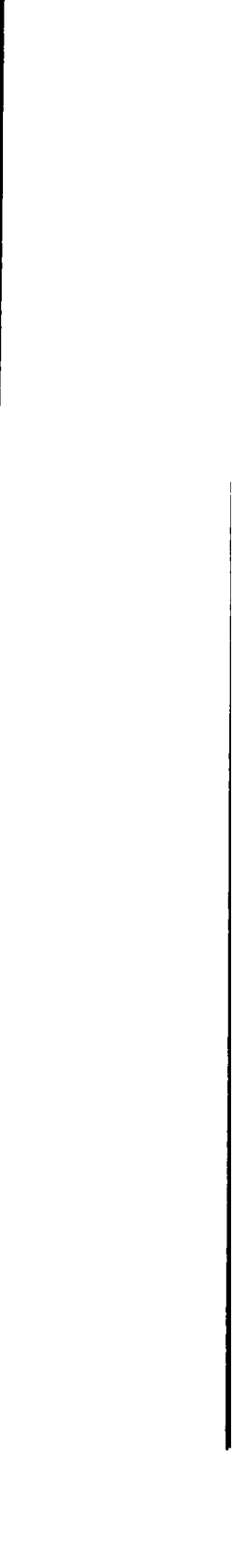
<sup>75</sup>"Milk. Where's Your Mustache?" New York Times Magazine (February 1, 1998), p. 14. This was a full-page colour advertisement.

<sup>76</sup>Daniel M. Witt and Tammy R. Lousberg, "Controversies Surrounding Estrogen Use in Postmenopausal Women," The Annals of Pharmacotherapy Vol. 31 (June 1997), pp. 745.

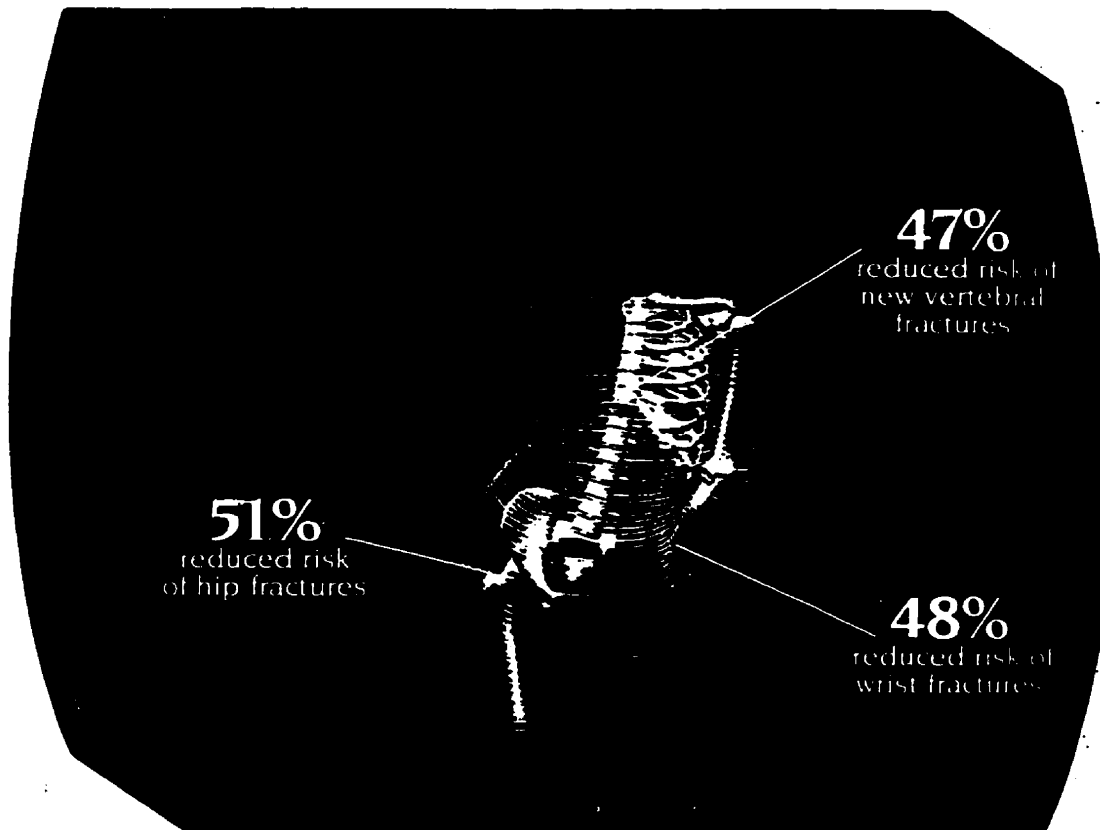
<sup>77</sup>Hologic Inc. Report, submitted to the U. S. Securities and Exchange Commission, September 29, 1996, Form 10-K, p. 3.

<sup>78</sup>"A Breakthrough for Brittle Bones," U. S. News & World Report Vol. 109 (July 23, 1990), p. 14. Estimated cost of an annual regimen of estrogen in the US was \$260 including patient visits. A. N. A. Tosteson, "A Review and Update of Cost-Effectiveness of Hormone Replacement Therapy in the Menopause," in Medical-Economic Aspects of Hormone Replacement Therapy, Proceedings of a Ciba-Geigy Workshop Basel, Switzerland, held March 9, 1993. J.-M. Cossery, ed. (New York: Parthenon Publishing Group, 1993), p. 191.

<sup>79</sup>Interview with Joyce Gordon, January 8, 1998.



# New Landmark Study in Postmenopausal Women with Osteoporosis Proves Pr FOSAMAX® Significantly Reduces the Risk of Fractures<sup>1,†</sup>



Wojtek Olszynski and Tibor Harmathy, "The Medical Post's Q & A Osteoporosis," *The Medical Post*, (May 6, 1997), p. back cover.

- The vertebral fracture arm of the Fracture Intervention Trial (FIT), a new landmark study in osteoporosis involved 2,027 community-dwelling, postmenopausal women with osteoporosis and existing vertebral fractures.<sup>1</sup>
- The results of FIT showed that FOSAMAX® significantly reduced the risk of hip, vertebral, and wrist fractures.<sup>1</sup>
- In FIT, FOSAMAX® was generally well tolerated and the side effects associated with FOSAMAX® did not differ significantly from placebo.<sup>1\*</sup>

\* Please refer to the enclosed prescribing information for contraindications and precautions with respect to upper gastrointestinal adverse events

† hip, vertebral, and wrist fractures

<sup>1</sup> Black DM et al for the Fracture Intervention Trial Research Group. Randomised trial of effect of alendronate on risk of fracture in women with existing vertebral fractures. *Lancet*. 1996; 348:1535-41

**FOSAMAX®**

Source:

Builds bone to build independence

alendronate sodium



MERCK SHARP & DOHME CANADA  
DIV. OF MERCK FROSST CANADA INC.  
1000 14th Avenue

BEFORE PRESCRIBING, PLEASE CONSULT THE PRESCRIBING INFORMATION.

®Trademarks Merck & Co., Inc., Merck Frosst Canada Inc. Use with care

taking Fosamax.<sup>80</sup> Estrogen analogues, the new class of drugs known as SERMs, such as Raloxifene (Eli Lilly) are predicted to become popular as hormone substitutes for osteoporosis patients because they are believed to be without carcinogenic side effects (Figure 8.3).<sup>81</sup> Premarin's manufacturer has already launched a defensive advertising campaign to protect its market share from SERMs (Figure 8.4).<sup>82</sup>

### **Sodium Fluoride, Calcitonin**

When Dr. Joan Harrison attended the NIH Conference in 1984, sodium fluoride was being discussed in medical literature as "the most hopeful treatment." But at the conference, sodium fluoride did not fare as well as either estrogen or calcium. Harrison suggested that a major reason for the delay in its development as a therapy was that "there was no money in it for the drug companies" since the element cannot be patented.<sup>83</sup> More recently in 1995, a slow-release combination of fluoride and calcium has been under study.<sup>84</sup> A calcitonin nasal spray developed by Sandoz to replace previous treatments only available by injection, was also approved by the FDA for treatment of osteoporosis in 1995; however, neither nasal sprays nor injected drugs have the same acceptability to consumers as a tablet.<sup>85</sup>

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<sup>80</sup>Hologic Inc. Report, submitted to the U. S. Securities and Exchange Commission, September 29, 1996, Form 10-K, p. 3.

<sup>81</sup>Advertisement from New York Times (March 8, 1998).

<sup>82</sup>Advertisement from New York Times Magazine (February 15, 1998). N.B. the reference to the Wyeth-Ayerst Women's Health Research Institute.

<sup>83</sup>Interview with Dr. Joan Harrison, January 8, 1998.

<sup>84</sup>Brink (1995), p. 90 who cited a study in the Annals of Internal Medicine (September 15, 1995).

<sup>85</sup>Susan Brink, "A High-Tech Debate Over Women's Bones," U. S. News and World Report Vol. 121 (September 30, 1996), p. 70.





Now that you're through with menopause, your body makes 80% less estrogen. Losing estrogen can mean losing bone.

Left untreated, that can lead to osteoporosis. But now there's a new way to prevent osteoporosis: Evista.

Evista isn't a traditional hormone. It's a SERM: Selective Estrogen Receptor Modulator, and it's been tested in clinical trials with over 12,000 women worldwide. In most women, Evista preserves bones and helps keep them strong. And while it preserves bones, it may also help lower cholesterol. Evista can even increase bone mass—though not quite as much as estrogen replacements.

Importantly, women taking Evista had no increased risk of breast or uterine cancer in studies of up to three years. And most women didn't get the bleeding, bloating, and breast tenderness often associated with estrogen replacements.

Evista is for the prevention of osteoporosis in postmenopausal women. If you are Caucasian or Asian, have a slender build, do not exercise, or have a family history of osteoporosis, you may be at increased risk. Also, if you don't get enough calcium in your diet, you should take calcium supplements. Your doctor will tell you that Evista will not help with hot flashes and its effect on fractures is not yet known.

If you are or can still become pregnant, have liver problems, or have had blood clots that required a doctor's treatment, Evista is not for you. Similar to estrogen replacements, taking Evista may increase the risk of these clots—being immobile for a long time adds to that risk. The most commonly reported side effects of Evista were hot flashes and leg cramps, although most women didn't find them serious enough to stop taking Evista.

Ask your doctor about Evista. It's available by prescription only. For more information, call toll-free 1-888-384-7823, visit [www.evista.com](http://www.evista.com), and read the next page. Because now you have a new choice.

Source:

New York Times, March 8, 1998.

Figure 8.3

Raloxifene Ad. 1998 (2 pages)

**EVISTA**<sup>®</sup>  
raloxifene HCl

There's life after menopause.™



# When considering menopause and the consequences of its associated estrogen loss, consider the entire body of evidence.

**Brain:** In the past 10 years, research has explored questions surrounding the consequences of menopause and cognitive functioning, memory, and Alzheimer's disease.

**Eyes:** Ongoing research continues to investigate cataracts in post-menopausal women, as well as age-related macular degeneration, the leading cause of blindness in the aging population.

**Uncomfortable symptoms:** For over 50 years, it's been known that estrogen loss associated with menopause causes the hot flashes and night sweats that often influence mood and sleep.

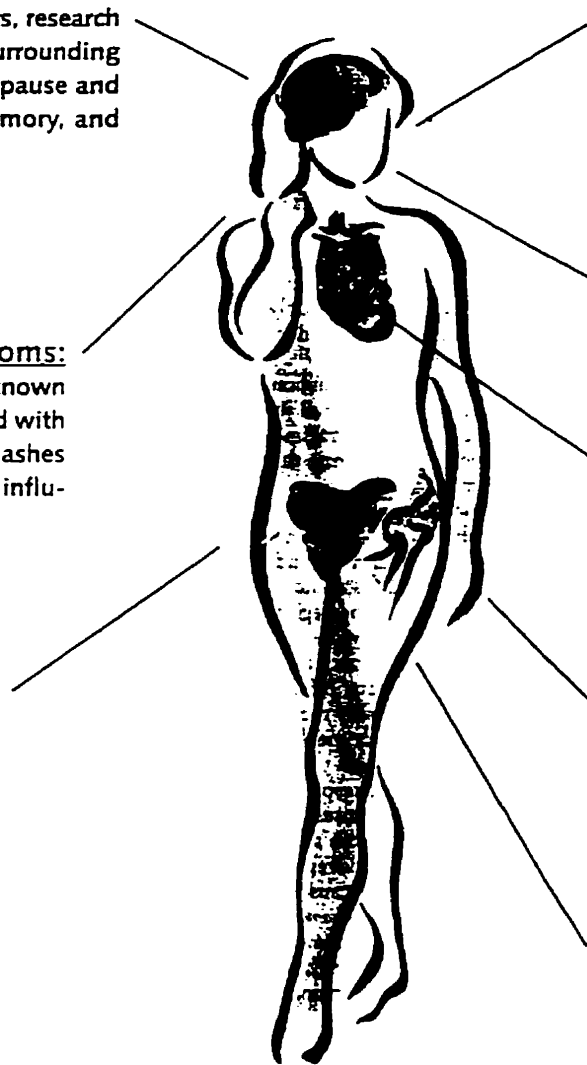
**Teeth:** Research continues to explore the association between tooth loss and menopause.

**Heart:** Since the 1950s, large-scale clinical trials have researched cardiovascular disease in post-menopausal women, looking at cholesterol, heart attacks, and death.

**Sexuality:** Half a century of study has confirmed that estrogen loss causes vaginal thinning and dryness and increases the frequency of vaginal infections, which can be uncomfortable and interfere with intimacy.

**Bone:** Decades of research have proven that estrogen loss decreases bone mineral density and increases the risk of fractures from osteoporosis.

**Colon:** Ongoing research continues to explore the risk of colon cancer among women after menopause.



Today, we know more than ever about the consequences of estrogen loss during and after menopause, and the effect it has on your entire body. So-called "selective" or "designer" estrogens may not impact a number of health issues associated with menopause. Talk to your doctor, because problems resulting from estrogen loss aren't always selective.

This message is sponsored by the Wyeth-Ayerst Women's Health Research Institute, devoted exclusively to the discovery and development of medicines that help women live healthier lives.



Figure 8.4 Defensive Estrogen Ad, 1998

Source: New York Times Magazine, February 15, 1998.

### **Diagnostic Imaging: A Booming Industry in the 1990's**

Decisions about the cost-benefit of mass screening for the numbers of persons at risk of developing osteoporosis have significant financial and ethical implications for society.<sup>86</sup> Hip fractures alone have been predicted to result in great suffering to individuals and increasingly high direct and indirect costs to society and families. A major issue for practitioners, individual patients, and government policy makers, therefore, has been the issue of screening for early detection and early intervention.<sup>37</sup>

According to a U.S. health industry analyst, "Diagnostic imaging ...is a prime example of how 'we continue to invest in technology in an absolutely irrational way'." Medical sociologists and other critics have pointed out that overuse of new diagnostic procedures have been typical because "unlike surgery or invasive procedures, they 'don't require the clinician to take any real risk'."<sup>38</sup> Additional economic motivation for extensive use of bone densitometry also exists in the for-profit U.S. system, where expensive technology such as bone scanning equipment must be heavily utilized in order to amortize the purchase and maintenance costs of

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<sup>36</sup>Stevenson and Marsh, p. 35. They comment that although there is insufficient evidence to analyse whether mass screening is a valid policy decision, their current practice for patients at menopause clinics (at the Wynn Institute for Metabolic Research and King's College Hospital Menopause Clinic in London) "is to perform bone density measurements at the hip or spine...in those patients who present with osteoporotic fracture, risk factors or in those women who request HRT solely for the treatment or prevention of osteoporosis."

<sup>37</sup>A World Health Organization study group established a technical definition for osteoporosis as "a value for bone mineral density that is 2.5 Standard Deviations or more below the value in young adults." Quoted from the WHO Study Group. "Assessment of fracture risk and its application to screening for postmenopausal osteoporosis". WHO Technical Report Service Vol. 843 (1994), pp. 1-129 in a letter from Joseph A. Foldes and Mordecai Popovitzer, to the New England Journal of Medicine Vol.334 (11) (March 14, 1996), p. 735.

<sup>38</sup>Consumer Reports (1992), p. 438. The report cited specifically CT and MRI, two expensive technologies which had grown exponentially in the 1980's. The first observation was attributed to Mark Chassin a physician and senior vice president of Value Health Sciences; the second quote is from Ann Lennarson Greer at University of Wisconsin.

the machines.<sup>89</sup> Fiscal pressures therefore exist to screen for larger rather than smaller numbers of people. Research on cost benefits has tended to lag behind the dissemination of medical technology, despite studies by such organizations as the California think tank Rand Corporation which began investigations of overtreatment issues in the late 1970's.<sup>90</sup>

By 1986, advertisements urging osteoporosis screening programs for "most women between 45-70 years" already existed, despite the lack of longitudinal data proving their usefulness in predicting fractures. Screening of all U.S. postmenopausal women would take 6 to 12 years and "cost a fortune." In the U.S. only half the insurers in 1996 were reported to pay for DEXA tests, while most Medicare carriers covered a portion of the costs.<sup>91</sup>

Growth in U.S. scanning sites swelled from only 25 centers, at the time of the 1984 NIH conference, to 500 clinics by 1986.<sup>92</sup> By the late 1990's, the numbers quadrupled to roughly 2,000 U.S. locations.<sup>93</sup> In Canada, the majority of bone scanning devices have been purchased for Ontario, Quebec and Maritime urban centres.<sup>94</sup> Accessibility to this technology is more limited in Western Canada.<sup>95</sup>

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<sup>89</sup>M. Rosenberg, lecture at Queen's University, Nov. 20, 1997.

<sup>90</sup>Consumer Reports (1992), p. 439.

<sup>91</sup>Ott, pp. 875-76.

<sup>92</sup>Napoli (1988), p. 115.

<sup>93</sup>The NOF through its 1-800 number has made available a list of the U.S. locations.

<sup>94</sup>Telephone interview with Marie Chevrier, February 5, 1998, of Aymes Company, the sole distributor of Lunar Corporation technology in Canada. She phoned me after I tried to get information directly from Lunar in Wisconsin for sales and site location data. Canadian physicians can purchase their own equipment for testing. In Ontario, since 1992, such arrangements are legal under the Independent Health Facilities Act. Patients must pay for these scans from personal resources or private insurance coverage. Telephone Interview March 12, 1998 with Rob Kennedy, of OHIP's Claims Branch.

<sup>95</sup>Interview with Joyce Gordon, January 8, 1998.

Four manufacturers of bone densitometry equipment have captured the market: Lunar Corporation (Figure 8.5), Hologic Inc., Norland, and Osteometer.<sup>96</sup> Hologic, which pioneered DEXA technology, was founded in 1986 and enjoyed record revenues of \$106,689,431 in 1997 by selling 3,200 systems worldwide.<sup>97</sup> Foreign sales were responsible for 40% (1996) and 58% (1995) of Hologic's total revenues, which were attributed to the "more advanced regulatory status for drug therapies for osteoporosis in certain foreign countries."<sup>98</sup> Hologic also introduced fan-beam DEXA technology in 1995, which enabled DEXA to be shifted "from research to the needs of routine clinical practice."<sup>99</sup> Their new portable "low cost" ultrasound device called SAHARA, which works without ionizing radiation has been selling briskly in the international market (Figure 8.6). The company has identified "the emerging primary care and OB/GYN segment of the osteoporosis market" as its new target for increasing sales.<sup>100</sup> Another low cost technology which Hologic has been developing is inexpensive strip tests to measure biochemical markers for the assessment of bone mineral status between bone scans.<sup>101</sup>

Hologic Inc.'s expectations are for continued growth in sales because newly approved therapies have enhanced the "the focus on osteoporosis detection and treatment,... and, in the

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<sup>96</sup>Phone interview with Susan Arndt, Communications Department, National Osteoporosis Foundation, Washington, D. C., February 5, 1998. Standard business directories have not provided data to ascertain the magnitude of the current market. Inquiries have been made to each company directly.

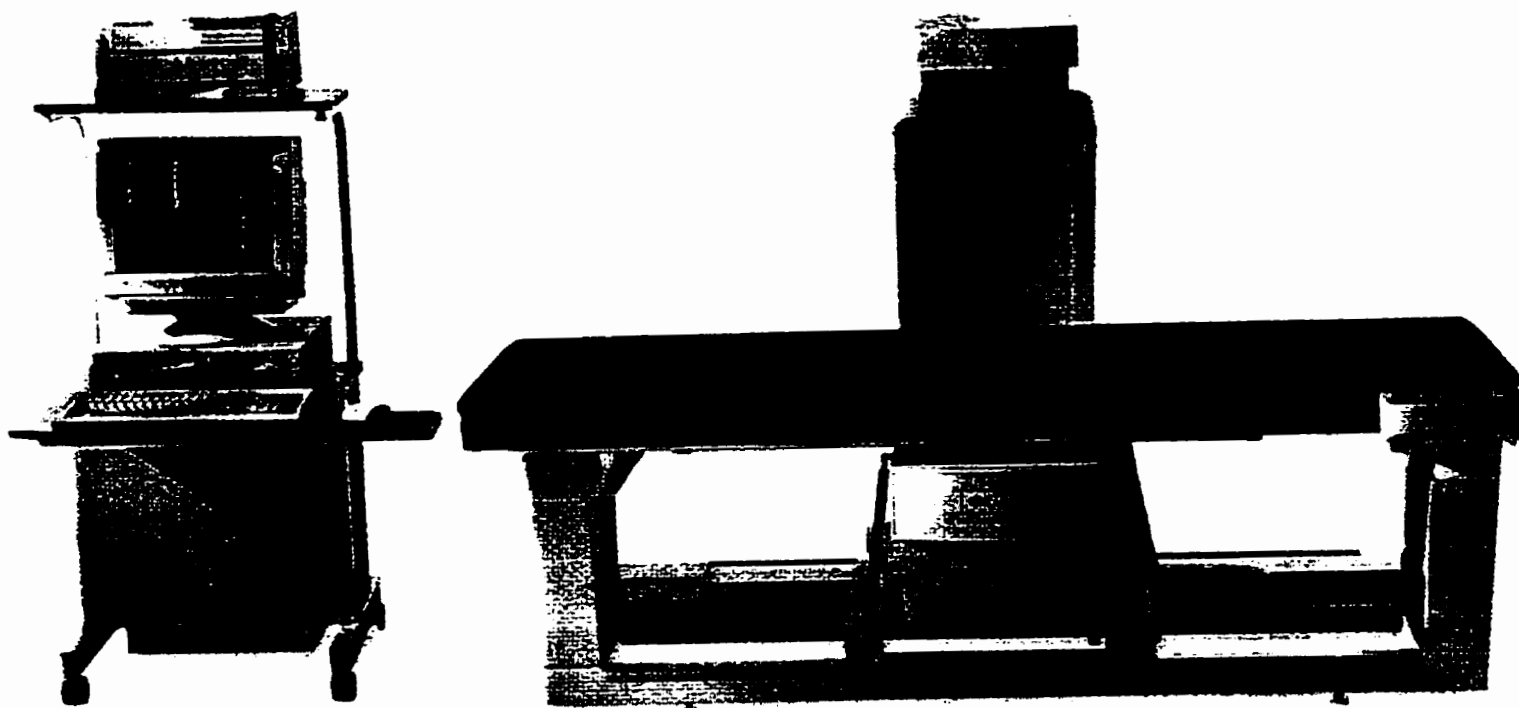
<sup>97</sup>Hologic Inc., "A Decade of Leadership in Bone Densitometry," 1996 Annual Report, p. inside cover.

<sup>98</sup>Hologic Inc. Report, submitted to the U. S. Securities and Exchange Commission, p. 11. I would interpret "More advanced" as a more relaxed regulatory environment.

<sup>99</sup>Hologic Inc., 1996 Annual Report, p. 9.

<sup>100</sup>Hologic Inc. "Hologic Announces Fourth Quarter and Record Fiscal 1997 Operating Results," News Release, (Waltham, Massachusetts, Nov. 12, 1997), p. 2. "OB/GYN" for obstetrician/gynaecologists is a direct quote from the news release. The release also noted that this company was the only one to receive an FDA Advisory Panel recommendation for approval of an ultrasound bone densitometry device.

<sup>101</sup>Hologic Inc., Report, submitted to the U. S. Securities and Exchange Commission, p. 6.

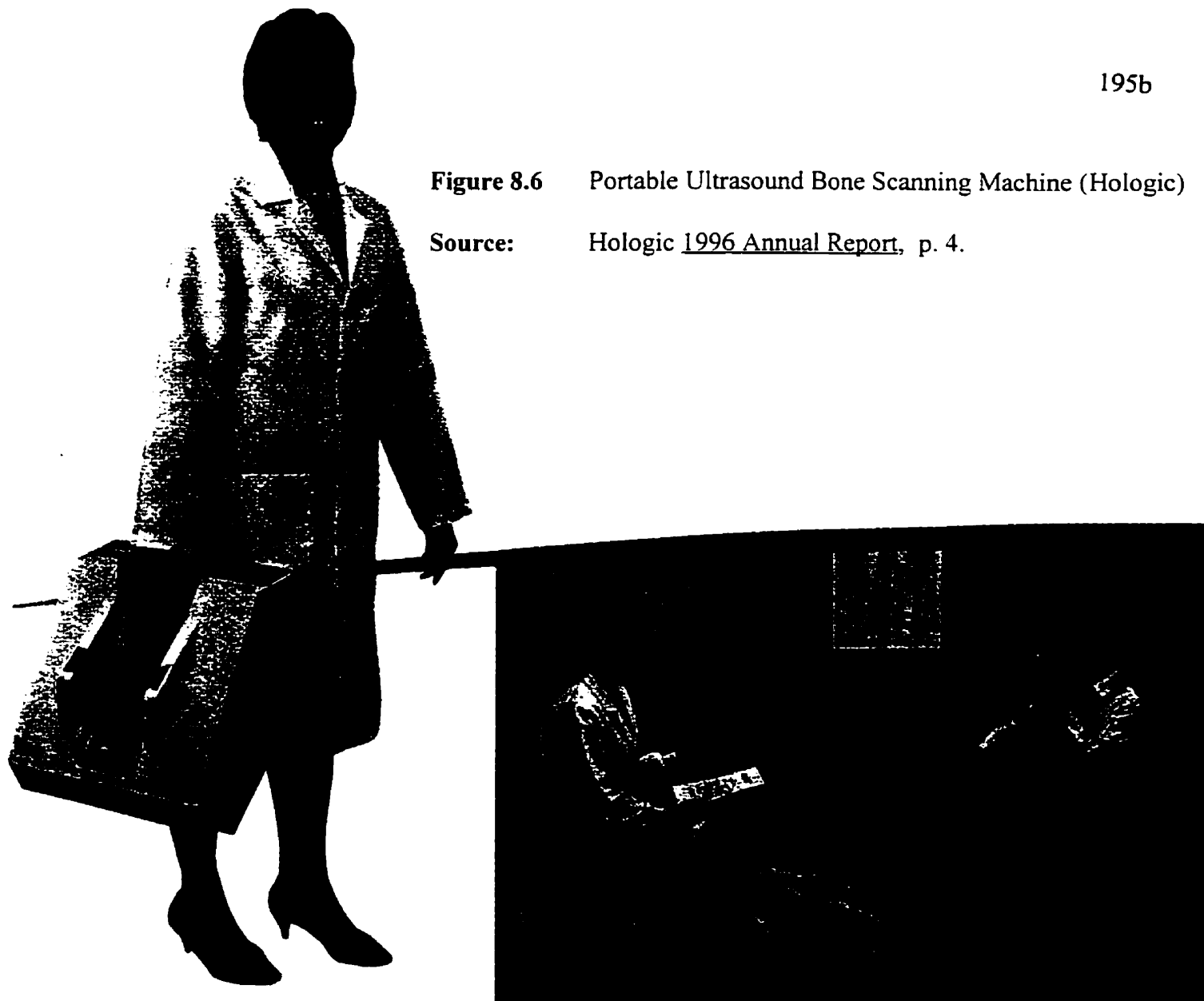


**Figure 8.5** Photograph of DEXA Bone Scanning Machine (Hologic)

**Source:** Hologic, 1996 Annual Report, Front Cover.

**Figure 8.6** Portable Ultrasound Bone Scanning Machine (Hologic)

**Source:** Hologic 1996 Annual Report, p. 4.



*Sahara Clinical  
Bone Sonometer —  
Introduced in late  
fiscal 1995, Sahara  
is a compact and  
portable dry ultra-  
sound system. Low  
cost and ease of  
use make Sahara  
a unique system  
for preliminary  
assessment of bone  
mineral status in a  
physician's office.*

United States. the recent increase in the recommended Medicare reimbursement rates for bone densitometry examinations."<sup>102</sup> In addition, "the aging population and an increased focus on women's health issues and preventive medical practices has created a growing awareness among patients and physicians that osteoporosis is treatable."<sup>103</sup> Interestingly, Dr. William A. Peck, the 1984 NIH Osteoporosis Chairperson, was appointed to Hologic's current Board of Directors<sup>104</sup>

Estimates of bone scanning costs by the different individual technologies which have been spread through North American testing sites are summarized in Table 8.4. A portable DEXA (pDEXA) machine with limited capability to measure bone loss in the forearm has recently been made available in clinics and private physicians' offices. In 1996, retail drug stores in the Walgreen chain sponsored a two month blitz of pDEXA testing in its stores in central Florida, one of the highest density locales for seniors. With Merck supplying the educational resources, this campaign reached 6,000 women who were charged \$27 per test.<sup>105</sup>

A partnership exists between Hologics and Merck in the U. S., and their equipment was used in Merck's clinical trials. Merck also owns biochemical markers which are also being produced to diagnose/monitor patients. Drug companies continue to look for lower cost diagnostics because they realize there is not enough of the high tech diagnostic equipment to support the growing need; biochemical markers would be cheaper than bone scans.

To increase sales to "new" patients, more asymptomatic people need to be diagnosed.

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<sup>102</sup>Hologic Inc., News Release (November 12, 1997), p. 1.

<sup>103</sup>Hologic Inc., Report, submitted to the U.S. Securities and Exchange Commission, p. 3.

<sup>104</sup> Hologic Inc., 1996 Annual Report, p. back inside cover. Dr. Peck's current academic position was listed as the Executive Vice Chancellor for Medical Affairs and Dean, Washington University School of Medicine in St. Louis.

<sup>105</sup>Brink (1996), p. 71.



**Table 8.4:** Estimated Costs of Bone Densitometry (By Type of Diagnostic Imaging)

<u>Year</u>	<u>Source</u>	<u>Country</u>	<u>Estimated Costs per Test</u>	<u>Equipment</u>
<u>SPA</u> (Effective for Cortical Bone Density Measurements)				
1986	Napoli <sup>1</sup>	US	\$40 -200	\$20,000 <sup>2</sup>
<u>DPA</u> (Effective for Spinal Density Measurements) <sup>3</sup>				
1986	Napoli <sup>4</sup>	US	\$100-350	\$30,000-70,000
<u>CT Scanning</u> (Effective for Spinal Density) <sup>5</sup>				
1986	Napoli <sup>6</sup>	US	\$100-300	\$0.5-1 million
1996	Brink <sup>7</sup>	US	\$300	
<u>Ultrasound</u> (Portable testing)				
1998	Gordon <sup>8</sup>	Can		\$35,000-40,000
<u>DEXA</u> ("The Current Gold Standard")				
1996	Brink <sup>9</sup>	US	\$125-150	
1998	Gordon <sup>10</sup>	Can	\$75-180	\$150,000

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<sup>1</sup>Napoli (1988), p. 117.

<sup>2</sup>D. R., "The Thin-Bone Detector," p. 16.

<sup>3</sup>Richard Mazess, Proceedings of the Congressional Hearing on Osteoporosis, p. 116. In Mazess's deposition to the 1985 Congressional hearing he estimated that 100-200 clinical installations of DPA were in use at that time.

<sup>4</sup>Napoli (1988), p. 117 for machine costs and Napoli (1986), p. 17.

<sup>5</sup> Treichel, p. 325. In 1983 only 50 medical centres in the U. S. and Europe at that time had the new CT scanning modifications which were able to measure only the mineral content of spinal trabecular bone.

<sup>6</sup>Napoli (1988), p. 117.

<sup>7</sup>Brink (1996), p. 71.

<sup>8</sup>Interview with Joyce Gordon, January 8, 1998.

<sup>9</sup>Brink (1996), p. 71.

<sup>10</sup>Interview with Joyce Gordon, January 8, 1998. Clarification of the differential in DEXA costs from phone interview with Mary Boyer, February 13, 1998. DEXA costs \$75 per scan in Quebec but is strictly used there only after a person is diagnosed with osteoporosis. In Ontario, the DEXA scan is reimbursed at \$200 per test, and can be utilized either for diagnosis of the disease or early detection of bone mass loss.

Another new scanning device, a portable x-ray technology called Radiographic absorbitometry, x-rays the hand which is placed resting next to a metal strip. The x-ray film is then sent to a laboratory, called The Bone Institute, to diagnose osteoporosis. When offered to Canada, this technology was rejected on the grounds that The Bone Institute did not have "arm's length" distance from Merck-- its senior management was co-terminus with executives of Merck.<sup>106</sup>

Senior officials of the Osteoporosis Society of Canada expressed firm support for expanded baseline bone density screening of women in Canada. Joyce Gordon "would love to see every woman at high risk of osteoporosis at age fifty with a baseline screening, "first using lower-cost testing and then with DEXA, if necessary." Currently, such tests may not be reimbursed by all provincial health insurance plans. Testing sometimes has been "underwritten." by drug companies, who own the diagnostics firms, and the dairy industry.<sup>107</sup> Indiscriminate testing of low-risk women in shopping malls may have been initiated by commercial interests similar to that in the U.S., but public funding for bone densitometry will likely continue to be restrained in Canada by the rationing of services.

### **Cost Benefits of Screening for Osteoporosis**

Selling screening technology to policy makers and funders has been justified in terms of humanitarian ideals for relief of suffering and the potential for savings in the health care system. Health experts have tried to develop measures which estimate the cost-effectiveness of various types of screening for osteoporosis in relationship to a fracture avoided or lives saved. Estimates of savings from each "incident avoided" in various jurisdictions have been published recently

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<sup>106</sup>Telephone interview Mary Bowyer, February 13, 1998.

<sup>107</sup>Interviews with Joyce Gordon and Mary Bowyer, January 8, 1998. A follow-up phone call with Mary Bowyer on February 13, 1998 clarified that some of the scanning equipment has been donated to hospitals by the dairy industry.

in medical journals and are summarized in Table 8.5.

### **Biomedical Devices for the Orthopedics Industry**

New biomedical technologies for orthopedic devices have created massive commercial opportunities during the last decade and have already realized an estimated worth of US\$7-8 billion world-wide for "75 million women who are affected by osteoporosis."<sup>108</sup> Product sales for the industry's segment which has developed innovations for bone regeneration to treat conditions arising from skeletal trauma, osteoporosis and other bone diseases have been growing at 13-14% per year. Sydney Pugh, a principal of the Kingston firm, Millenium Biologix, founded in 1992, has been marketing implantable synthetic bone remodeling technology currently used by pharmaceutical companies to test drugs for osteoporosis. He reported that the industry overall has forecasted sales of U.S. \$12-13 billion by 2002-2003.

Pugh described the development of new investigative, diagnostic, and therapeutic tools for osteoporosis as a "hot area," because of the impending demographic changes and estimated costs. He asserted that interest in addressing diseases of the aging stemmed from the need for "replacement for body parts that have worn out."<sup>109</sup>

### **Conclusions**

Scientific objectivity has been compromised by intentional or unintentional influences in forecasting the risk to millions of people or in evaluating therapies and diagnostic procedures

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<sup>108</sup>Harry Kilfoyle, "Township Company is Good to the Bone", Kingston Whig-Standard (April 5, 1997), p. 17.

<sup>109</sup>Telephone interview with Sydney Pugh, President and CEO of Millenium Biologix, January 30, 1998. Bio-bone, an implantable structural scaffolding which uses a natural bone remodelling process to repair tissue, has been a spin off of the company's other medical implant devices. Co-funded or collaborative relationships have been established for feasibility and research on the technology with such groups as the Canadian Space Agency, the NASA Life Sciences Center at the University of Alabama in Huntsville, and a 5 Year Program called Health Osteoporosis with the European Union and the European space industry. Experiments using the company's technology have been scheduled to be on the STS-95 Discovery flight in October 1998 with John Glenn.

**Cost Savings Estimated from the Implementation  
of Screening for Osteoporosis**

**Table 8.5:** Estimated Savings from Introduction of Screening for Osteoporosis

<u>Year</u>	<u>Author</u>	<u>Country</u>	<u>Estimated Costs</u>
1990	Tosteson et al <sup>1</sup>	US	\$11,700 per life year saved \$22,100 per life year saved
1996	Barlow et al <sup>2</sup>	UK	£ 1,391 per fracture averted £22,558 per life year saved

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<sup>1</sup>Anna N. A. Tosteson, Daniel I. Rosenthal, L. Joseph Melton III, and Milton C. Weinstein, "Cost Effectiveness of Screening Perimenopausal White Women for Osteoporosis: Bone Densitometry and Hormone Replacement Therapy," Annals of Internal Medicine Vol. 113 (1990), pp. 594-603. The article evaluated several clinical strategies for evaluating asymptomatic perimenopausal white women with intact uteri. They assumed if screening cost is less than \$84 (see Table 8.4) "then resource savings from hip fractures prevented would be more than the costs of screening and treatment". They compared this to universal treatment (with HRT) without screening which was estimated to cost an additional \$349,000 per year of life gained, compared with screening strategies.

<sup>2</sup>David Barlow, Cyrus Cooper, Jonathan Reeve, David Reid, "Department of Health Shoots Itself in the Hip: Why the Report of the Advisory Group on Osteoporosis Undermines Evidence Based Purchasing," British Medical Journal Vol. 312 (February 3, 1996), p. 298.

to treat future illness. Unequal power between groups joined in partnership arrangements may produce distorting effects on their ability to work towards common goals, especially those defined as "in the public interest." For example, organizations representing the collective voice of consumers/patients must contend with balancing patient interests with those of their business or medical partners. The ideology of prevention has blurred the difference between primary prevention and early detection of asymptomatic diseases such as osteoporosis. Feminists have noted an irony: the women's health movement called for more prevention to liberate women from dependence on the medical model; yet, marketing of health services in the name of prevention has led to enhanced reliance on traditional curative systems.<sup>110</sup> It seems that prevention cannot be accomplished without prior diagnosis, yet another manifestation of the pervasiveness of the organismic (individual-based) theory of disease (Chapter 1, page 5).

Alternative solutions for primary prevention of osteoporosis, such as profound structural changes to society, have been ignored, in part, because of an emphasis on medical interventions. These views would require a radical revision to the dominant theories of disease, based not on individuals but on populations, with the accompanying perspective that some illness/disease will always be present and could be tolerable (Chapter 1, page 6). Late 20<sup>th</sup> century trends in medical technology have led to innovations that make profits but, due to inadequate valuation of efficacy, toxicity and cost, may not always bring commensurate benefits in health status.<sup>111</sup>

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<sup>110</sup>Whatley and Worcester (1992), p. 201.

<sup>111</sup>Muller, pp. 230-232.

## Chapter 9: Conclusions

I have told you more about osteoporosis than I know. What I have told you is subject to change without notice. I hope I have raised more questions than I have given answers. In any case, as usual, a lot more work is necessary. Fuller Albright, endocrinologist and “father of modern conceptions of osteoporosis”<sup>1</sup>

Osteoporosis has been transformed during the late twentieth century from an obscure radiological finding to an epidemic disease with significant implications for individuals and society in Western industrialized nations. Ideas about the disease have been socially constructed in a dialectical process between the Hippocratic triad of the physician/observer, the patient, and the illness.<sup>2</sup> Forces in all three domains favoured the transformation.

### Illness Factors

As a largely asymptomatic condition with a minority of sufferers who experience severe manifestations, osteoporosis seems not to have changed qualitatively through time. Quantitatively, however, demographic changes have influenced its incidence. Increases in life expectancy since 1900 have brought realistic expectations of survival to age 75+ years for millions of people. Many women are surviving for thirty and more years beyond menopause and growth in the number and proportion of the elderly in the population has been predicted as the baby boomer cohort has aged. Most mortality attributed to osteoporosis has been associated with hip fractures, especially in patients at advanced ages;<sup>3</sup> however, not every person diagnosed with osteoporosis actually experiences such fractures. “Epidemics” of chronic diseases, including osteoporosis, already have come to dominate the patterns of illness and causes of death in economically advanced countries. Concerns have been raised

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<sup>1</sup>Albright (1947), p. 882.

<sup>2</sup>Rosenberg, “Introduction”, p. xiii.

<sup>3</sup>Ross, p. 1402; Papadimitropoulos, *et al.*, p. 1360.

about the future cost burdens of osteoporosis for individuals and society.

### **Observer Factors: Medical Knowledge**

Biological knowledge about bone metabolism has been an essential part of the medical construction of osteoporosis. Medical epistemology has long required exploration of facts about the new disease: clinically measurable objective signs and symptoms as criteria for diagnosis; definitions of normality and abnormality; descriptions of populations at risk, explanation of cause(s), treatments, and prognoses.<sup>4</sup> Controversies between scientists about these matters have contributed to the process of constructing the disease, as the meaning of facts are negotiated within the biomedical community.<sup>5</sup> Before Fuller Albright's 1940 discovery of the link between estrogen loss and bone loss in menopausal women, most scientists had believed that osteoporosis was rare, an inevitable concomitant of aging, and therefore both untreatable and unpreventable.

During the last two decades, bone loss associated with osteoporosis has been increasingly interpreted as a complex condition with multi-factorial origins, a mixture of both internal and external causes conforming to both causal theories of disease. Some of these causes are believed to be inherent to the patient's genetic makeup; to date, these factors are not influenced by medical intervention. Lifestyle factors, climate and geography, other disease processes, and iatrogenic causes have also been implicated in osteoporotic bone loss.

Scientific choices to pursue and use specific technological tools for diagnosis and for treatment have been crucial to changing medical conceptions of osteoporosis.<sup>6</sup> Social and

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<sup>4</sup>Risse (1978), p. 584.

<sup>5</sup>Ziporyn, p. 4 ; Fleck, pp. 144-145.

<sup>6</sup>Pellegrino, p. 253.

cultural factors have influenced physician and patient choice of treatments.<sup>7</sup> Medical research has correlated severe bone loss with the risk of fractures, pain and disability. Previously, from the development of x-rays at the turn of the century until the mid-1980's, the disease was recognized only in persons with severely depleted skeletons. During the last decade and a half, since the dissemination of improved bone scanning technologies made it possible to pinpoint minimal levels of bone loss, asymptomatic individuals have been increasingly detected and labelled as sufferers of osteoporosis.

Medical science has discovered a range of therapeutic agents and have prescribed these to assuage pain and to affect the physiological processes which form and dissolve bone tissue. I have shown that since 1984, when a treatment (estrogen) was energetically promoted by the NIH panel and approved by the U. S. F.D.A. for prevention and treatment of osteoporosis, osteoporosis has been deemed a disease and its status as a major epidemic was confirmed.

In addition, medical stakeholders and their partners in the drug and bone densitometry technology industries have been professional and economic beneficiaries of the utilization of these technological advances. The advent of estrogen therapy and of bone densitometry correlate directly with the epidemic's subsequent explosion in medical and popular literature on osteoporosis. From the observer perspective, the possibility of detection and treatment are key to raising a problem to the status of a disease.

### **The Patient Factors**

Patients have benefited from many dimensions of the formulations of osteoporosis as

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<sup>7</sup>Ibid., pp. 258-261.



a significant health concern. Public consciousness about osteoporosis was awakened when publicity from the NIH consensus conference reached a crescendo in 1984. The Panel's announcement of the diagnostic and therapeutic breakthroughs validated medicine's ability to "do something" about osteoporosis to physicians and the wider public.<sup>8</sup> In the 1990's, patients in urban areas of North America have access to earlier detection, therapies for pain and diminution of bone loss, and new attempts to address environmental causes of fracture prevention. Sympathetic validation of suffering has occurred with the recognition of osteoporosis as a major problem, and funding has been generated from governmental and private sources to address the ongoing need for additional research. Omnipresent public health messages concerning the prevention and amelioration of osteoporosis appear regularly in the press, in part due to cultural obsessions with youth and appearance, and in part to the influence of health promotion ideology. Media and food industries foster public awareness because they have enjoyed financial benefits from perceptions that women's health and, in particular, osteoporosis are "hot markets."

Biomedical reductionism and sexism have characterized both osteoporosis and menopause to which it is linked in a process deemed "disease substitution."<sup>9</sup> This conflation of osteoporosis with menopause has been crucial to society's participation in the construction of the disease. Since 1940, hormones other than estrogen have been implicated in the

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<sup>8</sup> See Regina Markell Morantz, "Nineteenth Century health Reform and Women: A Program of Self-Help," in Medicine Without Doctors: Home Health Care in American History, Guenter B. Risse, Ronald L. Numbers, and Judith Walzer Leavitt, eds. (New York: Science History Publications/ USA, 1977), p. 89. Morantz described the development of self-reliance as an ideology and its effect on the emergence of an American personality which finds it "intolerable" to fail to take action, i.e. to accept stoicism. She linked this idea to her explanation of the popular revolt against heroic medicine which was increasingly perceived as ineffective in curing disease.

<sup>9</sup>Dr. Adrienne Fugh-Berman of the National Women's Health Network, as quoted in Barbara Seaman's "Foreword" in Coney, p. 7.

complex process of bone formation and dissolution. Nonetheless, the association of osteoporosis as a women's disease has been maintained, despite the tendency of both sexes to develop porous bone after age 70, and the knowledge that bone loss in women precedes menopause. The most problematic aspect of the treatment debates is the continued urging by medical experts of prolonged hormone therapies for the majority of postmenopausal women who are at "low risk" of developing severe osteoporosis: science is as yet unable to tell us who are fast bone losers.

Ideological responses from late twentieth century social movements to medical paradigms have also shaped our ideas about osteoporosis.<sup>10</sup> Some representatives of feminism, grey power, patient advocacy and critics of capitalism have challenged the medical model of osteoporosis; but the overwhelming result of these interest groups has been to further endorse the concept of osteoporosis as a disease. Indeed, a new level of social movement has emerged in osteoporosis advocacy groups, which have survived and prospered, despite having to negotiate between their primary concern with patient welfare and the conflicting interests of commerce and medicine. As more asymptomatic patients become identified, osteoporosis groups can expect their support to grow.

Since the latter half of the 1980's, feminists have provided the most sustained and thorough critiques of the mainstream medical depiction of osteoporosis, but their arguments have been subsumed in controversies about menopause and aging. Consequently, in the 1990's, the paternalistic medical paradigm for osteoporosis has retained its dominance. Such disagreements have spilled over into the public domain, especially through mass media, and

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<sup>10</sup>Rosenberg, Explaining Epidemics, p. 302.

have been the source of both confusion and misinformation, making truly informed choice difficult. In addition, the cultural inclination shared by North American doctors and patients to want to absolve suffering with a pill has been an important factor in our society's approach to osteoporosis.

In my research I have run across a few critics, but I have yet to find any group-- medical, general public, commercial, or patients-- actively opposed to the concept of osteoporosis as a disease; yet the theoretical literature on disease history leads a historian to imagine such a development might be possible.

Paradoxically, modernity may have brought improvements in environmental conditions which contributed to longer life, but it has also brought a culture in which altered lifestyle patterns may have led to the burgeoning osteoporosis epidemic. From the patient's perspective, taking action to address osteoporosis in the mid-1970's required individual lifestyle choices. More recently, "blame" has expanded to aspects of affluent society which contribute to increased prevalence. This broader conception of the disease's origins places individual behaviour in a mediated social context. Thinking about the environment as an explanatory framework along with the biomedical model fits with Rene Dubos's contentions about the development of "new" diseases:

The concept of perfect and positive health is a utopian creation of the mind. It cannot become reality because man will never be so perfectly adapted to his environment that his life will not involve struggles, failures, and sufferings....The less pleasant reality is that in an ever-changing world each period and each type of civilization will continue to have its burden of disease created by unavoidable failure of adaptation to the new environment.<sup>11</sup>

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<sup>11</sup>Dubos, p. 346.

### Bibliography Part I

Abzug, Robert H. Cosmos Crumbling: American Reform and the Religious Imagination. New York: Oxford University Press, 1994.

Achenbaum, W. Andrew. Crossing Frontiers: Gerontology Emerges As a Science. New York: Cambridge University Press, 1995.

Ackerknecht, Erwin H. "A Plea for a 'Behaviorist' Approach in Writing the History of Medicine." Journal of the History of Medicine Vol. 22 (1967): pp. 211-214.

Ackerknecht, Erwin H. "Aspects of the History of Therapeutics." Bulletin of the History of Medicine Vol. 36 (1962): pp. 389-419.

Ackerknecht, Erwin H. A Short History of Medicine. Baltimore: Johns Hopkins Press, 1982.

Albright, Fuller. "Osteoporosis." Annals of Internal Medicine Vol. 27( 6) (1947): excerpts from pp. 861-881.

Albright, Fuller. "Some of the 'DO'S' and 'DO-NOT'S' in Clinical Investigation." The Journal of Clinical Investigation Vol. 23 (6) (1944): pp. 921-926.

Albright, Fuller, Bloomberg, E. and Smith, P.H. "Post-Menopausal Osteoporosis." Transactions of the Association of American Physicians Vol.55 (1940): pp. 298-305.

Albright, Fuller and Ellsworth, Read. Uncharted Seas. D. Lynn Loriaux, ed. Portland, Ore.: Kalima Press, 1990.

Albright, Fuller, Halstead, J. A. and Cloney, E. "Studies on Ovarian Dysfunction I. The Hormonal 'Measuring Sticks' available for Clinical Use and Values obtained on Normal Individuals." New England Journal of Medicine Vol. 212 (1935): pp. 192-95.

Albright, Fuller and Reifenshtein, Edward C. The Parathyroid Glands and Metabolic Bone Disease Selected Studies. Baltimore: The Williams & Wilkins Company, 1948.

Albright, Fuller, Smith, P. H. and Richardson, A. M. "Postmenopausal Osteoporosis Its Clinical Features." Journal of the American Medical Association Vol.116 (22) (1941): pp. 2465-2474.

Allen, Garland. Life Science in the Twentieth Century. New York: Wiley & Sons, 1975.

American Men and Women of Science 1995-96. 19th Edition. New York: R. R. Bowker, c.1995.

Anonymous. "Joseph C. Aub (1890-1973) In Memorium." Endocrinology Vol. 96 (1)

(1975): pp. i-ii.

Appelboom, Thierry and Body, Jean-Jacques. "The Antiquity of Osteoporosis: More Questions than Answers." Calcified Tissue International Vol. 53 (6) (1993): pp. 367-369.

Apple, Rima D., ed. Women, Health, and Medicine in America: A Historical Handbook. New York: Garland Publishing, Inc.. 1990.

Arnup, Katherine. Education for Motherhood: Child-rearing Advice for Canadian Mothers. Toronto: University of Toronto Press. 1994.

Associations Canada 1997/98: An Encyclopaedic Directory. Toronto: Copp Clark Professional, 1997/98.

Axelrod, Lloyd. "Bones, Stones and Hormones: The Contributions of Fuller Albright." New England Journal of Medicine (1970): pp. 964-970.

Barlow, David, Cooper, Cyrus, Reeve, Jonathan, and Reid, David. "Department of Health Shoots Itself in the Hip: Why the Report of the Advisory Group on Osteoporosis Undermines Evidence Based on Purchasing." British Medical Journal Vol. 312 (1996): pp. 298.

Barnett, Ellis and Nordin, B. E. C. "The Radiological Diagnosis of Osteoporosis: A New Approach." Clinical Radiology Vol.11 (1960): pp. 166-174.

Baron, Roland E. "Anatomy and Ultrastructure of Bone," in Osteoporosis: Etiology, Diagnosis, and Management. Second Edition. B. Lawrence Riggs and L. Joseph Melton III. eds. Philadelphia and New York: Lippincott-Raven, 1995: pp. 3-10.

Barrett-Connor, Elizabeth. "Postmenopausal Estrogen and Prevention Bias." Annals of Internal Medicine Vol. 115 (6) (1991) : pp. 455-456.

Bearn, A. G. and Miller, E. D. "Archibald Garrod and the Development of the Concept of Inborn Errors of Metabolism." Bulletin of the History of Medicine Vol. 53 (1979): pp. 315-328.

Bell, Susan E. "Changing Ideas: The Medicalization of Menopause." Social Science and Medicine Vol. 24 (6) (1987): pp. 535-542.

Bell, Susan E. "Sociological Perspectives on the Medicalization of Menopause." Annals of the New York Academy of Sciences Vol. 592 (June 13, 1990): pp. 173-178.

Bennett, (no initial). "Senile Osteoporosis." Dublin Journal of Medical Science 3s (lxvi) (1878): pp. 272-74.

Berger, Peter L. and Luckmann, Thomas. The Social Construction of Reality: A Treatise in

the Sociology of Knowledge. Garden City: Anchor Books. Doubleday, 1966.

Bernstein, Daniel, Sadowsky, Norman, Hegsted, D. Mark, Guri, Charles D., and Stare, Frederic J. "Prevalence of Osteoporosis in High and Low Fluoride Areas in North Dakota." Journal of the American Medical Association Vol. 198 (5) (October 31, 1966): pp. 499-504.

Black, Sir Douglas. Inequalities of Health: The Black Report. Harmondsworth: Penguin, 1982.

Bloch, H. "The Asclepiads of Dublin: A Moment in Ireland's Medical History." Southern Medical Journal Vol. 83 (6) (1990): pp. 664-668.

Boston Women's Health Collective. Our Bodies, Ourselves: A Book By and For Women, 1st edition. New York: Simon and Schuster, 1973; and The New Our Bodies, Ourselves: A Book By and For Women Updated and Expanded for the 1990's. New York: A Touchstone Book. Simon & Schuster, 1992.

Botelho, M. M. C. "Menopause: A Ghost Exorcized by Therapy." in Medical-Economic Aspects of Hormone Replacement Therapy. Proceedings of a Ciba-Geigy Workshop, Basel Switzerland, 9 March 1993, J.-M. Cosséry, ed. Pearl River, N.J.: Parthenon Publishing Group, 1993: pp. 43-58.

Brandt, Allan M. No Magic Bullet: A Social History of Venereal Disease in the United States Since 1880. New York. Oxford University Press, 1987.

Brecher, Ruth and Edward. The Rays: A History of Radiology in the United States and Canada. Huntington, N. Y.: Robert E. Krieger Publishing Co., 1969.

Broad, William J. "Science Magazines: The Second Wave Rolls In." Science Vol. 215 (1982): pp. 272-273.

Brumberg, Joan Jacobs. Fasting Girls: The Emergence of Anorexia Nervosa as a Modern Disease. Cambridge, Mass.: Harvard University Press, 1988.

Brunschwig, Alexander. "Jean Frédéric Lobstein: The First Professor of Pathology." Annals of Medical History N. S. Vol. 5, (1933): pp. 82-84.

Bunton, Robin. "Popular Health and Advanced Liberalism," in Foucault, Health and Medicine. Alan Petersen and Robin Bunton eds. London: Routledge, 1997.

Bykerk, Loree and Maney, Ardith. U. S. Consumer Interest Groups: Institutional Profiles. Westport, Conn.: Greenwood Press, 1995.

Bynum, W. F., Browne, E. J., and Porter, Roy, eds. Dictionary of the History of Science. Princeton: Princeton University Press, 1981.

Bynum, W. F. Science and the Practice of Medicine in the Nineteenth Century. Cambridge: Cambridge University Press, 1994.

Callahan, Daniel. Setting Limits: Medical Goals in an Aging Society. New York: Simon and Schuster, 1987.

Canadian Multicentre Osteoporosis Study (CAMOS) Protocol Montreal: January 1995. Copy obtained from Dr. Tassos Anastassiades.

Canguilhem, Georges. On the Normal and the Pathological. Dordrecht, Boston, Lancaster: D. Reidel, 1978.

Carlson, Elof Axel. The Gene: A Critical History. Philadelphia: W. B. Saunders Company, 1966.

Carter, K. Codell. "On the Decline of Bloodletting in Nineteenth-Century Medicine." The Journal of Psychoanalytic Anthropology Vol. 5 (3) (Summer 1982): pp. 219-234.

Cassedy, James H. "Why Self-Help? Americans Alone with their Diseases 1800-1850." in Medicine Without Doctors: Home Health Care in American History. Guenter B. Risse, Ronald L. Numbers and Judith Walzer Leavitt, eds. New York: Science History Publications/U.S.A., 1977: pp.31-48.

Cho, Mildred K. "FUNDamental Conflicts of Interest," [http://biomednet.com/hmsbeagle/1998/24/people/op\\_ed.htm](http://biomednet.com/hmsbeagle/1998/24/people/op_ed.htm). Issue 24. Posted January 30, 1998.

Chrisler, Joan C. and Levy, Karen B. "The Media Construct a Menstrual Monster: A Content Analysis of PMS Articles in the Popular Press." Women & Health Vol. 16 (2) (1990): pp. 89-104.

Clarke, Adele E. "Women's Health: Life-Cycle Issues," in Women, Health and Medicine in America: A Historical Handbook. Rima D. Apple ed. New York: Garland Publishers Inc., 1990: pp. 3-40.

Clendening, Logan. Source Book of Medical History. New York: Dover Publications, Henry Schuman, 1960.

Cobb, Janine O'Leary. Understanding Menopause: Answers and Advice for Women in the Prime of Life New York: Plume Book, 1993.(First published in Canada by Key Porter Books, 1988.)

Cohen, Leah. Small Expectations: Society's Betrayal of Older Women. Toronto: McClelland & Stewart, 1984.

Coney, Sandra. The Menopause Industry: How the Medical Establishment Exploits Women.

Almeda, California: Hunter House, 1994.

Conrad, Peter and Schneider, Joseph W. "Professionalization, Monopoly, and the Structure of Medical Practice." in The Sociology of Health and Illness: Critical Perspectives. Peter Conrad and Rochelle Kern eds. New York: St. Martin's Press, 1981: pp. 155-164.

"Consensus Conference: 'Osteoporosis.'" Journal of the American Medical Association Vol. 252 (6) (1984): pp. 799-802.

Cooke, A.M. "Osteoporosis." Lancet 1( April 30, 1955): pp.877-882 and (May 7, 1955): pp. 929-937. (Abridged from the Lumleian lectures for 1955 to the Royal College of Physicians of London, April 19 and 21, 1955 as "Some Aspects of Skeletal Disease.")

Cooper, Sir Astley. A Treatise on Dislocations and Fractures of the Joints. Philadelphia: Lea and Blanchard, 1844.

Corner, George W. "The Early History of the Oestrogenic Hormones." The Sir Henry Dale Lecture for 1964 at Middlesex Hospital London, Proceedings of the Society for Endocrinology. Journal of Endocrinology Vol. 31 (1964-65): pp. iii-xvii.

Crawford, Robert. "Healthism and the Medicalization of Everyday Life." International Journal of Health Services Vol. 19 (1980): pp. 365-388.

Crawford, Robert. "Individual Responsibility and Health Politics." in The Sociology of Health and Illness: Critical Perspectives. Peter Conrad and Rochelle Kern. eds. New York: St. Martin's Press, 1981: pp. 468-481.

Crawford, Robert. "You Are Dangerous to Your Health: The Ideology and Politics of Victim Blaming." International Journal of Health Services Vol. 7 (4) (1977): pp. 663-680.

Creighton, Lucy Black. Pretenders to the Throne: The Consumer Movement in the United States. Lexington, Mass.: Lexington Books, D.C. Heath and Company, 1976.

Culliton, Barbara J. "Science Sections in U. S. Newspapers Increase Dramatically in Past 2 Years." Science Vol. 235 (1987): p. 429.

Current Med Talk: A Dictionary of Medical Terms, Slang and Jargon. Joseph C. Segen, ed. Stamford, Conn: Appleton & Lange, 1995.

Davies, Wyndham. The Pharmaceutical Industry: A Personal Study. Oxford: Pergamon Press, 1967.

Davis, Audrey B. Medicine and Its Technology: An Introduction to the History of Medical Instrumentation. Westport, Conn.:Greenwood Press, 1981.



Davis, M. Edward, Strandjord, Nels M., and Lanzl, Lawrence H. "Estrogens and the Aging Process: The Detection, Prevention, and Retardation of Osteoporosis." Journal of the American Medical Association Vol. 196 (3) (1966): pp. 129-134.

Debus, Allen G., ed. World Who's Who in Science: A Biographical Dictionary of Notable Scientists From Antiquity to the Present. First Edition. Chicago: Marquis-Who's Who Inc., 1968.

DeLuca, H. F., Paaren, H. E. and Schnoes, H. K. "Vitamin D and Calcium Metabolism," in Biochemistry Vol. 83 Topics in Current Chemistry. F. L. Boschke, ed. Berlin and New York: Springer-Verlag, 1979: pp. 3-6.

Delva, M. Dianne. "Hormone Replacement Therapy: Risks, Benefits, and Costs." Canadian Family Physician Vol. 39 (1993): pp. 2149-2154.

Denstedt, Orville Frederick. A History of Biochemistry at McGill University. Unpublished manuscript of the Historical writings of O. F. Denstedt (1899-1976) obtained from Dr. Tassos Anastassiades, July 1997.

Dequeker, J. "Vertebral Osteoporosis as Painted by Vittore Carpaccio (1465): Reflections on Paleopathology of Osteoporosis in Pictorial Art." Calcified Tissue International Vol. 55 (1994): pp. 321-22.

Dequeker, J. and Geusens, P. "Review: Treatment of Established Osteoporosis and Rehabilitation: Current Practice and Possibilities." Maturitas Vol. 12 (1990): pp. 1-36.

de Swaan, Abram. The Management of Normality: Critical Essays in Health and Welfare. London and New York. Routledge, 1990.

Dodd, Dianne. "Women in Advertising: The Role of Canadian Women in the Promotion of Domestic Electrical Technology in the Interwar Period," in Despite the Odds: Essays on Canadian Women and Science. Marianne Gosztonyi Ainley, ed. Montreal: Véhicule Press, 1990: pp. 134-151.

Doisy, E. A. "Reminiscences," in Perspectives in Biological Chemistry. Robert E. Olson, ed. New York: Marcel Dekker Inc., 1970.

Doner, Kalia. "Women's Magazines: Slouching Towards Feminism." Social Policy (Summer 1993): pp. 37-43.

Dreifus, Claudia. "Introduction," in Seizing Our Bodies: The Politics of Women's Health. Claudia Dreifus, ed. New York: Vintage Books, Random House, 1977: pp. xvii-xxxii.

Dubos, Rene. Man Adapting. New Haven: Yale University Press, 1965.

Duffin, Jacalyn. History of Medicine. Toronto: University of Toronto Press. forthcoming.

Duffin, Jacalyn. "Tethering in Space: How I do My Research in the History of Medicine." Prairie Medical Journal Vol. 64 (3) (1994): pp. 101-103.

Ehrenreich, Barbara, and English, Deirdre. For Her Own Good: 150 Years of the Experts Advice to Women. New York: Anchor Books Doubleday. 1978.

Eisenberg, Leon. "From Circumstance to Mechanism in Pediatrics During the Hopkins Century." Pediatrics Vol. 85 (1) (1990): pp. 42-49.

Engel, George. "The Need for a New Medical Model: A Challenge for Biomedicine." in Concepts of Health and Disease: Interdisciplinary Perspectives. Arthur L. Caplan, H. Tristram Englehardt Jr., and James J. McCartney, eds. Reading, Mass.: Addison-Wesley Publishing Co, 1981: pp. 589-607.

Englehardt, Jr., H. Tristram. "The Concepts of Health and Disease." in Concepts of Health and Disease: Interdisciplinary Perspectives. Arthur L. Caplan, H. Tristram Englehardt Jr., and James J. McCartney, eds. Reading, Mass: Addison-Wesley, 1981: pp. 31-43.

Englehardt, Jr. H. Tristram and Caplan, Arthur L., eds. Scientific Controversies: Case Studies in the Resolution and Closure of Disputes in Science and Technology. Cambridge: Cambridge University Press, 1987.

Epstein, Sol. "New Concepts in the Etiology of Osteoporosis." Transactions & Studies of the College of Physicians of Philadelphia Vol. 7 (3) (September 1985): pp. 177-187.

Eriksen, E. F., Colvard, D.S., and Berg, N. J., Graham, M. L., Mann, K. G., Spelsberg, T. C., and Riggs, B. L. "Evidence of Estrogen Receptors in Normal Human Osteoblast-like Cells." Science Vol. 241 (1988): pp. 84-86.

Evans, Robert G. "Canada: The Real Issues." Journal of Health Politics, Policy and Law Vol. 17 (4) (Winter 1992): pp. 739-762.

Evans, Robert G. Strained Mercy: The Economics of Canadian Health Care. Toronto: Butterworths, 1984.

Fabrega, Jr., Horacio. "The Scientific Usefulness of the Idea of Illness," in Concepts of Health and Disease: Interdisciplinary Perspectives. Arthur L. Caplan, H. Tristram Englehardt Jr., James J. McCartney, eds. Reading, Mass.:Addison-Wesley, 1981: pp. 131-141.

Fausto-Sterling, Anne. "Hormonal Hurricanes: Menstruation, Menopause, and Female Behaviour." in Myths of Gender: Biological Theories about Women and Men. New York: Basic Books, Inc., 1985.

Fee, Elizabeth. "Improving the People's Health: Some Hopkins Contributions." American Journal of Epidemiology Vol .134 (10) (1991): pp.1014-1022.

Fein, Rashi. Medical Care, Medical Costs: The Search for a Health Insurance Policy. Cambridge, Mass.: Harvard University Press, 1986.

Ferguson, Marjorie. Forever Feminine: Women's Magazines and the Cult of Femininity. London, Exeter, N. H.: Heinemann, 1983.

Fleck, Ludwik. Genesis and Development of a Scientific Fact. Chicago: University of Chicago Press, 1979.

Fleisch, Herbert. "Bisphosphonates--History and Experimental Basis." Bone Vol. 8 (Supp 1) (1987): pp. S23-S28.

Foldes, Joseph A. and Popovitzer, Mordecai. Letter to the New England Journal of Medicine Vol.334 (11) (1996), p. 735.

Food and Agriculture Organization of the United Nations (FAO).Calcium Requirement: Report of an FAO/WHO Expert Group.(May 23-30, 1961) Rome. Italy. Geneva, 1962.

Forbes, Anne P. "Fuller Albright: His Concept of Postmenopausal Osteoporosis and What Came of It." Clinical Orthopaedics and Related Research No.269 (August 1991): pp.128-139.

Foucault, Michel. The Birth of the Clinic: An Archaeology of Medical Perception, trans. A.M. Sheridan Smith. London: Tavistock Publications Ltd., 1973.

Foucault, Michel. "Governmentality" in The Foucault Effect. G. Burchell, C. Gordon, and P. Miller, eds. Brighton: Harvester Wheatsheaf, 1991: pp. 87-194.

Fox, Daniel M., Meldrum, Marcia, and Ira Rezak, eds. Nobel Laureates in Medicine and Physiology: A Biographical Dictionary. New York: Garland Publishing Inc.. 1990.

Friedan, Betty. The Feminine Mystique. New York: Norton, 1963.

Freidson, Eliot. Professional Dominance: The Social Structure of Medical Care. Chicago: Aldine, 1970.

Fruchter, Rachel Gillett, Fatt, Naomi, Booth, Pamela and Leidel, Diana of the HealthRight [sic] Collective. "The Women's Health Movement: Where Are We Now?" in Seizing our Bodies, Claudia Dreifus, ed. New York: Vintage Books, Random House, 1977: pp. 271-278.

Fruton, Joseph S. A Bio-Bibliography for the History of the Biochemical Sciences Since 1800. First Edition. Philadelphia: American Philosophical Society. 1982 and Second Edition. Philadelphia: American Philosophical Society, 1992.

Geist, Samuel H. and Spielman, Frank. "Therapeutic Value of Theelin in the Menopause." American Journal of Obstetrics and Gynaecology Vol. 23 ( 5) (1932): pp. 701-707.

Gershon-Cohen, J., Schraer, Harald, and Blumberg, Nathan. "Bone Density Measurements of Osteoporosis in the Aged." Radiology Vol. 65 (1955): pp. 416-419.

Giddens, Anthony. The Consequences of Modernity. Cambridge, U. K.: Polity Press, 1992.

Gibbs, Denis. "Rickets and the Crippled Child: An Historical Perspective." Journal of the Royal Society of Medicine Vol. 87 (1994): pp. 729-732.

Gifford, C.G. Canada's Fighting Seniors. Toronto: James Lorimer and Company, 1990.

Gilman, Sander. "Introduction: What Are Stereotypes and Why Use Texts to Study Them?" in Differences and Pathology: Stereotypes of Sexuality, Race and Madness. Ithaca: Cornell University Press, 1985: pp. 15-35.

Golden, Judith. "You're Just in Menopause." Canadian Women Studies Vol. 5 (3) (Spring 1984): p. 74.

Goodman, Lenn E. and Madeleine J. "Prevention-How Misuse of a Concept Undercuts Its Worth." Hastings Center Report Vol.16 (2) (1986): pp. 26-38.

Gordan, Gilbert S. "Fuller Albright and Postmenopausal Osteoporosis: A Personal Appreciation." Perspectives in Biology and Medicine Vol.24 (Summer 1981): pp. 547-560.

Gordan, G. S. and Eisenberg, E. "The Effect of Estrogens Androgens, and Corticoids on Skeletal Kinetics in Man." Proceedings of the Royal Society of London Vol. 56 (1963): p

Gorecki, Paul K. "Introduction," in Controlling Drug Expenditure in Canada: The Ontario Experience. Ottawa: The Economic Council of Canada and the Ontario Ministry of Health, 1992.

Government of Canada. "The Canadian Health Care System: Myths and Realities." Expression (newsletter of the National Advisory Council on Aging) Vol. 8 (2) (Spring 1992).

Government of Canada: Departments of National Health and Welfare and Secretary of State. "Yes You Can: The Lindy Fraser Story." video (no date).

Greenwald, P., Barlow, J.J., Nasca, P.C. and Burnett, W. "Vaginal Cancer After Maternal Treatment with Estrogens." New England Journal of Medicine Vol. 285 (1971): pp. 390-393.

Greer, Germain. The Change: Women, Aging and the Menopause. New York: Fawcett Columbine, 1991.

Grigg, E. R. N. The Trail of the Invisible Light, from X-Strahlen to Rad(bio)ology. Springfield, Ill.: Thomas, 1965.

Grmek, Mirko D. History of AIDS. Princeton: Princeton University Press, 1990.

Gusberg, S. B. "Current Concepts in Cancer: The Changing Nature of Endometrial Cancer." New England Journal of Medicine Vol. 302 (13) (1980): pp. 729-731.

Gusberg, S. B. "Precursors of Corpus Carcinoma Estrogens and Adenomatous Hyperplasia." American Journal of Obstetrics and Gynecology Vol. 54 (6) (1947): pp. 905-925.

Hall, Diana Long. "Biology, Sex Hormones and Sexism in the 1920's." The Philosophical Forum Vol. V (1-2) (Fall-Winter 1973-74): pp.81-96.

Hancock, Trevor. "Developing Healthy Public Policy at the Local Level," in Developing Local Healthy Public Policy. A. Evers et al. eds. Frankfurt/Boulder: Campus/Westview, 1990.

Harden, Victoria A. Inventing the NIH: Federal Biomedical Research Policy, 1887-1937. Baltimore: Johns Hopkins Press, 1986.

Hayter, Charles. "Making Sense of Shadows: Dr. James Third and the Introduction of X-Rays, 1896 to 1902." Canadian Medical Association Journal Vol. 153 (9) (1995): pp.1249-1256.

Healthy People 2000: National Health Promotion and Disease Prevention Objectives. Boston: Jones and Bartlett, 1992.

Heaney, Robert P. and Matkovic, Velimir. "Inadequate Peak Bone Mass," in Osteoporosis: Etiology, Diagnosis, and Management. Second Edition. B. Lawrence Riggs and L. Joseph Melton III. eds. Philadelphia and New York: Lippincott-Raven, 1995: pp.115-132.

Henneman, Philip H. and Wallach, Stanley. "Prolonged Estrogen Therapy in Post-menopausal Women." Journal of the American Medical Association Vol. 171(1959): pp.1637-1642.

Holden, Constance, ed. "Silver Threads, Thin Bones." Science Vol. 266 (1994): p. 366.

Holick, Michael F. "McCollum Award Lecture, 1994: Vitamin D-- New Horizons for the 21st Century." American Journal of Clinical Nutrition Vol. 60 (1994): pp. 619-630.

Hologic Inc. "A Decade of Leadership in Bone Densitometry." 1996 Annual Report. Waltham, Mass., 1996.

Hologic. "Hologic Announces Fourth Quarter and Record Fiscal 1997 Operating Results."

News Release. Waltham, Mass.: Nov. 12, 1997.

Hologic Inc. Report. Submitted to the U. S. Securities and Exchange Commission. September 29, 1996. Form 10-K. Waltham, Mass.

Horowitz, Norman H. "Obituary: George W. Beadle." Genetics Vol. 124 (1) (1990): pp. 1-6.

Horton, Richard. "Sponsorship, Authorship, and a Tale of Two Media." The Lancet Vol. 349 (1997): pp. 1411-1412.

Howard, John Eager. "Fuller Albright." Perspectives in Biology and Medicine (Spring 1981): pp. 374-381.

Howell, Joel D. Technology in the Hospital: Transforming Patient Care in the Early Twentieth Century. Baltimore: Johns Hopkins University Press, 1995.

Hudson, Robert P. Disease and its Control: The Shaping of Modern Thought. Westport, Conn.: Praeger, 1987.

Illich, Ivan. Limits to Medicine: Medical Nemesis: The Expropriation of Health. London: Marion Boyars, 1976.

Index Catalogue of the Library of the Surgeon-General's Office, U.S. Army. Washington: Government Printing Office, Vols. II (1881), IV (1883), and XIII (1892).

Jablonski, Stanley. Illustrated Dictionary of Eponymic Syndromes and Diseases and their Symptoms. Philadelphia: W. B. Saunders Co., 1969.

Jacoby, Itzhak and Clark, Susan M. "Direct Mailing as a Means of Disseminating NIH Consensus Statements: A Comparison with Current Techniques." Journal of the American Medical Association Vol. 255 (10) (1986): pp. 1328-1330.

Jergas, Michael, and Genant, Harry K. "Current Methods and Recent Advances in The Diagnosis of Osteoporosis." Arthritis & Rheumatism Vol. 36 (12) (1993): pp. 1649-1659.

Jewson, N. D. "The Disappearance of the Sick-Man From Medical Cosmology, 1770-1870." Sociology Vol.10 (1976): pp. 225-243.

Jones, G., White, C., Nguyen, T., Sambrook, P.N., Kelly, P. J., and Eisman, J. A. "Prevalent Vertebral Deformities: Relationship to Bone Mineral Density and Spinal Osteophytosis in Elderly Men and Women." Osteoporosis International Vol. 6 (1996): pp. 233-239.

Jones and Siev (no initials given). "In Osteoporosis the Affected Bone Presents an Increase of Size." Pathological Anatomy (1874): p.841.

Judd, Howard and Utian, Wulf. "Introduction: What We Hope to Learn. Current Perspectives in the Management of the Menopausal and Postmenopausal Patient." American Journal of Obstetrics and Gynecology Vol. 156 ( 5) (1987): pp. 1279-1280.

Kanis, John A., Devoogelaer, Jean-Pierre, and Gennari, Carlo. "Practical Guide for the Use of Bone Mineral Measurements in the Assessment of Treatment of Osteoporosis: A Position Paper of the European Foundation for Osteoporosis and Bone Disease." Osteoporosis International Vol. 6 (1996): pp. 256-261.

Kanis, John A., Melton III, L. Joseph, Christiansen, Claus, Johnston, Conrad C., and Khaltayev, Nikolai. "The Diagnosis of Osteoporosis." Journal of Bone and Mineral Research Vol. 9 (8) (1994): pp.1137-1141.

Kanis, John A. and Pitt, F. A. "Epidemiology of Osteoporosis." Bone Vol. 13 (1992) (Supplement 2): pp. S7-S15.

Kaufert, Patricia A. and McKinlay, Sonja M. "Estrogen-replacement Therapy: The Production of Medical Knowledge and the Emergency of Policy," in Women, Health, and Healing: Toward a New Perspective, Ellen Lewin and Virginia Olesen, eds. New York: Tavistock Publications, 1985: pp.113-138

Kaufmann, Carl. "Über die Therapie ovarieller Störungen mit Hormonen der Keimdrüse." Med. Klinik Vol. 28 (July 8, 1932): pp. 955-57.

Keen, R. W., Nguyen, T., Sobnack, R., Perry, L. A., Thompson, P. W., and Spector, T. D. "Can Biochemical Markers Predict Bone Loss at the Hip and Spine?: A 4 Year Prospective Study of 141 Early Postmenopausal Women." Osteoporosis International Vol. 6 (1996): pp. 399-406.

Kemp, Kerry B. "From the Congressional Office of Technology Assessment: Public Information on Osteoporosis." Journal of the American Medical Association Vol. 273 (14) (1995): p. 1082.

Kevles, Bettyann Holtzmann. Naked to the Bone: Medical Imaging in the Twentieth Century. New Brunswick, N.J.: Rutgers University Press, 1997.

Khachaturian, Zaven S. "Calcium and the Aging Brain: Upsetting a Delicate Balance?" Geriatrics Vol. 46 (11) (November 1991): pp. 78-83.

Khosla, Sundeep, Riggs, L. B., and Melton III, L. J. "Clinical Spectrum," in Osteoporosis: Etiology, Diagnosis, and Management. Second Edition. B. Lawrence Riggs and L. Joseph Melton III, eds. Philadelphia and New York: Lippincott-Raven, 1995: pp.205-223.

King, Lester S. Medical Thinking: A Historical Preface. Princeton: Princeton University

Press, 1982.

Kleerekoper, Michael and Avioli, Louis V. "Evaluation and Treatment of Postmenopausal Osteoporosis." in Primer on the Metabolic Bone Disease and Disorders of Mineral Metabolism. 3rd Edition. An Official Publication of the American Society for Bone and Mineral Research. Murray Favus, ed. Philadelphia: Lippincott-Raven, 1996: pp. 264-271.

Klein, Renate and Dumble, Lynette J. "Disempowering Midlife Women: The Science and Politics of Hormone Replacement Therapy (HRT)." Women's Studies International Forum Vol. 17 ( 4) (1994): pp. 327-343.

Kopera, H. "The Dawn of Hormone Replacement Therapy." Maturitas Vol.13 (1991): pp. 187-188.

Kristiansen, Connie M. and Harding, Christina M. "A Comparison of the Coverage of Health Issues by Britain's Quality and Popular Press." Social Behaviour Vol. 3 (1988): pp. 25-32.

Kupperman, Herbert S., Wetchler, Ben B., and Blatt, Meyer H. G. "Contemporary Therapy of the Menopausal Syndrome." The Journal of the American Medical Association Vol. 171 (12) (1959): pp. 1627-1636.

Labonte, Ron. Health Promotion and Empowerment: Practice Framework. Toronto: Centre for Health Promotion, University of Toronto and ParticipAction, 1993.

Lafferty, E. W., Spencer, G. E., and Pearson, O. H. "Effects of Androgens, Estrogens and High Calcium Intake on Bone Formation and Resorption in Osteoporosis." American Journal of Medicine Vol. 36 (1964): p. 5-

Laidlaw, J. C. and Maclean, A. A. "Fuller Albright: A Memoir." unpublished paper presented at the Toronto Medical Historical Club, February 22, 1991. Obtained from Dr. E. R. Yendt, July 1997.

Lalonde, Marc. A New Perspective on the Health of Canadians. Ottawa: Information Canada, 1974.

Landau, Richard L. "What You Should Know About Estrogens: Or the Perils of Pauline." Journal of the American Medical Association Vol. 241 (1) (1979): pp. 47-51.

Lang, Ronald W. The Politics of Drugs. Westmead: Saxon House, D.C. Health Ltd., 1974.

Larmour, Jean B. D. A Matter of Life and Breath: The 75 Year History of Saskatchewan Anti-Tuberculosis League and the Saskatchewan Lung Association. Regina: Saskatchewan Lung Association, 1987.

Lauritzen, Christian and van Keep, P.A. eds. Ageing[sic] and Estrogens: Frontiers of



Hormone Research. Basel: Karger, 1973.

Lees, Belinda, Molleson, Theya, Arnett, Timothy R., and Stevenson, John C. "Differences in Proximal Femur Bone Density Over Two Centuries." The Lancet Vol. 341 (1993): pp. 673-75.

Leeson, Joyce and Gray, Judith. Women and Medicine. London: Tavistock Publications, 1978.

Lewin, Ellen and Olesen, Virginia L. Women, Health, and Healing: Toward a New Perspective. New York: Tavistock Publications, 1985.

Lexchin, Joel. The Real Pushers: A Critical Analysis of the Canadian Drug Industry. Vancouver: New Star Books, 1984.

Levey, Judith S. and Greenhall, Agnes, eds. The Concise Columbia Encyclopedia. New York: Columbia University Press, 1983.

Levy, Karen B. The Politics of Women's Health Care: Medicalization as a Form of Social Control. Las Colinas, Tex.: Ide House, 1992.

Li, Alison. "J. B. Collip, A.M. Hanson and the Isolation of the Parathyroid Hormone, or Endocrines and Enterprise." The Journal of the History of Medicine and Allied Sciences Vol. 27 (1992): pp. 405-438.

Liebenau, Jonathan. Medical Science and Medical Industry: The Formation of the American Pharmaceutical Industry. London: MacMillan Press and Business History Unit, University of London, 1987.

Lindsay, Robert. Osteoporosis: A Guide to Diagnosis, Prevention, and Treatment. New York: Raven Press, 1992.

Lindsay, Robert. "Prevention of Osteoporosis." in Primer on the Metabolic Bone Disease and Disorders of Mineral Metabolism. 3rd Edition, An Official Publication of the American Society for Bone and Mineral Research. Murray J. Favus, ed. Philadelphia: Lippincott-Raven, 1996: pp. 256-261.

Long, Diana E. "Hidden Persuaders: Medical Indexing and the Gendered Professionalism of American Medicine, 1880- 1932," in Women, Gender, and Science: New Directions. Sally Gregory Kohlstedt and Helen E. Longino, eds. Osiris Vol. 12 (1997): pp.100-120.

Lukert, Barbara P. "Glucocorticoid and Drug-Induced Osteoporosis," in Primer on the Metabolic Bone Diseases and Disorders of Mineral Metabolism. 3rd Edition, Murray J. Favus, ed. An Official Publication of the American Society for Bone and Mineral Research. (Philadelphia: Lippincott-Raven, 1996): pp. 278-282.

Lupton, Deborah. Medicine as Culture: Illness, Disease and the Body in Western Societies. London: Sage Publications. 1994.

Macdonald, Michael. "The Medicalization of Suicide in England: Laymen, Physicians, and Cultural Change, 1500-1870," in Framing Disease: Studies in Cultural History. Charles E. Rosenberg and Janet Golden, eds. New Brunswick, N. J.: Rutgers University Press, 1992.. pp. 85-103.

MacIntyre, Iain. Evans, Imogen M. A., and Larkins, Richard. "Vitamin D." Clinical Endocrinology Vol. 6 (1977): pp. 65-79.

Mack, P. B., O'Brien, A. T., Smith, J. M., and Bauman, A. W. "Method of Estimating Degree of Mineralization of Bones from Tracings of Roentgenograms." Science Vol.89 (1939): p. 467.

Mack, T. H., Pike, M. C., Henderson, B. L., Pfeiffer, R. I., Gerkins, V. R., Arthur, M. and Brown, S.E. "Estrogens and Endometrial Carcinoma in a Retirement Community." New England Journal of Medicine Vol. 294 (1976): pp. 1262-1267.

MacMurray, Emily J. ed. Notable 20th Century Scientists. Vol. 1 Detroit: Gale Research Inc., 1995.

MacPherson, Kathleen I. "Osteoporosis: The New Flaw in Woman or in Science?" Health Values Vol. II (4) (July/August 1987): pp. 57-62.

Magner, Lois N. The History of the Life Sciences. New York: Marcel Dekker, Inc., 1979.

Marieskind, Helen I. "The Women's Health Movement: Past Roots," in Seizing Our Bodies: The Politics of Women's Health, Claudia Dreifus, ed. New York: Vintage Books/Random House, 1978: pp. 3-12.

Martin, Alan D., Silverthorn, Kelly G., Houston, C. Stuart, Bernhardson, Steven, Wajda, André, and Roos, Leslie L. "The Incidence of Fracture of the Proximal Femur in Two Million Canadians From 1972 to 1984: Projections for Canada in the Year 2006." Clinical Orthopaedics and Related Research No. 266 (May 1991): pp. 111-118.

Martin, Emily. "Toward an Anthropology of Immunology: The Body as Nation State." Medical Anthropology Quarterly Vol.4 (4) (December 1990): pp. 410-426.

Martin, Emily. Women in the Body: A Cultural Analysis of Reproduction. Milton Keynes: Open University Press. 1989.

Marx, Jean L. "The 1988 Nobel Prize for Physiology or Medicine." Science Vol. 242 (4878) (1988): pp. 516-517.

Marx, Jean. "Osteoporosis: New Help for Thinning Bones." Science Vol. 207 (1980): pp. 628-30.

Mausner, Judith S. and Kramer, Shira. Epidemiology: An Introductory Text. 2nd Edition. Philadelphia: W. B. Saunders. 1985.

Mayr, Ernst. The Growth of Biological Thought: Diversity, Evolution, and Inheritance. Cambridge, Mass.:The Belknap Press of Harvard University Press, 1982.

McCrea, Frances B. "The Politics of Menopause: The 'Discovery' of a Deficiency Disease." Social Problems Vol. 31( 1) (October 1983): pp. 111-123.

McDonnell, Kathleen ed. Adverse Effects: Women and the Pharmaceutical Industry. Toronto: Women's Educational Press. 1986.

McKusick, Victor A. "Walter S. Sutton and The Physical Basis of Mendelism." Bulletin of the History of Medicine Vol.34 (6) (November-December 1960): pp.487- 497.

McSweeney, E. S. "A Case of Pronounced Osteoporosis." Proceedings from the New York Pathological Society n. s. Vol. v (1905): pp. 36-38.

The Medical Letter on Drugs and Therapeutics, all indexed references to osteoporosis from its inception in 1959 to 1996.

Medvei, Victor Cornelius. A History of Endocrinology. Lancaster, Boston and The Hague: MTP Press Limited. 1982.

Melton, L. Joseph III. "Epidemiology of Osteoporosis: Predicting Who is at Risk?" Annals of the New York Academy of Sciences Vol. 592 (June 13, 1990): pp. 295-305.

Melton, L. J. "How Many Women Have Osteoporosis Now?" Journal of Bone and Mineral Research Vol. 10 (1995): pp. 175-77.

Milhaud, Gérard. " First Therapeutic Use of Calcitonin." Bone and Mineral Vol. 16 (March 1992): pp. 201-210.

Mitchinson, Wendy. The Nature of Their Bodies: Women and their Doctors in Victorian Canada. Toronto: University of Toronto Press, 1991.

Mitteneß, Linda A. "Historical Changes in Public Information About the Menopause." Urban Anthropology Vol.12 (1983): pp.161-179.

Morantz, Regina Markell. "Nineteenth-Century Health Reform and Women: A Program of Self-Help." in Medicine Without Doctors: Home Health Care in American History. Guenter B. Risse, Ronald L. Numbers, and Judith Walzer Leavitt, eds. New York: Science History

Publications/U. S. A.. 1977: pp. 73-94.

Morey, Emily R. and Baylink. David J. "Inhibition of Bone Formation During Space Flight." Science Vol. 201 (1978): pp. 1138-1141.

Morris. Charles R. The AARP: America's Most Powerful Lobby and the Clash of Generations. New York: Times Books/Random House. 1996.

Morton's Medical Bibliography: An Annotated Checklist of Texts Illustrating the History of Medicine. (Garrison and Morton), 5<sup>th</sup> Edition. Jeremy M. Norman. ed. Aldershot, Hants.: Scolar Press. 1991.

Mould, Richard F. A History of X-Rays and Radium. Sutton, U. K.: IPC Building and Contract Journals Ltd., 1980.

M'Phail. (no initial). "Specimens of Bones affected with Osteoporosis." Glasgow Medical Journal Vol. xvi (1881): pp. 137-139.

Muller. Charlotte F. Health Care and Gender. New York: Russell Sage Foundation. 1990.

Nagel, Ernest. The Structure of Science: Problems in the Logic of Scientific Explanation. New York: Harcourt, Brace, & World. Inc. 1961.

Nanda, Meera. "Against Social De(con)struction of Science: Cautionary Tales from the Third World," in In Defense of History: Marxism and the Postmodern Agenda. Ellen Meiksins Wood and John Bellamy Foster, eds. New York: Monthly Review Press. 1997: pp 74-96.

Napoli, Maryann. "Screening for Osteoporosis: An Idea Whose Time Has Not Yet Come," in Women's Health: Readings on Social, Economic and Political Issues. Nancy Worcester and Mariamne Whatley, eds. Dubuque, Iowa: Kendall/Hunt Publishers, 1988: pp. 115-119. Reprinted from HealthFacts [sic]. New York: Center for Medical Consumers Vol. XI, (87) (August 86).

National Cyclopedia of American Biography 1893-1984. (39),

National Osteoporosis Foundation. Fact sheet. (No date.) Received in 1998.

National Osteoporosis Foundation. Silent No More: New Promise. New Hope. Washington, D. C., no date but probably 1997. Received February 1998.

Navarro, Vincente. Dangerous to Your Health: Capitalism in Health Care. New York: Monthly Review Press, 1993.

Nettleton, Sarah. "Governing the Risky Self: How to Become Healthy, Wealthy and Wise," in Alan Petersen and Robin Bunton, eds.. Foucault, Health and Medicine. London: Routledge,

1997: pp. 207-222.

Nordin, B. E. C. "International Patterns of Osteoporosis." Clinical Orthopaedics and Related Research No. 45 (March-April 1966): pp. 17-29.

Norton, Mary Beth. ed. Major Problems in American Women's History. Lexington, Mass.: D. C. Heath & Co., 1989: pp .350-386.

Olszynski, Wojtek and Harmathy, Tibor. "The Medical Post's Q & A Osteoporosis." The Medical Post. Pauline Anderson, ed. (May 6, 1997): pp. Q1-Q7. Copy obtained from Dr. Brian Farnell.

Osler, William. Modern Medicine: Its Theory and Practice in Original Contributions by American and Foreign Authors. Philadelphia: Lea, 1907-1910.

Osler, William. The Principles and Practice of Medicine: Designed for the Use of Practitioners and Students of Medicine. 2nd, 3rd, and 4th Editions New York: D. Appleton & Co., 1898, 1900, and 1901 respectively; and also the 8th Edition of Principles and Practice, Thomas McCrae, ed. New York: Appleton, 1912.

Osteoporosis and Related Bone Diseases National Resource Center. Fact Sheets and Progress Report. Washington, D. C.. October 1997.

Osteoporosis Society of Canada (Scientific Advisory Board). "Clinical Practice Guidelines for the Diagnosis and Management of Osteoporosis." Canadian Medical Association Journal Vol. 155 (8) October 15, 1996.

Osteoporosis Society of Canada. Growing Stronger Together: Annual Report 1996-97. Toronto, 1997.

Osteoporosis Society of Canada. Helping Canadians Build Better Bones: Annual Report 1996. Toronto, 1996.

Osteoporosis Society of Canada. Information Package of Fact Sheets. Toronto, 1996.

Osteoporosis Society of Canada. "Osteoporosis to the Third Millennium: Priorities for Prevention and Treatment: Summary Report," abstracted from Osteoporosis Society of Canada. Osteoporosis to the Year 2020: Priorities for Prevention and Early Intervention. Toronto, May 1996.

Ott, Susan. "Should Women Get Screening Bone Mass Measurements?" Annals of Internal Medicine Vol. 104 (6) (1986): pp. 874-876.

Papadimitropoulos, Emmanuel A., Coyte, Peter C., Josse, Robert G., and Greenwood, Carol E. "Current and Projected Rates of Hip Fracture in Canada." Canadian Medical

Association Journal Vol. 157 (10) (1997): pp.1357-1363.

Parfitt, A.M. "Richmond Smith as a Clinical Investigator: His work on Adult Periosteal Bone Expansion and Nutritional and Endocrine aspects of Osteoporosis in light of Current Concepts." Henry Ford Hospital Medical Journal Vol.28 (2 and 3) (1980): pp. 95-107.

Pearsall, Marilyn. "Introduction." in The Other Within Us. Marilyn Pearsall, ed. Boulder, Colo.: Westview Press, 1997: pp. 1-16.

Peck, William A. and Avioli, Louis V. Osteoporosis: The Silent Thief. AARP Book (American Association of Retired People).Glenview, Ill.: Scott Foresman and Company, 1988.

Pederson, Ann P. Health Promotion in Canada: Provincial National and International Perspectives. Toronto and Philadelphia: Saunders, 1994.

Peel, Nicola and Eastell, Richard. "Osteoporosis," in ABC of Rheumatology. Michael L. Smith, ed. London: BMJ Publishing Group, 1996: pp.36-39.

Pellegrino, Edmund D. "The Sociocultural Impact of Twentieth-Century Therapeutics," in The Therapeutic Revolution: Essays in the Social History of American Medicine. Morris J. Vogel and Charles E. Rosenberg, eds. Philadelphia: University of Pennsylvania Press, 1979: pp. 245-268.

Peltier, L. F. "Fractures of the Distal End of the Radius. An Historical Account." Clinical Orthopaedics and Related Research Vol. 187 (July-August 1984): pp.18-22.

Peppin, Patricia and Carty, Elaine. "What Drug Advertising Tells About Women, their Doctors and Menopause." Paper presented at the 5th National Health Promotion Research Conference in Halifax, July 5, 1997 by Carty and at the World Conference on Breast Cancer in Kingston on July 15, 1997 by Peppin.

Perzigian, Anthony J. "The Antiquity of Age-Associated Bone Demineralization in Man." Journal of the American Geriatrics Society Vol. XXI (3) (March 1973): pp. 100-105.

Petersen, Alan. "Risk Governance and the New Public Health," in Foucault, Health and Medicine. Alan Petersen and Robin Bunton, eds. London: Routledge, 1997: pp 189-206.

Peterson, Marvelu and Rose, Charles L. "Historical Antecedents of Normative vs Pathologic Perspectives in Aging." Journal of the American Geriatrics Society Vol. 30 (4) (April 1982): pp. 289-294.

Pharmaceutical Manufacturers of Canada, <http://www.pmac-acim.org/industry/97facts/ontaren.html>. February 1, 1998.

Phillipson, Chris. Capitalism and the Construction of Old Age. London: The MacMillan Press Ltd., 1982.

Poovey, Mary. "'Scenes of an Indelicate Character': The Medical 'Treatment' of Victorian Women," in The Making of the Modern Body: Sexuality and Society in the Nineteenth Century, Catherine Gallagher and Thomas Laquer, eds. Berkeley: University of California Press, 1987: pp.137-168.

Porter, Roy. "The Patient's View." Theory and Society Vol. 14 (1985): pp.175-198.

Powell, Douglas and Leiss, William. Mad Cows and Mother's Milk: The Perils of Poor Risk Communication. Montreal and Kingston: McGill-Queen's Press, 1997.

Premier's Council on Health Strategy. Nurturing Health: A Framework on the Determinants of Health. Toronto: Government of Ontario, 1991. Premier's Council on Health. Well-being and Social Justice. Nurturing Health: A New Understanding of What Makes People Healthy. Toronto: Queen's Printer for Ontario, 1993.(Brochure Summary of original document.)

Prince, Richard L. "Diet and the Prevention of Osteoporotic Fractures." New England Journal of Medicine Vol. 337 (10) (1997): pp. 701-702.

Public Health Reports, the Journal of the U. S. Public Health Service. Vol.110 (1) (January-February 1995): p.112.

Quick, Armand J. Bleeding, Drugs, Vitamins: Their Impact on History. Self-published, 1976.

Rafter, Gale W. "Elmer McCollum and the Disappearance of Rickets." Perspectives in Biology and Medicine Vol. 30 (4) (Summer 1987): pp. 527-534.

Ratcliff, Kathryn Strother. "Health Technologies for Women: Whose Health? Whose Technologies?" in Healing Technology: Feminist Perspectives. Kathryn Strother Ratcliff, et al., eds. Ann Arbor: The University of Michigan Press, 1989: pp. 173-198.

Reifenstein Jr., E. C., Albright, F., Wells, S. L. "The Accumulation, Interpretation, and Presentation of Data Pertaining to Metabolic Balances, Notably Those of Calcium, Phosphorus and Nitrogen." Journal of Clinical Endocrinology Medicine Vol. 5 (1945): pp. 367-395.

Reiser, Stanley J. Medicine and the Reign of Technology. Cambridge: Cambridge University Press, 1978.

Renner, John H. "The Awareness of Osteoporosis Among Health Professionals, Consumers, and Journalists." Proceedings of the National Conference on Women's Health Series; Special Topic Conference On Osteoporosis, October 30, 1987, Bethesda, Maryland. Public Health Reports Vol. 104 (1989 and Supplement September-October ): pp. 87-90.

Revell, Peter A. Pathology of Bone. Berlin/ Heidelberg: Springer-Verlag, 1986.

Rich. Clayton, Bernstein, D.S., Gates, S., Heaney, R. P., Johnston Jr., C. C., Rosenberg, C. A., Schnaper, H. W., Tewksbury, R. B., and Williams, G. A. "Factors Involved in an Objective Study of the Efficacy of Treatment of Osteoporosis." Clinical Orthopaedics and Related Research No. 45 (March-April 1966): pp. 63-66.

Richards, I. D. Gerald and Baker, Mark R. The Epidemiology and Prevention of Important Diseases. London: Churchill Livingstone, 1988.

Riessman, Catherine Kohler. "Women and Medicalization: A New Perspective." Social Policy Vol. 14 (1983): pp.3-18.

Riggs, B. L., Jowsey, J., Goldsmith, R. S., Kelly, P. J., and Hoffman, D. L. "Short and Long term Effects of Estrogen and Synthetic Anabolic Hormone in Post-menopausal Osteoporosis." The Journal of Clinical Investigation Vol. 51 (1972): p. 1659.

Riggs, B. L. and Melton III, L. J. "Evidence for Two Distinct Syndromes of Involutional Osteoporosis." American Journal of Medicine Vol. 73 (1983): pp. 899-901.

Riggs, B. Lawrence and Melton III, L. Joseph, eds. Osteoporosis: Etiology, Diagnosis, and Management. Second Edition. Philadelphia and New York: Lippincott-Raven, 1995.

Risse, Guenter B. "Epidemics and Medicine: The Influence of Disease on Medical Thought and Practice." Bulletin of the History of Medicine Vol. 53 (1979): pp. 505-519.

Risse, Guenter B. "Health and Disease: History of the Concepts of Health and Disease," in Encyclopedia of Bioethics, 4th Edition, Vol. 2 Warren T. Reich ed. New York: Free Press, 1978: pp. 579-585.

Risse, Guenter B. "The History of Therapeutics," in Clio Medica: Essays in the History of Therapeutics. Vol. 22 W. F. Bynum and V. Nutton, eds. Amsterdam-Atlanta: Rodopi, 1991: pp. 3-11.

Risse, Guenter B. and Warner, John Harley. "Reconstructing Clinical Activities: Patient Records in Medical History." Social History of Medicine Vol. 5 (1992): pp. 183-205.

Robinson, Joan. Economics: An Awkward Corner. London: Allen and Unwin, 1966.

Rogers, Naomi. "Germs with Legs: Flies, Disease, and the New Public Health." Bulletin of the History of Medicine Vol. 62 (1989): pp. 599-617.

Rose, Geoffrey. "Sick Individuals and Sick Populations." International Journal of Epidemiology Vol. 14 (1) (1985): pp. 32-38.



Rosenberg, Charles E. Explaining Epidemics and Other Studies in the History of Medicine. New York: Cambridge University Press, 1992.

Rosenberg, Charles E. "Introduction in Framing Disease: Illness, Society and History." in Framing Disease: Studies in Cultural History. Charles E. Rosenberg and Janet Golden, eds. New Brunswick, N. J.: Rutgers University Press, 1992.

Rosenberg, Lynn. "Hormone Replacement Therapy: The Need for Reconsideration." American Journal of Public Health Vol. 83 (12) (1993): pp. 1670-1673.

Ross, Philip D. "Osteoporosis Frequency, Consequences, and Risk Factors." Archives of Internal Medicine Vol. 156 (1996): pp. 1399-1411.

Rowland, Sydney. "On The Application of the New Photography to Medicine and Surgery." British Medical Journal from February 8, 1896 to March 7, 1896, pp. 361-64; pp. 431-32; pp. 492-97; pp. 556-59; pp. 620-22.

Ruzek, Sheryl Burt. The Women's Health Movement: Feminist Alternatives to Medical Control. New York: Praeger, 1978.

Ruzek, Sheryl Burt. "Medical Response to Women's Health Activists: Conflict, Accommodation and Co-optation." Research in Sociology of Health Care Vol. 1 (1980): pp. 335-354.

Sambrook, Philip N. "The Treatment of Postmenopausal Osteoporosis." The New England Journal of Medicine Vol.333 (2) (1995): pp. 1495-1496.

Schapira, Daniel and Charlotte. "Osteoporosis: The Evolution of a Scientific Term." Osteoporosis International. Vol. 2 (1992): pp. 164-167.

Schiebinger, Londa. "Skeletons in the Closet: The First Illustrations of the Female Skeleton in Eighteenth Century Anatomy." in The Making of the Modern Body: Sexuality and Society in the Nineteenth Century, Catherine Gallagher and Thomas Laquer, eds. Berkeley: University of California Press, 1987: pp. 42-82.

Schlesinger, Bernard S. and June H., eds. The Who's Who of Nobel Prize Winners 1901-1990. 2nd Edition. Phoenix, Ariz.: Oryx Press, 1991.

Schmidt, J. E. Medical Discoveries: Who and When. Springfield, Ill.: Charles C. Thomas, 1959.

Scriver, Charles R. "1992 Genetics Society of Canada Award of Excellence Lecture: Genes, Science and Society." Genome Vol. 36 (4) (1993): pp. 631-640.

Seaman, Barbara. "Foreword." in Coney, Sandra. The Menopause Industry: How the Medical

Establishment Exploits Women. Alameda, California: Hunter House. 1994: pp. 1-8.

Seeman, Ego, Hopper, John L., Young, Nicholas R., Formica, Carmelo, Goss, Peter and Tsalamandris, Con. "Do Genetic Factors Explain Associations between Muscle Strength, Lean Mass, and Bone Density? A Twin Study." American Journal of Physiology Vol. 270 (1996): pp. E320- E327.

Sen, Kasturi. Ageing [sic]: Debates on Demographic Transition and Social Policy. London: Zed Books. 1994.

Sevringhaus, E. I. "Treatment of the Menopause." Journal of the American Medical Association Vol. 116 (1941): pp. 1197-1199.

Sheehy, Gail. The Silent Passage: Menopause. Rev. ed. New York: Pocket Books. 1995.

Sherwin, Susan. No Longer Patient: Feminist Ethics and Health Care. Philadelphia: Temple University Press, 1992.

Shortt, S. E. D. "Antiquarians and Amateurs: Reflections on the Writing of Medical History in Canada," in Medicine in Canadian Society: Historical Perspectives. S. E. D. Shortt, ed. Montreal: McGill-Queen's University Press, 1981: pp. 1-17.

Shryock, Richard Harrison. "The Interplay of Social and Internal Factors in Modern Medicine: An Historical Analysis," in Medicine in America: Historical Essays. Baltimore: Johns Hopkins Press, 1966: pp. 111-125. (Reprinted from *Centaurus* 1953:3: pp 107-125.)

Sidel, Ruth. Women and Children Last: The Plight Poor Women in Affluent America. New York: Viking, 1986.

Silverman, Milton and Lee, Philip R. Pills, Profits and Politics. Berkeley: University of California Press, 1974.

Smith, D. C., Prentice, R., Thompson, D., Herrmann, W. L. "Association of Exogenous Estrogen and Endometrial Carcinoma." New England Journal of Medicine Vol. 293 (23) (1975): pp. 1164-1167.

Smith-Rosenberg, Carroll. Disorderly Conduct: Visions of Gender in Victorian America. New York: Alfred Knopf, 1985.

Smith-Rosenberg, Carroll and Rosenberg, Charles. "The Female Animal: Medical and Biological Views of Woman and Her Role in Nineteenth-Century America." Journal of American History Vol. LX (2) (September 1973): pp. 332-356.

Smith Jr., Richmond W., and Rizek, Juan. "Epidemiologic Studies of Osteoporosis in Women of Puerto Rico and Southeastern Michigan With Special Reference to Age, Race,

National Origin and to Other Related or Associated Findings." Clinical Orthopaedics and Related Research No. 45 (March-April 1966): pp. 31-48.

Sontag, Susan. Illness as Metaphor. New York: Farrar, Straus, and Giroux, 1978.

Spencer, Herta, Lewin, Isaac, Fowler, Josephine, and Samachson, Joseph. "Effect of Sodium Fluoride on Calcium Absorption and Balance in Man." American Journal of Clinical Nutrition. Vol. 22 (1969): pp. 381-390.

Stage, Sarah. Female Complaints: Lydia Pinkham and the Business of Women's Medicine. New York: W. W. Norton and Co., 1979.

Stamp, Trevor. "Grey Hairs, False Teeth and Bad Bones." The Lancet Vol. 345 (1995): p. 876.

Stedman, Thomas Lathrop. Stedman's Medical Dictionary. 26th Edition. Baltimore: Williams and Wilkins, 1995.

Strauss, Anselm. "Chronic Illness," in The Sociology of Health and Illness: Critical Perspectives. Peter Conrad and Rochelle Kern, eds. New York: St. Martin's Press, 1981: pp. 138-149.

Stevenson, J. C. and Marsh, M. S. An Atlas of Osteoporosis. Park Ridge, New Jersey: The Parthenon Publishing Group Inc., 1992.

Strong-Boag, Veronica. The New Day Recalled: Lives of Girls and Women in English Canada, 1919-1939. Toronto: Copp, Clark, Pitman Ltd., 1988.

Stubbs, Allston J., and Resnick, Martin I. "Fuller Albright (1900-1969)." Investigative Urology Vol.15 (4) (1978): p. 352.

Swann, John P. "Universities, Industry and the Rise of Biomedical Collaboration in America." in Pill Peddlers: Essays on the History of the Pharmaceutical Industry. Jonathan Liebenau, Gregory J. Higby, and Elaine C. Stroud, eds. Madison, Wis.: American Institute of the History of Pharmacy, 1990: pp. 73-90.

Swogger, Glenn Jr. "The Emotional Effects of the Osteoporotic Syndrome," in The Osteoporotic Syndrome: Detection, Prevention and Treatment, 3rd Edition. Louis A. Avioli, ed. New York: Wiley-Liss, 1993.

Temple, Norman J. and Burkitt, Denis P. "Towards a New System of Health: The Challenge of Western Disease." Journal of Community Health Vol. 18 (1) (February 1993): pp. 37-47.

Thibodeau, Gary A. and Patton, Kevin T., eds. Anatomy and Physiology, 2nd Edition. St. Louis: Mosby, 1993.

Tosteson. A. N. A., Rosenthal, Daniel I., Melton III, L. Joseph. and Weinstein. Milton C. "Cost Effectiveness of Screening Perimenopausal White Women for Osteoporosis: Bone Densitometry and Hormone Replacement Therapy." Annals of Internal Medicine Vol. 113 (1990): pp. 594-603.

Tosteson. A. N. A. "A Review and Update of Cost-Effectiveness of Hormone Replacement Therapy in the Menopause," in Medical-Economic Aspects of Hormone Replacement Therapy . Proceedings of a Ciba-Geigy Workshop Basel, Switzerland, held March 9, 1993. J.-M. Cosséry, ed. New York: Parthenon Publishing Group, 1993.

Turshen, Meredith. The Politics of Public Health. New Brunswick, N. J.: Rutgers University Press, 1989.

Turner, Bryan S. "From Governmentality to Risk: Some Reflections on Foucault's Contribution to Medical Sociology," in Foucault, Health and Medicine. Alan Petersen and Robin Bunton, eds. London: Routledge, 1997: pp. ix-xxi.

U. S. Senate Sub-Committee on Aging's Committee on Labor and Human Resources. Reviewing the Diagnosis and Treatment of Osteoporosis: Proceedings of the Hearing on Osteoporosis before the 99th Congress, 1st Session. Washington: U. S. Government Printing Office, June 20, 1985.

Utian, Wulf H. "The Menopause in Perspective: From Potions to Patches." Annals of the New York Academy of Sciences Vol. 592 ( June 13, 1990): pp. 1-7.

van Keep, P.A. "The History and Rationale of Hormone Replacement Therapy." Maturitas Vol. 12 (1990): pp. 163-170.

Verbrugge, Lois M. "Pathways of Health and Death," in Women, Health, and Medicine in America: A Historical Handbook. Rima D. Apple ed. New York: Garland Publishers Inc., 1990: pp. 41-80.

Verbrugge, Martha H. Able-Bodied Womanhood: Personal Health and Social Change in Nineteenth Century Boston. New York:Oxford University Press, 1988.

Vos, Rein. Drugs Looking For Diseases: Innovative Drug Research and the Development of the Beta Blockers and the Calcium Antagonists. Boston: Kluwer Academic Publishers, 1991.

Warren, Reg. Wealth and Health, Health and Wealth. Premier's Council on Health, Well-being, and Social Justice. Toronto: Queen's Printer for Ontario, 1994.

Wasnich, Richard D. "Epidemiology of Osteoporosis," in Primer on the Metabolic Bone Disease and Disorders of Mineral Metabolism, 3rd Edition. An Official Publication of the American Society for Bone and Mineral Research. Murray J. Favus, ed. Philadelphia:

Lippincott-Raven, 1996.: pp. 249-252.

Weatherall, Miles. In Search of a Cure: A History of Pharmaceutical Discovery. New York: Oxford University Press, 1990.

Welbourn, Richard B. The History of Endocrine Surgery. New York: Praeger, 1990.

Weston, Louise C. and Ruggiero, Josephine A. "The Popular Approach to Women's Health Issues: A Content Analysis of Women's Magazines in the 1970's." Women & Health Vol. 10(4) (Winter 1985/86): pp. 47-62.

Whatley, Mariamne. The Ideology of Images in Educational Media: Hidden Curriculums in the Classroom. New York: Teachers College Press, Columbia University, 1990.

Whatley, Mariamne H. and Worcester, Nancy. "The Role of Technology in the Co-optation of the Women's Health Movement: The Cases of Osteoporosis and Breast Cancer Screening." in Healing Technology: Feminist Perspectives. Kathryn Strother Ratcliff, ed. Ann Arbor: The University of Michigan Press, 1989: pp.199-220.

Whatley, Mariamne H. and Worcester, Nancy. "The Selling of HRT: Playing on the Fear Factor." Feminist Review No. 41 (Summer 1992): pp. 1-27.

Whedon, G. Donald. "International Collaborative Study of Osteoporosis and Fracture Epidemiology." Clinical Orthopaedics and Related Research No. 45 (March-April 1966): pp.13-15.

Wilbush, Joel. "Confrontation in the Climacteric." Journal of the Royal Society of Medicine Vol. 87 (1994): pp. 342-347.

Wilbush, Joel. "La Ménèspausie--the Birth of a Syndrome." Maturitas Vol. 1 (1979): pp.145-151.

Wilbush, Joel. "Menopause and Menorrhagia: a Historical Exploration." Maturitas Vol. 10 (1988): pp. 83-108.

Wilks, (no initial). "Case of Osteoporosis or Spongy Hypertrophy of the Bones." Transactions of the Pathology Society Vol. xx (London, 1869): pp. 273-277.

Wilson, Robert A. and Thelma A. "The Fate of Nontreated Postmenopausal Woman: A Plea for the Maintenance of Adequate Estrogen from Puberty to Grave." Journal of American Geriatrics Society Vol. 11 (1963): pp. 347-362.

Wilson, Robert A. Feminine Forever. New York: M. Evans and Co., 1966.

Wilson, Robert A., Brevetti R. E., and Wilson, Thelma. "Specific Procedures for the

Elimination of the Menopause." Western Journal of Surgery, Obstetrics and Gynecology Vol. 71 (May 1963): pp. 110-121.

Wilton. Peter. "Cod Liver Oil, Vitamin D and the Fight Against Rickets." Canadian Medical Association Journal Vol. 152 (9) (1995): pp. 1516-1517.

Winkler. John D., Kanouse, David E., Brodsley, Laurel, Brook, Robert H. "Popular Press Coverage of Eight National Institutes of Health Consensus Development Topics." Journal of the American Medical Association Vol. 255 (10) (1986): pp. 1323-1327.

Witt, Daniel M. and Lousberg, Tammy R. "Controversies Surrounding Estrogen Use in Postmenopausal Women." The Annals of Pharmacotherapy Vol. 31 (1997): pp. 745-754.

Women Against Osteoporosis (W. A. O). W. A. O. News King City, Ontario. Fall 1997.

Worcester. Nancy and Whatley, Marianne H. "The Response of the Health Care System to the Women's Health Movement: The Selling of Women's Health Centers," in Women's Health: Readings on Social Economic and Political Issues. Nancy Worcester and Marianne H. Whatley, eds. Dubuque, Iowa: Kendall/Hunt Publishers, 1988: pp. 17-23.

Worcester, Nancy. "The Obesity of the Food Industry," in Women's Health: Readings on Social, Economic and Political Issues. Nancy Worcester and Marianne H. Whatley, eds. Dubuque, Iowa: Kendall/Hunt Publishers, 1988.

World Health Organization. "Assessment of Fracture Risk and its Application to Screening for Postmenopausal Osteoporosis." Report of a WHO Study Group. World Health Organization Technical Report Series. Vol. 843 (1994): pp. 1-129.

Wright, Peter. "Introduction," in The Problem of Medical Knowledge: Examining the Social Construction of Medicine. Peter Wright and Andrew Treacher, eds. Edinburgh: Edinburgh University Press, 1982: pp. 2-22.

Yeaton. William H., Smith, Dawn, Rogers, Karen. "Evaluating Understanding of Popular Press Reports of Health Research." Health Education Quarterly Vol. 17 (2) (Summer 1990): pp. 223-234.

Ziel, M. K. and Finkle, W. D. "Increased Rise in Endometrial Carcinoma among Users of Conjugated Estrogens." New England Journal of Medicine Vol. 293 (23) (1975): pp. 1167-70.

Ziporyn. Terra. "Introduction: When Experts Disagree," in Nameless Diseases. New Brunswick, N. J.: Rutgers University Press, 1992.

Zita, Jacquelyn N. "Heresy in the Female Body," in The Other Within Us: Feminist Explorations of Women and Aging. Marilyn Pearsall, ed. Boulder, Colo.: Westview Press,

1997.

Zola, Irving K. "Medicine as an Institution of Social Control." in The Sociology of Health and Illness: Critical Perspectives. Peter Conrad and Rochelle Kern, eds. New York: St. Martin's Press: pp. 511-527.

Zones, Jane Sprague. "Beauty Myths and Realities and their Impact on Women's Health." in Sheryl Burt Ruzek, Virginia L. Olesen, Adele E. Clarke, eds. Women's Health: Complexities and Differences. Columbus: Ohio State University Press, 1997: pp. 249-275.

**Bibliography Part II**  
**Sources from Popular Literature (in Chronological Order)**

**1940<sup>1</sup>-1969**

Sevringhaus, Elmer L. "A Woman Faces Fifty." Hygeia Vol. 17 (August 1939): pp. 685+-688.

Miller, Milton L. "Facts About the Menopause." Hygeia Vol. 18 (August 1940): pp 692+740.

Davis, Maxine. "The Menopause." Good Housekeeping Vol. 117 (July 1943): p. 30+ 149.

Deutsch, Helen. "The Dangerous Age for Women." Science Digest Vol. 17 (October 1945): pp. 21-24.

Carp, Louis. "Broken Hips." Hygeia Vol. 24(5) (May 1946): pp. 350+382.

Davis, Maxine.<sup>2</sup> "Fractures." Good Housekeeping Vol. 123 (1946): pp. 40+ 300.

"Dr. P. B. Mack Describes New X-ray Technology for Measuring Bone Density." New York Times (April 20, 1950): p. 31.

"Women with Nerves." Newsweek Vol. 38 (December 17, 1951): p. 45.

"Women and Womb." Time Vol. 64 (September 27, 1954): p. 58.

"Hope for Grandmothers." Newsweek Vol. 43 (June 28, 1954): p. 82.

Locke, Jeannine. "Medicine's New Boon to Women: A Pill that Prolongs the Prime of Life." Macleans Vol. 78 (August 7, 1965): p. 7+34.

"Western Mares Contribute to Blush of Youth." Financial Post Vol. 60 (April 16, 1966): p. 9.

Marshall, Douglas and Korcok, Milan. "Old Grey Mare Worth Millions Now." Macleans Vol. 79(August 6, 1966): p. 1.

"Birth Pill Research of Author Assailed." New York Times (November 17, 1966): p. 30 and

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<sup>1</sup>I found one source in 1939, after the synthesis of estrogen (stilbestriol) and prior to Fuller Albright's publication as a 'baseline' to the search for direct or indirect references to osteoporosis. This list represents only the articles with some relevant content pertinent to this paper; I did not include other articles which had titles that hinted at a possibility of useful information.

<sup>2</sup>Maxine Davis, the author of many health articles in Good Housekeeping in this era, was billed as "the world's foremost medical reporter."



"Drug Agency Ruling on Doctor Clarified." New York Times (February 11, 1967): p. 13.<sup>3</sup>

Schmeck, Jr., Harold M. "Bone Decay Rated as Major Problem." New York Times Vol. 4 (April 18, 1967): p. 34.

Whedon, G. Donald. "Battling the Bone-Thinner." Today's Health Vol. 45 ( 9) (September 1967): pp. 66-70.

## 1970- 1983

"Strengthening Brittle Bones." Time Vol. 196 (August 17, 1970): pp. 43-44.

Reinhold, Robert. "Scientists Create Hormone That Aids in Bone Formation." New York Times (November 20, 1970): p. 1.

Nemy, Enid. "Nutritional Problems of Women Discussed by Medical Experts." New York Times (November 22, 1975): p. 34.

"Ohio Commission on Aging Works to Combat Effects of Bone-Crippling Disease." Aging Vol. 277 (November/December 1977): p. 22.

"Your Body." Vogue Vol. 168 (October 1978): p.384+. (nested set of articles and columns)

"Promising Rx for Brittle Bones." Newsweek Vol. 94 (December 10, 1979): p. 124.

Brody, Jane E. "Vitamin D Used to Treat Bone Disease." New York Times (February 26, 1980), Section III: pp. C1- C2.

"Make Your Bones Last a Lifetime." Vogue Vol. 172 (July 1982): p. 244.

Benzaia, Diana. "The Calcium Connection." Health Vol. 14 (February 1982): pp. 20-21.

Titolo, Phil. "Revolutionary?" Health (February 2, 1982): unpaginated inside cover.

D. R. "The Thin-Bone Detector." Health Vol. 14 (August 1982): pp. 15-16.

Wood, Gael MacDonald. "Osteoporosis--Bone Degeneration--is Preventable. *if We Get Enough Calcium and Exercise.*" House and Garden Vol. 154 (November 1982): p. 60+.

Treichel, J. A. "CT Scanning and Osteoporosis Prevention." Science News Vol. 123 (May 21, 1983): p. 325.

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<sup>3</sup>These two articles were on the FDA's 1966 ruling on Dr. R.A. Wilson's popularization of Enovid.

## 1984-1989

"U. S. Agency Approves Estrogens to Aid Bones." New York Times (May 21, 1984) Section II : p. 10.

Phillips, Catherine. "Start Now to Prevent Osteoporosis." Chatelaine Vol. 57 (August 1984): pp. 12-14.

M. H. J. F. "Start Young to Keep Your Bones Strong." Good Housekeeping Vol. 199 (September 1984): p. 4.

"Osteoporosis." Consumer Reports Vol. 49 (October 1984): pp. 576-580.

Seligmann, Jean. "New Comforts for Old Bones." Newsweek Vol. 104 (September 17, 1984): pp. 79-79C.

"Young Women, Take Care of Your Bones." Changing Times Vol. 38 (December 1984): pp. 75-78.

"Boning Up on Osteoporosis." Ladies Home Journal Vol. 101 (September 1984): p. 121.

Koop, C. Everett. "Surgeon-General Talks About Osteoporosis, the Bone-Thinning Disease." Aging No. 347 (1984): pp. 30-32.

"Osteoporosis. The 'Silent' Disease, Strikes One in Four Women Over 65. An Expert Warns." People Vol. 23 (April 1, 1985): pp. 129-132.

Weber, Melva. "Osteoporosis: Cancelled." Vogue Vol. 175 (October 1985): pp. 558-559.

Pekkanen, John. "The Hidden Health Risk Most Women Face." Reader's Digest Vol. 127 (November 1985): pp. 72-77.

"Bone Analyzer." New York Times (December 24, 1985) Section III, p. 5.

Clark, Matt. "The Calcium Craze: The Miracle Mineral Builds Up Bones, Teeth--And Perhaps False Hopes." Newsweek Vol. 107 (January 27, 1986): pp. 48-52.

McNurlen, Carolyn A. "Osteoporosis: A Second Look." Better Homes & Gardens Vol. 64 (April 1986): pp. 64-66.

Finlayson, Ann. "New Aid for Bone Victims." Maclean's Vol. 99 (April 7, 1986): pp. 42-43.

McCarthy, Paul. "A Fishy Cure." Health Vol. 18 (September 1986): p. 23.

Larkin, Marilyn. "Make These 10 Exercises Your Secret Weapon Against Osteoporosis." Health Vol. 18 (October 1986): pp. 33-34.

Boxer, Sarah ed. "New Bones to Pick About Osteoporosis and Calcium Supplements." Discover Vol. 7 (October 1986): pp. 8-9.

Napoli, Maryann. "The Latest in Getting Sick: Disease of the Week." New Republic Vol. 195 (December 1, 1986): pp. 17-18.

Toufexis, Anastasia. "Going Crazy over Calcium." Time Vol. 129 (February 23, 1987): pp. 88-89.

"No Calcium Fix." Scientific American Vol. 256 (April 1987): p. 72.

Breu, Giovanna. "The Calcium Controversy: An Expert Warns that Supplements are Not the Cure-All for Dowager's Hump." People Vol. 27 (April 13, 1987): pp. 69-.

Weisburd, S. "New Bone-Loss Risk Factors in Young Women." Science News Vol. 132 (November 28, 1987): p. 347.

Cooper, Kenneth H. "Osteoporosis: Are You at Risk?" Ladies' Home Journal Vol. 106 (March 1989): pp. 56-60.

Mann, Peggy. "The Truth About Calcium." Reader's Digest Vol. 134 (March 1989): pp. 70-74.

## **1990 to Present**

"A Breakthrough for Brittle Bones." U. S. News and World Report Vol. 109 (July 23, 1990): pp. 13 -14.

"For Older Women, Calcium Counts." Newsweek Vol. 116 (October 8, 1990): p. 77.

"Wasted Health Care Dollars." Consumer Reports (July 1992): pp. 435-445.

Olson, Arthur J. and Goodsell, David S. "Visualizing Biological Molecules." Scientific American (November 1992): pp. 76-81.

Brody, Jane E. "Exercise Saves Bones, But Not by Itself." New York Times (July 14, 1993): p. C 12.

Brink, Susan. "A Drug for Fragile Bones." U. S. News and World Report Vol. 119 (November 6, 1995): pp. 89-90.

Brink, Susan. "A High-Tech Debate Over Women's Bones." U. S. News and World Report

Vol. 121 (September 30, 1996): pp. 70-71.

"Do Broken Hearts Lead to Broken Bones?" The Economist Vol. 341 (November 23, 1996): p. 99.

Kilfoyle, Harry. "Township Company is Good to the Bone." Kingston Whig-Standard (April 5, 1997): p. 17.

Eggertson, Laura. "Drug-Approval Process Criticized." Globe and Mail (May 28, 1997): p. 1.

Felner, Julie. "Dr. Susan Love Cuts Through The Hype on Women's Health." Ms (July/August 1997): pp. 37-46.

Zuger, Abigail. "Drug Companies' Sales Pitch: 'Ask Your Doctor.'" New York Times (August 5, 1997): p. C1+.

Coutts, Jane. "'Publication Bias' May Put Patients At Risk." Globe and Mail (September 22, 1997): p.?

Sarick, Lila. "Life After Menopause a Mystery for Many." Globe and Mail (October 1, 1997): p. A7.

Immen, Wallace. "Unexpected Result in Menopause Survey." Globe and Mail (October 8, 1997).

Brody, Jane. "In Vitamin Mania, Millions Take a Gamble on Health." New York Times (October 26, 1997): pp. 1, 28 and 29.

Strauss, Stephen. "Why It's Tough to Name Genes and Be Genial." The Globe and Mail (January 1, 1998): p. A8.

Branswell, Brenda. "The HRT Conundrum." Maclean's Vol. 111( 2) (January 12, 1998): pp. 54-55.

Nichols, Mark. "Women's Health: New Attitudes and Solutions." Maclean's Vol. 111 (2) (January 12, 1998): pp.52-52.

Rapp, Jerry. "Reporting on Science." Letter to the Editor, Week in Review Section, New York Times (January 18, 1998): p. 16.

Jones, W. Gifford. "Denying Your Kids Whole Milk? Time to Think Again." The Doctor Game Column, Kingston This Week (January 24, 1998): p. 22A.

Scofield, Heather. "Drug Firms Hold Out Investment Lure." Globe and Mail (January 30, 1998): p. B4.

## Appendix I Selected Osteoporosis Definitions

Osteoporosis ( from Greek roots=porous bone) originated as a description of a pathological state of the bone.

**Jean-Georges-Chrétien-Frédéric-Martin Lobstein "the Younger," France in the early 1820's**

"Osteoporosis is defined as that category of decreased bone mass where the disturbance is a failure of the osteoblasts to lay down bone matrix."

**Fuller Albright, 1947**

"...women whose skeletons long outlive their ovaries often reach the point of having 'too little bone.'"

**Gilbert Gordan, Perspectives in Biology and Medicine, 1981**

"Osteopenia is commonly used to denote any loss of bone mass to levels below normal. Osteoporosis is the abnormal rarefaction of bone in response to reduced levels of estrogen, calcium, and/or vitamin D. It is the most common disease entity of the menopause."

**Winnifred Berg Cutler and Celso-Ramon Garcia, The Medical Management of Menopause and Premenopause, 1984**

"Osteoporosis is the latest media disease."

**Dr. Nigel Gilchrist, New Zealand Journal of Medicine, 1988**

"Osteoporosis is not now regarded as a disease but a syndrome which manifests itself as a fracture resulting from minimal trauma in a person with reduced skeletal mass. Analogous syndromes include congestive heart failure, renal insufficiency hepatic failure mental deficiency, arterial insufficiency and respiratory insufficiency. All of these syndromes have a common physiopathology, namely insufficient organ reserves to meet intercurrent minor stress. Physiological aging gradually reduces tissue 'reserves', a process which might be accelerated temporarily or permanently by concomitant diseases affecting bone, such as hyperthyroidism, gastrectomy, immobilization, arthritis, etc."

**J. Dequeker, Belgium, 1988**

"A reduction in the quantity and quality of bone by the loss of both bone mineral and protein content. It can be primary as is seen in postmenopausal women or elderly men, or secondary, as a consequence of thyrotoxicosis, hypersteroidism, or prolonged immobilization."

**Churchill's Medical Dictionary, 1989**

"...a disease characterized by low bone mass and fragility and a consequent increase in fracture risk."

**National Institute of Health Consensus Development Conference, 1990**

"Osteoporosis is not a single disease entity, but it is the end result of a number of processes which become more common with increasing age and lead to the diminution of the amount of bone in the skeleton."

**Germaine Greer, The Change, 1991**

"Osteoporosis is not a disease: it is the end result of many processes that lead to a state where bone mass is less than the needs of body mass."

**Janine O'Leary Cobb, Understanding Menopause, 1993**

"a value for bone mineral density that is 2.5 Standard Deviations or more below the value in young adults."

**WHO Study Group on Osteoporosis, 1994**

"Osteoporosis is a serious health problem for women who suffer fractures: however, there has been a tendency for the extent of the problem among women to be exaggerated."

**Sandra Coney, The Menopause Industry, 1994**

"Osteoporosis is a potentially crippling disease characterized by low bone mass (density) and deterioration of bone tissue...A bone is considered osteoporotic if it has weakened to the point where it may fracture with minimum trauma or if a fracture has already occurred."

**Osteoporosis Society of Canada Fact Sheet Series No. 4, 1996**

**Appendix II:  
Chronology of Selected Scientific Discoveries and Historical Milestones  
Related to the History of Osteoporosis**

- 4th Cent. B.C. **Herophilus** described the ovaries as “female testicles.”
- 3rd Cent. A.D. **Galen** (129-201) postulated about the role of the thyroid gland.
- c.1590        **Jansson and Jansson** and **Anton van Leeuwenhoek** (1632-1723) invented early microscopes.
- 18th Century    **Albrecht von Haller** noted that glands without ducts released substances into the body’s circulatory system.
- 1814        **Abraham Colles** (1773-1843) published classic early description of wrist bone fracture (Colles fracture).
- 1816        **C. P. L. De Gardanne** first used the term “la ménèspausie” to describe symptoms related to the cessation of menstruation.
- 1820’s        **Jean-G-C-F-M Lobstein “The Younger”** (1777-1835) coined the term osteoporosis to describe a pathological state of the bone.
- 1822        **Sir Astley Cooper** (1768-1841) published an early association between bone fragility and old age, especially in women.
- 1823        Improved compound lens invented for microscopes.
- 1855        **Claude Bernard** (1813-1878) first used concept of internal secretion using new science of experimental pathology. He showed for first time that the body plays a synthesizing role in the metabolic process as well as a decomposing one. In addition he saw physiology more as the study of changes or lack of change in the chemical constitution of body fluids.
- 1858        **Rudolf Virchow** (1821-1902) developed the concept that disease processes are in the cells within tissues. His theories represented the shift from gross to microscopical anatomy in the field of pathology and the transition from clinic to the laboratory as the priority focus for modern medical science
- 1866        **Gregor Mendel** (1822-84) published his findings from experiments on heredity in plants.
- 1869        **Sir Francis Galton** (1822-1911) published book on heredity, developing biometry, the methodology for studying the statistical analysis of populations.

- 1870's **Emil Fischer** (1852-1919) pioneered studies of human nutrition and developed laboratory principles essential for the technological production of synthetic chemicals and foodstuffs.
- 1877 **F. Hoppe-Seyler** (1825-1895) coined the term 'biochemistry.'
- 1880 **Ivar Victor Sandström** (1852-1889) described parathyroid glands in humans.
- 1881 **Paul von Bruns** (1846-1916) pointed out the association between more frequent incidence of fractures of the hip and wrist in women over age 50 years.
- 1881 **Nicolai I. Lunin** (1852-1937) observed that synthetic diets lack essential substances to sustain life (an early concept of vitamins).
- 1886 **Culmann** and **A. Wolff** initiated modern scientific study of mechanical stress on femoral bone formation.<sup>1</sup>
- 1889 **Charles-Edouard Brown-Sequard** (1817-1894) was the first modern scientist known to self-test with organotherapy using testicular substances.
- 1889 **Albert Schinzinger** (1827-1911) made a link between breast cancer and ovaries.
- 1895 **Wilhelm K. Roentgen** (1845-1923) discovered the X-ray. The ability to diagnose bone 'abnormalities' and fractures in living patients begins. Within two years this technology is disseminated in hospitals across North America, although its usage for diagnosis developed slowly over 2 decades. (The Nobel Prize in Physics 1901 was awarded for the discovery of x-rays.)
- 1896 **Edwin Brant Frost** (1866-1935) first to use x-rays for diagnosis in North America.
- 1900 Rediscovery of Mendelian genetics by three separate investigators, including **Hugo Marie de Vries** (1848-1935), **Carl Correns** (1864-1933) and **Erich Tschermak** (1871-1962).
- 1900 **Walter Heape** linked "pro-estrum" to menstruation.
- 1900 **Paul H. M. Sudeck** (1866-1938) described acute bone atrophy following trauma (Sudeck's atrophy or traumatic osteoporosis).

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<sup>1</sup>A.M. Cooke (April 30, 1955), p. 878.



- 1901      **Archibald E. Garrod** (1857-1936) first linked defects in human metabolism to inherited factors.
- 1902      **Clarence Erwin McClung** (1870-1946) identified male and female sex chromosomes.
- 1903      **Walter S. Sutton** (1877-1916) developed the theory that the chromosome contained the unit of inheritance and explained the mechanism for Mendelism as the division of cell nuclei within the chromosome.
- 1900-25:    Increasing reliance on clinical examination of patients ushers in the era of scientific laboratory investigation used to confirm diagnoses, especially in hospitals.<sup>2</sup>
- 1900-50:    “**The Golden Age of Biochemistry**” when a vast number of biological compounds were isolated, structurally determined, and synthesized, including vitamins and hormones.<sup>3</sup>
- 1903      **Charles E. Sajous** (1852-1929) was the first U. S. scientists to publish a treatise on internal secretions.
- 1902-05    **Sir William B. Hardy** and **W. T. Vesey** suggested the word hormone (hormone from hormaso (GK=to put into quick motion, to excite or arouse).
- 1905      **Francis H. A. Marshall** (1878-1949) and **William Adam Jolly** (1873-1945) demonstrated that ovarian extracts could produce the state of being in heat in castrated animals.
- 1905      **Ernest H. Starling** (1866-1927) and **William Bayliss** (1860-1924) used the word 'hormone' for first time in the modern sense of “chemical messengers.”
- 1905      **E. S. McSweeny** published first North American paper using the term 'osteoporosis.'
- 1905-1906    **John N. Langley** (b. 1852) And **Sir Henry H. Dale** (1875-1968) observed that there were two types of receptors in tissues upon which binding of drugs caused excitatory or inhibitory responses.
- 1905-1906    **William Bateson** (1861-1926) first used the word genetics.

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<sup>2</sup>Howells, p. 2.

<sup>3</sup>Doisy, pp. 267-268.

- 1906 **Jakob Erdheim** (1874-1937) first linked parathyroid gland, bone disorder (osteomalachia) and calcium metabolism.
- 1906 **Sir Frederick G. Hopkins** (1861-1947) developed first modern concept of accessory nutrients (vitamins) in the human diet. (He received the Nobel Prize in Medicine and Physiology in 1929 for his discovery of growth-stimulating vitamins.)
- 1908 Cyclical changes in the endometrium were first described as a normal physiological process by **Fritz Hitschmann** (1870-1926) and **Ludwig Adler** (1859-1926).
- 1909 **William G. MacCallum** (1874-1944) with **Carl Voegtlin** (1879-1960) showed that calcium administration can control effects of parathyroid removal and hypocalcaemia.
- 1909 **Nicolo Pende** (b. 1880) used word 'endocrinology' for first time.
- 1910-1920 **Thomas Hunt Morgan** (1866-1945) refined theories about the chromosome and gene into their classical concepts.
- 1911 **George de Hevesy** (1885-1966) used radioactive isotope of lead as a tracer. He was later instrumental in applying tracer techniques in biology. (He won the Nobel Prize in Chemistry 1943 for isotopes as tracers.)
- 1912 **Casimir Funk** (1884-1967) named accessory nutrients "vitamines," later called vitamins.
- 1910-1919 **Elmer V. McCollum** (1879-1967) and **Harry Steenbock** (1886-1967) proved the importance of micronutrients to health and reproduction of domestic animals, discovering Vitamins A, B, and D. McCollum and Steenbock observed rickets in lab animals and experimented with cod-liver oil and sunlight as possible cures.
- 1915 **Paul Ehrlich** (1854-1915) conceived of the concept of drugs binding to receptors in the cell.
- 1918 **Sir Edward Mellanby** (1884-1955) recognized anti-rachitic factor (Vitamin D). He later used cod liver oil to cure rickets.
- 1919 **Kurt Huldshinsky** (1883-1941) first reported successful treatment of rickets with ultraviolet light.
- 1921-26 **John Howland** (1873-1926) and **Benjamin Kramer** (1888-1972) provided

evidence that the major failure to calcify bone in rickets is an insufficient supply of calcium and phosphorus to the mineralization sites.

- 1922 **Harry Steenbock** (1886-1967) discovered antirachitic Vitamin D, synthesized it in 1924, and invented Vitamin D in milk, which was introduced c. 1925.
- 1923 **Edgar Allen** (1892-1943) and **E. A. Doisy** (1893-1986) isolated oestrin, a form of estrogen.
- 1925 **James Bertram Collip** (1892-1965) isolated parathormone, the active principle of the parathyroid glands, preparing a stable, physically active extract of PTH which could be used for experimental purposes. **A.M. Hanson** (b.1883) in 1923 had made the same discovery but had published it in an obscure medical military journal.
- 1926 **Oscar Riddle** (1877-1968) published research on linkage between estrogens and bone formation in birds.
- 1927 Federal Health Department in Canada acquired regulatory authority for misbranded drugs.
- 1929 **E. A. Doisy** with **Sidney A. Thayer** (1902-1969) isolated estrogenic hormone from human urine.
- 1920's-1930's **H. J. Muller** (1890-1967) developed genetics through studies about mutations caused by radiation, and transformed the gene concept into a physical model.
- 1930's U. S. Food and Drug Administration established as part of the federal Department of Agriculture.
- 1930's Discovery of bone as a non-static organ that both grows and is resorbed throughout the lifespan.
- 1931 The concept of an interdependent system of ductless glands was developed, metaphorically described as an "endocrine orchestra," discharging its products into the blood directly, with the "leader," the pituitary gland, playing a regulatory role.
- 1932 **Walter B. Cannon** (1871-1945) coined the word 'homeostasis' to define the concept of constancy of the internal environment in the human body which is maintained, not by sealing the organism off from its environment, but by regulating ongoing internal physiological processes.
- 1932 **Joseph Aub** (1890-1973), Fuller Albright and Walter Bauer confirm link of parathyroid hyperactivity to bone dissolution in a famous case of a sea captain.

- Aub pioneered in studying the connections between calcium metabolism, the parathyroid and bone dissolution.
- 1932 **Hans Selye** (b. 1907) observed the increase in bone formation caused by parathormone while working in Collip's laboratory.
- 1931-37 Isolation and identification of nutritional forms of Vitamin D by **Steenbock**, **Wilhelm Hess** (1862-1934), and **A. O. R. Windaus** (1876-1959).
- 1932 **Carl Kaufmann** (b. 1900) in German was among the first physicians to treat women with amenorrhea or ovariectomies using estrogenic hormone. In the same year **Samuel Geist** and **Frank Spielman** in the U. S. also first published results of treatments of menopausal women with "theelin" (estrogen).
- 1932 First provincial federation of pensioners organized in B.C.
- 1934 **Preston Kyes** (1875-1949) published study on osteoporotic pigeons.
- 1935-43 **R. Nicolaysen** showed conclusively that Vitamin D directly stimulates intestinal calcium absorption and that Vitamin D was required for the intestine to adapt to dietary calcium levels.
- 1936-1938 **Russell Marker** and **Thomas Oakwood** in 1936 were credited with the development of first synthetic oestrogen (stilboestrol) by some authors.<sup>4</sup> **Edward C. Dodds** (1899-1973) and colleagues in the U. K. were also described as originators this drug.<sup>5</sup>
- 1938 **Reinhold Rudenberg** patented the electron microscope.
- 1938 U. S. Food, Drug and Cosmetic Act passed, modernizing the previous regulatory legislation from 1906.
- 1939-1941 Beginning phase of the medicalization of menopause.<sup>6</sup>
- 1940-1968 Vitamin D was thought to act directly on target tissues without metabolic alteration; therefore from 1940-68 Vitamin D chemistry was "quiescent."<sup>7</sup>

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<sup>4</sup>McCrae p. 112 and Wilson p. 185;

<sup>5</sup>Medvei, p. 836.

<sup>6</sup>Bell, pp. 541-42

<sup>7</sup>DeLuca, Paaren, and Schnoes, p. 3.

1940's-1950's "The Golden Age of Drug Discovery"<sup>8</sup>

- 1940      **Fuller Albright** (1900-1969) "The Father of Clinical Endocrinology" published research linking the loss of estrogen and the loss of bone in perimenopausal women.
- 1941      **G. N. Papanicolaou** (1883-1962) published his technique for cell examination.
- 1942      Fuller Albright and Henry Klinefelter described new syndrome; this discovery led to the development of chromosome mapping for genetic disorders.<sup>9</sup>
- 1943      Treatments of osteoporotic women with estrogen and/or progesterone supplements for osteoporosis began.<sup>10</sup>
- 1943      **James Goodall** extracted estrogen from mare's urine, paving the way for a new hormonal drug, Premarin.
- 1945      **George W. Beadle** (1903-1989) and **E. L. Tatum** (1909-1975) postulated the "one gene -- one enzyme" theory of gene functioning for which they received the 1958 Nobel Prize. This discovery initiated the turning point from the age of classical genetics to the post-war molecular investigations of heredity in human populations.
- 1945      **Fuller Albright** published description of balance study (measured intake and output), the basic technique for much of his clinical investigations.
- 1946      ENIAC (Electronic Numerical Integrator and Computer) put into operation. Computers enter research and business worlds.
- 1947      **Fuller Albright** published first reports on the effectiveness of estrogen replacement therapy in retarding further bone loss in his patients with osteoporosis.
- 1947      **S. B. Gusberg** published an article citing 11 previous studies showing estrogen to be carcinogenic in female reproductive organs.

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<sup>8</sup>Vos, p. 277.

<sup>9</sup>Laidlaw and McLean.

<sup>10</sup>Albright and Reifenstein, p. 159

- 1948 **Herman J. Ahlquist** (b. 1903) differentiated two types of adrenaline receptors in the body's tissues; this paradigm was later used in the development of rational drug derivatives called beta blockers.
- 1950's(early) **Walter Campbell** first refined method for accurately measuring calcium. He devised a method for separating ionized calcium from calcium bound to protein. This method was supplanted by the use of electrodes to measure ionized calcium. In the diagnosis of osteoporosis the ionized calcium is the important fraction of calcium.<sup>11</sup>
- 1950's-1960's Beginning of modern public interest consumer movement in U. S.
- 1952 **A. J. Carlson** (1875-1956) provided first true insight in the mechanism of action of Vitamin D on bone by demonstrating that Vitamin D was responsible for the mobilization of calcium from previously formed bone.
- 1953 **James D. Watson** (b. 1928) and **Francis H. C. Crick** (b. 1916) discover the double helix structure of DNA, how it replicated and its significance for information transfer in living material, leading to development of genetic engineering including gene mapping and gene splicing and the Nobel Prize in 1962.
- 1955 **J. Gershon-Cohen** first identified the development of densitometric and computation equipment as a promising advance for the diagnosis of osteoporosis. This technology had been invented by physicists at Pennsylvania State University c. 1939-49.
- 1958 American Association for Retired people (AARP) established by **Ethel Percy Andrus** (1882-1967).
- 1959 Discovery of parathyroid hormone and definition of its structure as a polypeptide hormone by **Howard Rasmussen** (b. 1925).
- 1960 **Richmond Smith Jr.** conducted first study of apparent bone density in healthy female subjects (asymptomatic) and predicted incidences in the general population (i.e those who are non-institutionalized).
- 1960's Life expectancy increased in industrialized Western nations.
- 1960's Rapid development of chromatography methods for lipid soluble materials allowed Vitamin D to be separated from its metabolites in a convenient and reproducible manner.

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<sup>11</sup>Interview with Dr. E. R. Yendt, July 21, 1997.

- 1960's      Development of mass spectrographic methods of structural determination of organic compounds and nuclear magnetic resonance spectrometers made possible the identification of small amounts of important metabolites.
- 1960's      Single photon and x-ray absorptometry (SPA) was introduced but not commercially used in bone density tests for two decades.
- 1960's      **B. E. C. Nordin** (b. 1920) suggested that calcium deficiency was an important risk factor for osteoporosis. He elucidated the importance of calcium in human nutrition and its possible relation to fractures in the elderly.
- 1961        **Helen and Harold Harrison** demonstrated that vitamin D activates the transport of phosphate across the intestinal membrane.
- 1963        **Hector F. DeLuca** (b. 1930) showed how metabolism of vitamins and hormones worked in the body. He demonstrated that Vitamin D and parathyroid hormone were both necessary to mobilize calcium from previously formed bone.
- 1962        **D. Harold Copp** (1915-1998) discovered and isolated a new hormone calcitonin, that lowers blood calcium. Calcitonin was first believed to originate in the parathyroid; later it was learned that it was a hormone from the thyroid gland.
- 1963        **Jerome A. Berson** (b. 1924) introduced a radio-immunological method for estimation of parathyroid hormone in blood serum.
- 1963        **Alan MacLeod Cormack** (b. 1924) published results from experimental scanner using a computer to reconstruct images from data. He is credited with the invention of new x-ray technology, computer axial tomography (CT) in which x-ray projections of a sample taken at a variety of different angles are combined using the computer to reconstruct the image being viewed. (Cormack shared the Nobel Prize in Medicine and Physiology in 1979 for this discovery.)
- 1963        **Betty Friedan** published Feminine Mystique, marking the beginning of the second wave of feminism in the U. S.
- 1965        **Gérard Milhaud** investigated calcitonin's use in treating bone and calcium disorders.
- 1964-66     **DeLuca** discovers first biologically active metabolites of Vitamin D.
- 1966        Epidemiological investigation of connection between sodium fluoride and osteoporosis first reported.

- 1966 **Robert A. Wilson** (b. 1895) published Feminine Forever, publicizing menopause as a disease of estrogen deficiency; he recommended routine hormone replacement therapy. Estrogen replacement therapy (ERT) became recommended for an increasing array of menopausal symptoms, mild as well as severe; previously, only severe menopausal symptoms were so treated. Osteoporosis prevention was also touted as a reason to give estrogen to asymptomatic women.
- 1968 **DeLuca** showed that Vitamin D must be metabolically altered in both the liver and kidneys to function in regulating calcium in the body.
- 1968 **Herbert Fleisch** (b. 1933) discovered and reported on pyrophosphate, which was thought to be involved in the regulation of bone loss. A twenty year long search for analogs commenced, resulting in the development of bisphosphonates as a new therapeutic agent for osteoporosis. Didronel-sodium mitidronate was first used for Paget's Disease, another bone disorder, from the 1960's.
- 1970's Rise of the Women's Health Movement.
- 1970's(late) U. S. grey power movement took shape under leadership of Maggie Kuhn.
- 1970's-1980's Studies were published on the effects of weightlessness on bone formation during space flights.
- 1970 **John T. Potts, Jr.** synthesized the active ingredient in parathyroid hormone which allowed therapeutic experimentation with the pure form of this hormone.
- 1971 Publication of discovery that widely used synthetic estrogen (DES diethylstilbestrol) was a transplacental carcinogen.
- 1971 Most potent and hormonal form of Vitamin D was isolated, identified, and chemically synthesized by **DeLuca**, which was reclassified as a hormone.
- 1974 Publication of the Lalonde Report in Canada which stressed the broad determinants of disease causation outside of biological factors.
- 1974-76 **DeLuca** discovered that vitamin D is a precursor of at least one steroid hormone which is involved in the regulation of calcium and phosphorus metabolism. This finding enabled the application of active metabolites of Vitamin D to the treatment of calcium, phosphorus and bone disorders.
- 1975-1976 Publication of several articles confirming link between estrogen treatments and endometrial (uterine) cancer. By this time in the U. S., 6 million women



- had started estrogen treatments.
- 1976 National Women's Health Network established in U. S. co-founded by Barbara Seaman.
- 1976 International (medical) definition of menopause and related physiology established at Montpellier in France by International Congress on Menopause.
- 1977 U. S. Government changed the labelling requirement for estrogen prescriptions.
- 1980's(early) SPA introduced to screen asymptomatic osteoporosis patients.
- 1980's(mid) DPA replaced SPA to provide a more accurate measure of bone loss.
- 1982 Osteoporosis Society of Canada established as the first patient advocacy group in the world dedicated to this disease.
- 1984 NIH Consensus Conference on Osteoporosis. Calcium, estrogen, and bone densitometry promoted to stem the epidemic.
- 1984 U. S. FDA approved estrogen for treatment and prevention of osteoporosis.
- 1984 WHO European Office issued concepts paper on health promotion.
- 1985 U. S. Congress passed a resolution declaring the first National Osteoporosis Week in May of that year.
- 1985 U. S. Congress holds hearing on Osteoporosis.
- 1985 Canadian seniors protest movement propelled by a Federal Government attempt to alter pensions.
- 1986 National Osteoporosis Foundation established in the U. S.
- 1986 Ottawa Charter on Health Promotion issued.
- 1986 Canadian Association of Retired Persons (CARP) established.
- 1980's Genome project maps location of mutated genes responsible for various disorders.
- 1980's-1990's Commercial development of a group of rational derivatives, bisphosphonates, by Proctor and Gamble and academic investigators for use in osteoporosis.

- 1980's C. Scrivener and H. S. Tenenhouse (b.1940) investigated inherited ability to metabolize Vitamin D.
- 1980's (late) Commercial introduction of 'gold standard' bone densitometry dual absorption X-ray (DEXA). This technology provided more sensitive and accurate measurement of bone density and earlier detection of bone loss.
- 1989 North American Menopause Society founded.
- 1990's Development and commercial release of second generation bisphosphonates (Didronel and Fosamax) with apparently few side effects and ability to not only slow down bone loss but also increase bone density.
- 1991 Canadian Multi-Centre Osteoporosis Study established with funding from Canadian federal government, university and pharmaceutical partners.
- 1990's Tagging of steroids with radioactive materials was developed, a process which allowed for subsequent demonstration of sex hormone receptors in bone.
- 1990's Estrogen and testosterone receptors in bone tissue were proven to exist. This concept had previously been assumed to exist because it explained the connection between sex hormones and bone growth. Earlier technology was crude and required grinding up bone, which destroyed the receptors.
- 1993 U. S. Congress passed the NIH Revitalization Act which mandated a federally funded but privately run clearinghouse, The Osteoporosis and Related Bone Diseases National Resource Center (ORBD-NRC), and established the Federal Working Group on Bone Disease.
- 1994 WHO established current diagnostic criteria for osteoporosis using T-scores.
- 1990's(late) Development and first commercial release (1998 in the U. S.) of organ-specific estrogen analogues (e.g. Raloxifene) to recognize estrogen receptors in bone tissue but avoid estrogen receptors in reproductive organs.
- 1998 World Federation of Osteoporosis to be established in Washington, D. C.

### APPENDIX III

#### **Bone Anatomy and Metabolism As Conceived in the 1990's<sup>1</sup>**

Bone is not a static organ. Cellular activity continually creates and dissolves bone tissue during the human lifespan. If the balance between bone formation (ossification) and dissolution favours loss (resorption), a reduction of bone tissue results (osteopenia from the term bone poverty). Females reach their peak bone density by the end of their 20's; males achieve maximum bone density by their early 20's, accumulating more dense bone formation on average than females. Bone growth during the maturation process is called modelling; after the adult skeleton has been formed, continuing bone turnover is called remodelling, which does not significantly change the size or shape of bones. The amount of bone accumulated early in life is a more important factor than the rate of loss later in life as a determinant of bone reduction, except in the very old.<sup>2</sup> Four major factors influence normal bone growth in adults: genetic, nutritional, endocrine and mechanical.

Four types of bones exist in the human skeleton: long, short, flat and irregular, which vary in size, shape and appearance to serve differing purposes; for example, some bones bear great weight while others also serve protective functions. Bone tissue is considered connective tissue and consists of cells, fibers, and extracellular material, or matrix. Bone tissue differs from other connective tissue in that its extracellular material is hard and calcified, dominating other components and providing rigidity. Bone matrix is composed of two principal chemical

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<sup>1</sup>This description of the process of bone formation is based on information from interviews with scientists studying bone metabolism at Queen's University and Gary A. Thibodeau and Kevin T. Patton, eds., Anatomy and Physiology 2nd Edition (St. Louis: Mosby, 1993), pp. 153-165, p. 432, and p. 697.

<sup>2</sup>A .M. Parfitt, "Richmond Smith as a Clinical Investigator," Henry Ford Hospital Medical Journal Vol. 1 (28) (1980), pp. 95-104.

components: inorganic salts and organic matrix. The inorganic salts provide the hardness characteristic of bone through the deposition of highly specialized chemical crystals, calcium and phosphate. Bone's organic matrix consists of a mixture collagenous fibers, protein and polysaccharides. These substances add resilience and additional strength to the bone.

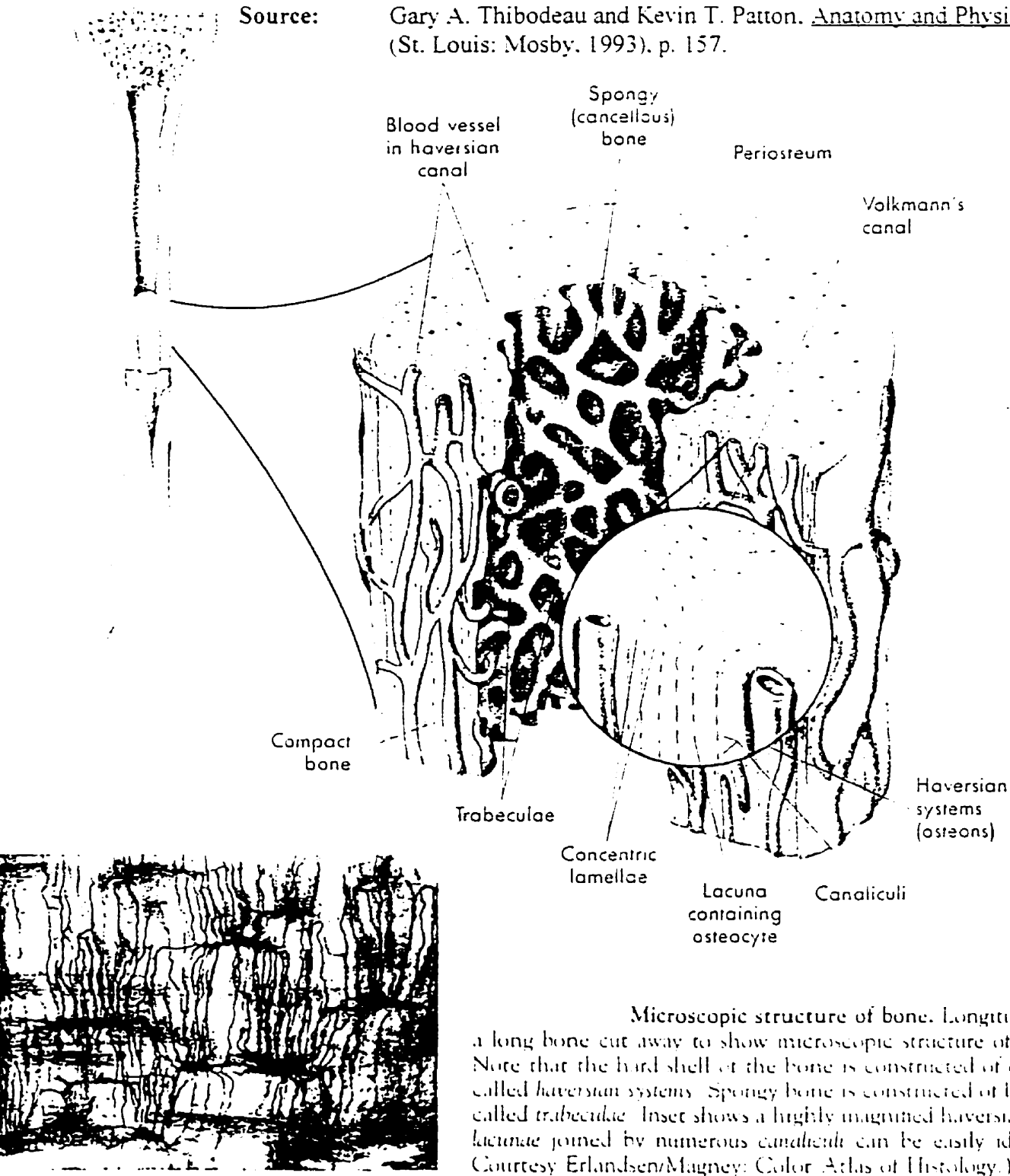
Two types of bone tissue exist in differing proportions within bone. Compact bone is more dense: it is made up of structural units called haversian systems (osteons) which allow the delivery of nutrients and removal of waste from other metabolically active but imprisoned cells within hard matrix tissue. Cancellous or spongy bone, contains lattice-like structures called trabeculae, with significant amounts of space between these formations. Active bone cells are found within the trabeculae (Figure IIIa). These include osteoblasts (bone-forming cells); osteoclasts (bone-absorbing cells); and osteocytes (mature bone cells) (Figure IIIb).

The biochemical processes by which the body manufactures bone tissue are exceedingly complex. The hormones estrogen, testosterone, parathyroid hormone, and calcitonin each play a major role in the formation of new bone; in addition hormones from the thyroid, adrenal and pituitary glands are also involved in the process of bone growth. Calcium, a mineral nutrient, and phosphorus a nonmetallic chemical element, are also necessary for healthy bone growth. Calcitonin and its antagonist parathyroid hormone (PTH) regulate calcium homeostasis. Vitamin D, an organic compound, exists in human skin and is activated by exposure to sunlight. Vitamin D also must pass through the liver and kidney during the process by which it regulates the utilization of calcium and phosphorus in forming bone.

Estrogen and testosterone, reproductive hormones found respectively in females and males, stimulate the activity of the bone-forming cells after puberty. In older adults, decreasing levels of these hormones reduce new bone growth and the ability of the body to maintain its

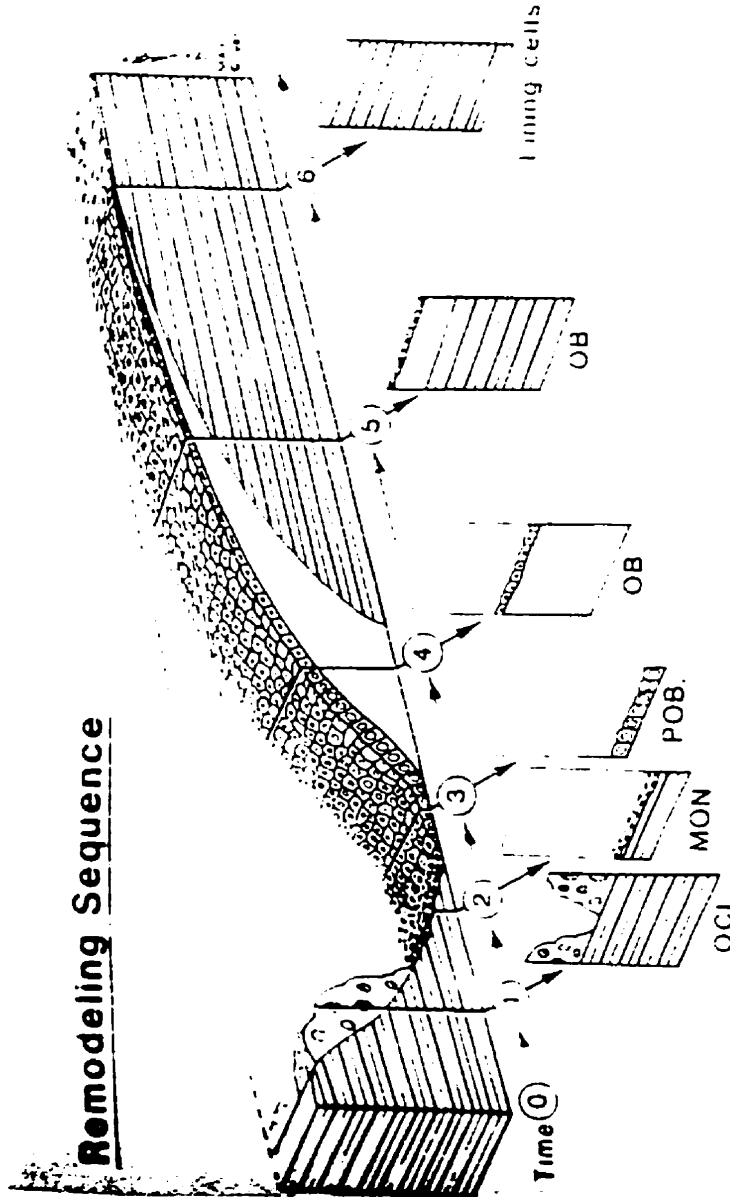
Figure IIIa Microscopic Structure of Bone

Source: Gary A. Thibodeau and Kevin T. Patton. Anatomy and Physiology, 2<sup>nd</sup> Edition (St. Louis: Mosby, 1993), p. 157.



Microscopic structure of bone. Longitudinal section of a long bone cut away to show microscopic structure of compact bone. Note that the hard shell of the bone is constructed of cylindrical units called *haversian systems*. Spongy bone is constructed of bony projections called *trabeculae*. Inset shows a highly magnified haversian system where *lacunae* joined by numerous *canaliculi* can be easily identified. (Inset, Courtesy Erlandsen/Magney: Color Atlas of Histology.)

## Remodeling Sequence



Bone remodeling in cancellous bone as seen in longitudinal sequence and cross sections. Five different phases can be distinguished over time: (1) osteoclastic resorption, (2) reversal, (3) preosteoblastic migration and differentiation into osteoblasts, (4) osteoblastic matrix (osteoid) formation, and (5) mineralization. The end product of remodeling in cancellous bone is the completed cancellous bone structural unit (BSU) covered by lining cells (6). (From: Eriksen EF, Axelrod DW, Melsen F. *Bone Histomorphometry*. Raven Press, New York, pp 3-12, 1994.)

**Figure IIIb** Bone Remodelling

**Source:** Roland E. Baron, "Anatomy and Ultrastructure of Bone," in Primer on the Metabolic Bone Diseases and Disorders of Mineral Metabolism, 3rd Edition, Murray J. Favus, ed. (Philadelphia: Lippincott-Raven, 1996), p. 9.

existing bone mass. When estrogen levels fall in women after menopause (about age 50), the amount of bone mass dramatically declines for the first five years after their last period. Men after age 60 when testosterone levels decline, also lose bone mass; however, males usually start with more bone mass and the loss of bone falls at a slower rate than in females.

Calcium and Vitamin D are both substances necessary for normal bone mineralization. Inadequate availability of either calcium or Vitamin D for a protracted period will also bring about reduced bone mass. Lack of sunlight (or food sources of Vitamin D) can cause the softening of bones due to deficient calcification of bone tissue; this is a Vitamin D deficiency disease called rickets in children, which is also known as osteomalacia in adults. Similar declining patterns of secretion occur in non-reproductive hormones, which secrete continuously from puberty but taper off in later years. Decline in renal function in the older population also contributes to the inability to metabolize Vitamin D. If proteins, calcium, or other necessary nutrients are in short supply anytime before the beginning of adulthood, the consequences may be permanent. For example, bone deformities resulting from a lack of calcium in childhood would become permanent if not corrected or compensated for before the skeleton ossifies completely.

Large quantities of calcium are needed by a growing body to maintain normal development of the skeleton and other tissues. During pregnancy, parathyroid hormone levels rise, increasing calcium in the blood, and at the same time increasing calcium absorption in the kidney and gut, partly by removing calcium from storage in the bone. This calcium is then available for the growing fetus. Pregnancy can result in bone-softening effects of calcium deficiency, if the mother does not consume enough calcium to replace the quantity removed.

As humans age, their metabolic rate declines, and with it the amount of calories which

are needed to sustain life. This metabolic decline is believed to be the result of age-related alterations in the body's metabolic hormones, such as thyroid. Despite the lessening of caloric intake required in late adulthood, a balance in the overall amount of nutrients remains essential for proper metabolic function. Therefore, in older adults some nutrients may be required in larger amounts to avoid or compensate for age-related bone mass loss. The three typical sites for bone fractures associated with osteoporosis are the spine, hip, and wrist bones (Figure IIIc).

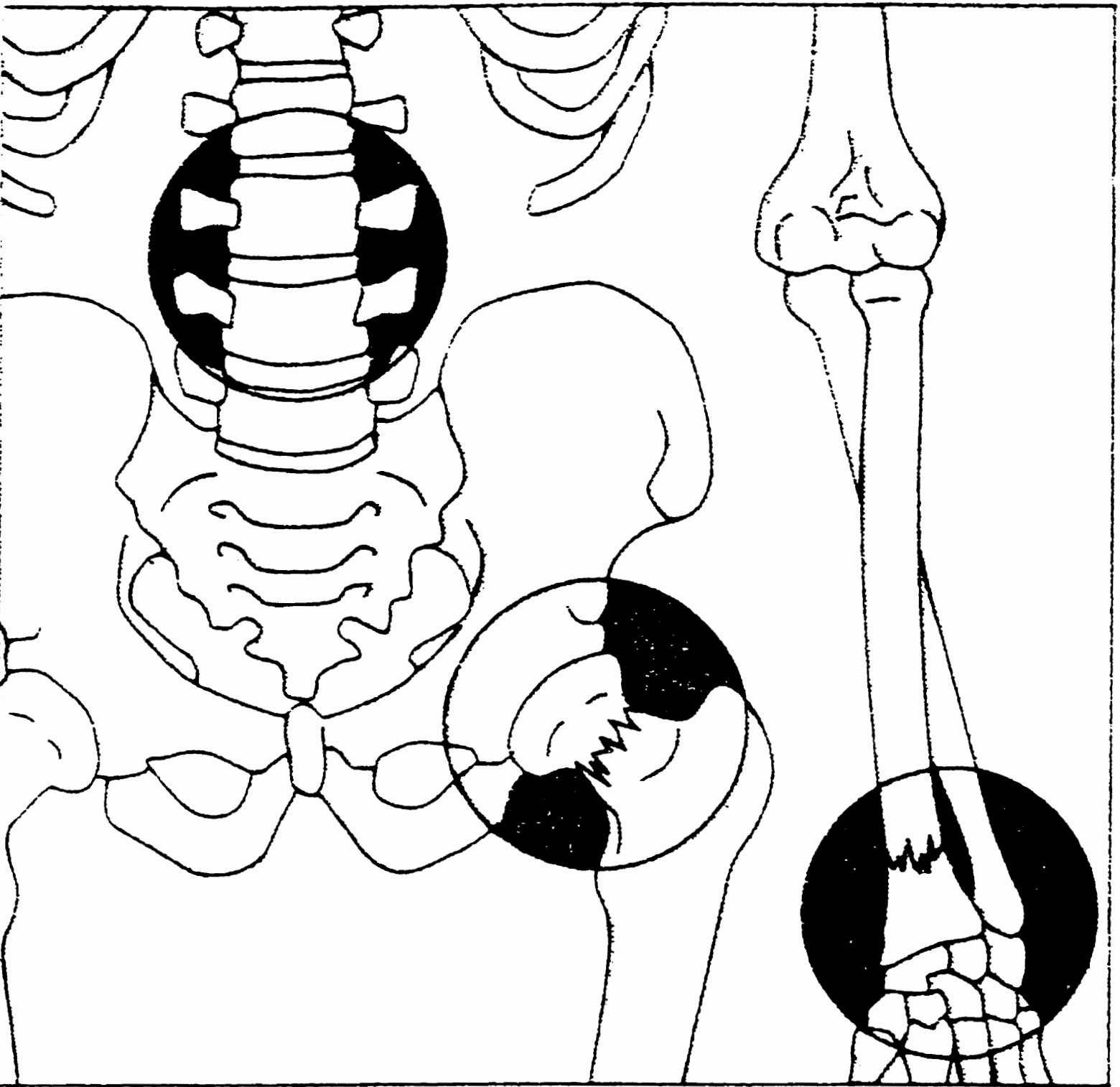
Other factors which contribute to optimal bone development include genetics, exercise, exposure to sunlight's ultraviolet rays, and lifestyle choices, such as the use of alcohol, caffeine, and smoking. Inherited characteristics pertaining to an individual's skeletal growth (and Vitamin D absorption capability) plays a predisposing role for some populations to develop osteoporosis. Exercise stimulates bone formation, while alcohol, caffeine, and smoking contribute to bone depletion.



**Figure IIIc** Typical Fracture Sites for Osteoporosis

**Source:** Nicola Peel and Richard Eastell. "Osteoporosis." in ABC of Rheumatology. Michael L. Smith, ed. (London: BMJ Publishing Group, 1996), p. 36.

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Typical sites of osteoporotic fracture.

### Appendix IV: Oral History Sources

Ms Pamela Anastassiades	Project Manager CAMOS, Kingston Site	05/02/98
Dr. Tassos Anastassiades	Professor of Medicine Rheumatology Queen's University	02/07/97
Ms Susan Arndt	Communications Dept. National Osteoporosis Foundation Washington, D.C.	05/02/98
Ms Joan Axelrad	Manager, Payment Claims Ontario Health Insurance Program	03/01/98
Ms Mary Bowyer	Assistant Executive Director Osteoporosis Society of Canada	08/01/98
Ms Marie Chevrier	Aymes Company Aurora, Ontario	05/02/98
Dr. L. Fransman	Professor of Radiology, Retired Queen's University	22/09/97
Ms Joyce Gordon	Executive Director Osteoporosis Society of Canada	08/01/98
Dr. Joan Harrison	Professor of Medicine, Retired Medical Physics University of Toronto	08/01/98
Ms Deborah Howe	Women Against Osteoporosis King City, Ontario	30/01/98
Dr. Robert W. Hudson	Professor of Medicine Endocrinology Queen's University	01/08/97
Mr. Robert Kennedy	Data Division, Claims Dept. Ontario Health Insurance Program Ontario Ministry of Health	12/03/98

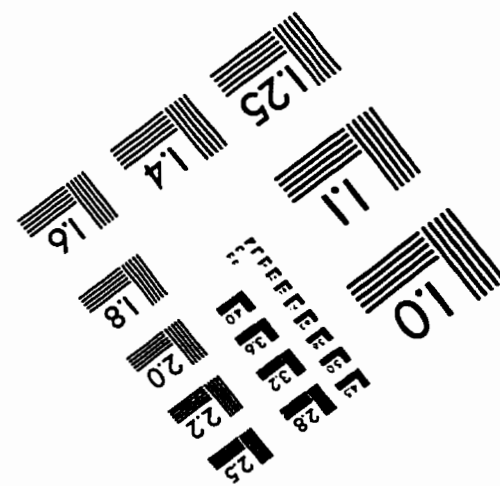
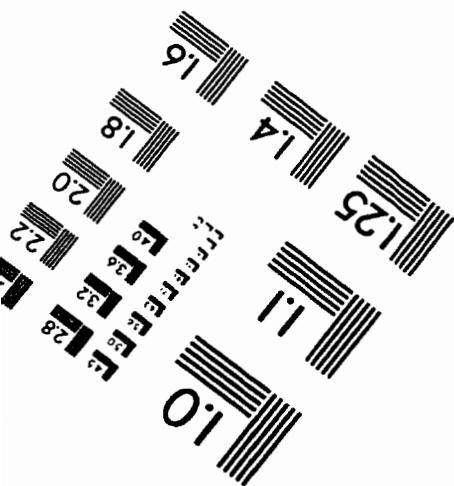
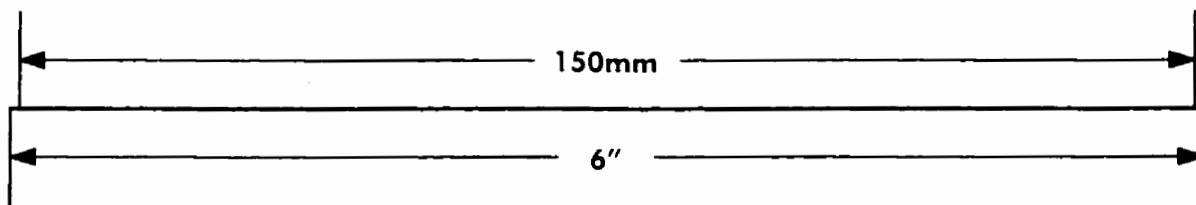
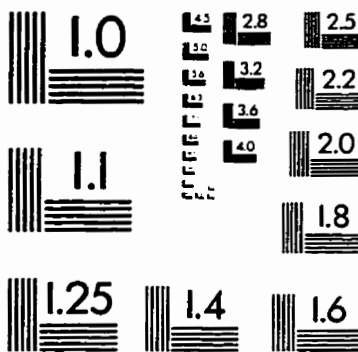
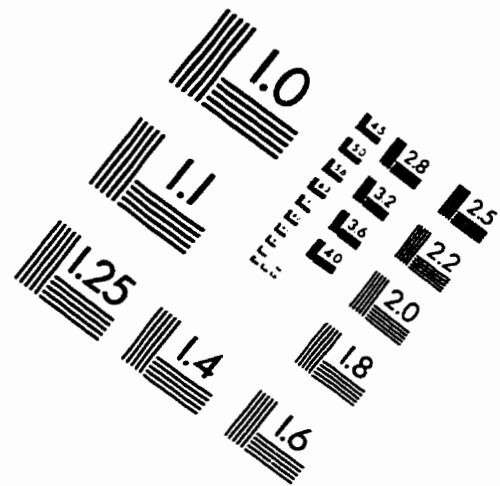
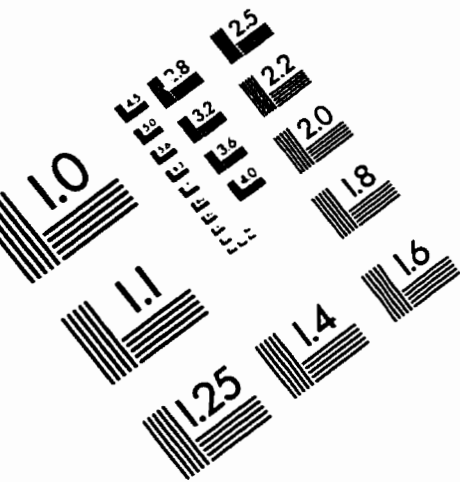
Mr. Ron Labonte	Private Consultant Kingston, Ontario	22/03/98
Dr. George Linn	Dept. of Psychiatry Kingston General Hospital	20/11/97
Dr. Thomas Mackenzie	Professor, Community Health & Epidemiology Queen's University	09/07/97*
Dr. Gerald Marks	Professor of Pharmacology & Toxicology, Retired Queen's University	16/11/97
Ms Margaret Anne McHugh	Manager, Women's Health Bureau Ontario Ministry of Health	10/05/97
Dr. Patricia Peppin	Professor of Law Queen's University	18/12/97
Mr. Sidney Pugh	President and CEO Millenium Biologix	30/01/98
Dr. William Racz	Professor of Pharmacology & Toxicology Queen's University	23/07/97
Dr. Edmund R. Yendt	Professor of Medicine, Retired Endocrinology Queen's University	21/07/97

\*Dr. Mackenzie died in November 1997.

**Appendix V: Meetings, Lectures, and Other Sources**

- 05/97                   Osteoporosis  
Grand Rounds. Queen's Faculty of Medicine  
Hotel Dieu Hospital  
Kingston. Ontario
- 10/97                   Public Forum: Menopause and Osteoporosis  
Society of Canadian Obstetricians and Gynaecologists &  
Osteoporosis Society of Canada,  
Grand Theatre  
Kingston, Ontario
- 11/97                   Public Lecture: Osteoporosis  
Queen's University Gerontological Project  
Wilson Room, Kingston Public Library  
Kingston, Ontario
- 20/11/97               "Restructuring Canada's Health Care System: What Does  
It Mean for an Aging Population?"  
Mark Rosenberg, Department of Geography  
Queen's University
- 05/03/98               "Hot Flash on Menopause"  
By Heather Cook, on David Suzuki.  
The Nature of Things, CBC TV

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