Heightened Expectations:
The History of the Human Growth Hormone Industry in America

by

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DISSERTATION

Submitted in partial satisfaction of the requirements for the degree of

DOCTOR OF PHILOSOPHY

in

HISTORY OF HEALTH SCIENCES

in the

GRADUATE DIVISION

of the

UNIVERSITY OF CALIFORNIA, SAN FRANCISCO

[redacted]

Acknowledgements

Research for this dissertation was funded in part by the National Science Foundation's Social, Behavior, and Economic Sciences Doctoral Dissertation Research Improvement Grant #1058143

Abstract

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This dissertation examines the rise of the human growth hormone (HGH) industry in America. I make three key arguments in this work. First, I argue that the medicalization of height and the modern social stigmatization of short stature, which began to take shape during the late nineteenth and early twentieth century, were essential ingredients in the making of the human growth hormone industry. Secondly, I demonstrate how sociological notions of gender during the last half of the twentieth century influenced the development of HGH therapy in the treatment of children with short stature. Finally, I show how the amount and type of growth-promoting hormone therapeutically available have framed popular and expert perceptions of short stature and its treatment.

Heightened Expectations draws on a diverse set of sources, including government agency records and publications, popular and scientific publications, internet archives, legal documents, corporate archives, and personal files of scientists. It contributes to the histories of pharmaceuticals, public health, and masculinity as well as disability studies and gender studies. Throughout the dissertation, I have employed an innovative technique of simultaneously dealing with the history of the pathologization of short stature in children and the emergence of human growth hormone therapy. Rather than giving preference to one side of the pharmaceutical equation over the other, this dissertation examines how the histories of the human growth hormone therapy and the pathologization of short stature found each other during the era of scientific medicine. While the pathologization of short stature speaks to the medicalization of somatic realities perceived as deficits, the quest to discover, isolate, and clinically use growth

hormone reveals the development in medicine to search inside the body for causation instead of outside in the environment. Once these stories intertwined during the mid-twentieth century, the short, middle-class, full-of-potential, white boy became the poster-child for the human growth hormone industry. Together these histories make us question the implications of the medicalization of social stigmas, the reflexivity between pathology and treatment, and how height matters.

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Introduction

Ever wish you had the power to grow taller?
You do!
It's called growth hormone.[1]

Filled with expectation and potential, these lines serve as the introduction to an adventure story titled "The Great Growth Hormone Caper," found in an 2004 activity book marketing Genentech's growth hormone product, Nutropin. This downloadable book from Genentech's Nutropin website targeted short children and their parents with promises of height, eye-catching graphics, games, quizzes, and activity stories featuring Bobby and his friends, otherwise known as the kids of Nutropinville. "The Great Growth Hormone Caper" was the first of the three stories and it described the role of growth hormone (GH) in human development after Bobby's doctor informed him that he might be missing this essential hormone. Bobby and the gang decided to hunt down the missing growth hormone until the mayor informed them that the whole city was built to help those who are GH deficient. At the end of the story, Bobby begins GH treatment, and the following two stories demonstrate how growth hormone therapy helped Bobby build more confidence on the baseball field in "Out of the Ballpark" and the ability to stop harassment from his bully in "Bobby and the Big Bully." The activity book successfully framed growth hormone therapy as an appropriate remedy not only for growth hormone deficiency (GHD) but also for the social anxieties short boys face in sports and social settings.[2]

[1] Genentech Inc.'s Website for Nutropin, "The Nutropinville Kids," accessed December 17, 2008, http://www.nutropin.com/pdf/13898_gene_ntrpnvlle_fa4.pdf.

[2] Ibid.

Genentech walked a fine line by featuring *The Nutropinville Activity Book* as an education booklet on its website. In 2004, Genentech received approval from the Food and Drug Administration (FDA) for the use of Nutropin in treating children with Idiopathic Short Stature (ISS) with an important caveat; the company had to adhere to a "risk management plan" composed a year earlier when Eli Lilly received the identical approval for its GH product. This plan included no direct-to-consumer advertising, a limited sales force, and controlled distribution.[3] While the "Great Growth Hormone Caper" story helped Genentech stay true to its promise to the FDA by keeping the use of Nutropin linked to GH deficiency (GHD), the stories of baseball and bullies spoke to potential consumers and their parents about the real-life hazards of being a short boy and the genie-like promise of GH therapy.

This dissertation reveals how growth hormone therapy became synonymous with medically treating short boys in the hope of making them tall. The FDA's approval of growth hormone therapy for ISS in 2003 was more reflective of a longer trend in pediatric care rather than a revolutionary move orchestrated by pharmaceutical companies as the tie between growth hormone deficiency and therapy had been loosening over the years. Even when this link was strong, the intent of commercial growth hormone was to spur linear growth in GHD children and not necessarily to make up for growth hormone per se. This focus to kick start vertical growth continued and expanded throughout the late 1980s and early 1990s as biotechnology made a variety of GH

[3] Food and Drug Administration, Letter from David G. Orloff, Director of the Division of Metabolic and Endocrine Drug Products, Office of Drug Evaluation II, Center for Drug Evaluation and Research to Pat Harada of Genentech, Inc. regarding a labeling revision approval of Nutropin for long-term treatment of Idiopathic Short Stature, Application number NDA 19-676/S-020, S-021 (June 28, 2005), accessed May 20, 2012, http://www.accessdata.fda.gov/drugsatfda_docs/appletter/2005/019676s020,021_rel2_ltr.pdf.

pharmaceuticals possible. By the early 1990s pediatric endocrinologists prescribed GH therapy to a series of children in order to make them taller. A mid-1990s NIH-funded survey of 434 U.S. pediatric endocrinologists indicated that only 58% of patients they were treating had GHD. Girls with Turner Syndrome made up the majority of the other 42% and the rest were a hodge-podge of children with various conditions including chronic renal insufficiency, familial short stature, and ISS.[4] Around this time, protocol caught up with clinical practice as the FDA began granting approval for the use of GH in a series of stunting but non-GHD conditions including Turner Syndrome (1996), Prader-Willi Syndrome (2000), Small for Gestational Age (2001), Idiopathic Short Stature (2003), Short Stature Homeobox-Containing Gene SHOX (2006), and Noonan Syndrome (2007).[5] Although the range of syndromes and conditions treated by growth hormone has expanded, promoting linear growth in children remains the main goal for the majority of the approximately thirteen growth hormone products on the market as of 2012. My dissertation examines the relationship between the rise of the growth hormone industry and the development of the modern notion of short stature, its stigmatization, and science's mission to quantify and fix it.

This dissertation features three recurring themes. First, I demonstrate how pharmaceutical companies cannot be blamed as the sole culprits of framing short stature as a disease; rather the pathologization of this somatic reality has a long history, which stretches back to the nineteenth century and is linked to the emergence of Enlightenment

[4] Leona Cuttler, J.B. Silvers, Jagdip Singh, Ursula Marrero, Beth Finkelstein, Grace Tannin, and Duncan Neuhauser, "Short Stature and Growth Hormone Therapy: A National Study of Physician Recommendation Patterns," *Journal of American Medical Association* 276, no. 7 (August 21, 1996): 532-534.

[5] Leona Cutter and J.B. Silvers, "Growth Hormone and Health Policy," *Journal of Clinical Endocrinology and Metabolism* 95, no. 7 (July 1, 2010): 3150.

philosophy and modern capitalism. Short stature developed into an indicator of substandard working and living conditions and joined a series of other somatic realities, including small frames and waif-like body types, that together constituted a system of reference used by reformers to encourage governmental regulation of abusive practices during the late nineteenth and early twentieth century.

Those engaged in anthropometry codified the anecdotal data from public health reformers and contributed to the normalization of average measurements and the pathologization of short stature by conducted large growth surveys of children. While historians of medicine have described the rise of scientific medicine at length and the role of the laboratory in establishing objectives and standards to be used in clinical practice, there is less scholarship on how medicine used data compiled by those engaged in anthropometry in a similar fashion. At the turn of the century, these surveys began to slowly creep into private pediatric practice through the medium of growth charts, which presented average measurement as healthy norms. In this context, short stature signaled a need for medical intervention at an individual level. As the medical specialty of pediatrics professionalized, growth charts became less reflective of the series of varied measurements from growth studies and more in line with other diagnostic tools of the clinic, as their data served as standards. By the 1940s, short stature stuck out as a sign of poor living and working conditions at a population-level and as an indicator of ill health in need of medical intervention for the individual.

The second theme traces the origins of growth hormone therapy in the U.S. and in doing so resets the beginning of the GH industry to the early 20th century and not to 1958, the year medical experts reported on their successful therapeutic uses of human growth

hormone. Even though we know today that early growth hormone promoting therapy was ineffective, many medical experts from the 1910s, 1920s, and 1930s interpreted their results with GH pharmaceuticals as promising, and it was their trial and error process with growth promoting medical regimens, that brought growth hormone therapy and the medical treatment of short boys closer together. It took decades for animal-based growth hormone products to fall out of favor with physicians as each positive clinical trial was interpreted with hope. Ultimately, pediatric endocrinologists were forced to admit the ineffectiveness of these pharmaceuticals, and by the early 1950s growth hormone no longer became an option in treating GHD children. Specialists turned toward the male sex hormone testosterone. According to pediatric endocrinologists, this cure for short stature was a perfect fit for the ideal patient as there seemed to have been a synergy between testosterone and the majority of children who sought out medical attention, boys.

Even when human growth hormone therapy was finally developed in the late 1950s, the link between the male patient and growth promoting treatment remained unbroken. The National Pituitary Agency (a federal agency in charge of growth hormone therapy in the U.S.), the Human Growth Foundation (a parent-run organization of families with children with short stature), and medical experts throughout the country campaigned for Americans to donate their pituitary glands before they died by advertising the success of boy patients who had grown in height due to cadaver human growth hormone (cHGH) therapy and therefore were able to overcome the pitfalls of being short. In short, these human-interest stories showed that GH therapy saved short boys from disappointing lives by spurring vertical growth. This message reverberated in commercial cadaver human growth hormone advertisements in the early 1980s and

continues to play a major role in recombinant growth hormone marketing campaigns today.

The third theme in this history of growth hormone therapy further articulates how changing sociological notions about gender and masculinity during the last half of the twentieth century influenced the development of medical treatment of children with short stature. During the 1960s and 1970s, child psychology researchers attempted to scientifically substantiate the psychoanalytical notion that children felt inferior if they were short, and these experts also aimed to learn the cause and the extent of the problems short children faced. By the early 1980s, many experts believed short stature impaired academic performance, hindered interpersonal relationships, and caused personality disorders as short statured children responded in an unhealthy manner to the discrimination they faced.

Sociologists contributed to this discussion by pinpointing who exactly faced the most social discrimination based on stature. In 1971 Saul Feldman, a sociologist, coined the term heightism in a paper he presented before the annual meetings of the American Sociological Association. Claiming that short men had it the worst, Feldman argued that "American society is a society with a heightist premise: to be tall is to be good and to be short is to be stigmatized," and he explored the nuances of this discrimination in language, male-female relationships, politics, economics, popular culture, and "degradation of self."[6] His ideas were quickly popularized by journalists eager to carry his social criticism into mainstream media. While child psychologists substantiated the

[6] Saul D. Feldman, "The Presentation of Shortness in Everyday Life -- Height and Heightism in American Society: Toward a Sociology of Stature." A paper presented at the 1971 meetings of the American Sociological Association, box 17, folder 5, Records of the Sociology Department, Case Western Reserve University Archives, 3LZ, Cleveland, Ohio.

hardships short children faced in childhood, sociologists warned about the impending adversity boys would endure when they became men if parents did not seek out medical assistance.

Historiography

The original research put forth by this project is imperative, as no comprehensive history of the human growth hormone industry exists. Recent books, including *Normal at Any Cost* by journalists Susan Cohen and Christine Cosgrove (2009), *Our Daily Meds* by journalist Melody Peterson (2008), *The Medicalization of Society* by Peter Conrad (2007), and *The Pursuit of Perfection* by David J. and Sheila Rothman (2003) have addressed segments of the history of HGH but, in the process, they have used HGH as a cautionary tale of the dangers of medicine and enhancing technology.[7] This dissertation provides an opportunity for a rich historical analysis of the complex relationship between growth hormone and short stature stretching back into the nineteenth century and focuses on cultural notions of masculinity, health sciences, disability, and technology. This project contributes to the present state of knowledge in the history of medicine, gender studies, and disability studies and is inspired by each of these academic fields.

Though contemporary scholars effectively used the history of the HGH industry to point to the pitfalls surrounding the growing power of the pharmaceutical industry and problems of consumer-based medicine, they often ignored the social context and

[7] Susan Cohen and Christine Cosgrove, *Normal and Any Cost: Tall Girls, Short Boys, and the Medical Industry's Quest to Manipulate Height* (New York: Tarcher, 2009) and Melody Peterson, *Our Daily Meds: How the Pharmaceutical Companies Transformed Themselves into Slick Marketing Machines and Hooked the Nation on Prescription Drugs* (New York: Farrar, Straus and Giroux, 2008) and Peter Conrad, *The Medicalization of Society: On the Transformation of Human Conditions into Treatable Disorders* (Baltimore: Johns Hopkins Press, 2007) and David J. and Sheila Rothman, *The Pursuit of Perfection: The Promise and Perils of Medical Enhancement* (New York: Pantheon, 2003).

extensive historical roots of these developments. In *Our Daily Meds*, Melody Peterson explores how huge profits caused drug companies to concentrate on selling pharmaceuticals rather than developing more effective medicine. In this context, she points to the rise of the human growth hormone industry and what she describes as its insidious plan to market to children and parents through toys, games, video games campaigns, and to promise perfection to its consumers as indicative of the unprincipled nature of the fast-growing market of pediatric pharmaceuticals. Susan Cohen and Christine Cosgrove, Peter Conrad, and David and Sheila Rothman also spend considerable time exploring the advertising of human growth hormone in the age of biotechnology. They discuss specific campaigns and tactics taken by pharmaceutical giants, such as Eli Lilly and Genentech, to demonstrate the unscrupulous practices taken by "big pharma." My interest in the cultural history of the human growth hormone industry departs somewhat from these works as I consider how existing public health projects and protocols, the rise in the surveillance of children's health in schools, and early efforts to advertise medicine and healthy habits to families contributed to the development of the human growth hormone industry by creating pathways to consumers and venues for advertising campaigns.

This project treats the development of the stigmatization of short stature and the rise of growth hormone therapy on equal footing in the making of the human growth hormone industry by using the concept of "desiring-production" put forth by Gilles Deleuze and Félix Guattari as its framework. In their book *Anti-Oedipus*, Deleuze and Guattari present the idea of a mechanistic nature of desire and use the term "desiring-machine" to explain the way in which the processes of production, distribution, and

consumption are intertwined and produce a circular flow of desire. The history of human growth hormone serves as a poignant example of the creation of a "desiring machine" as it demonstrates how anxieties, processes of production, and desires are grafted onto one another.[8] Also, it shows how a multitude of actors, from pharmaceutical industry executives to grandparents, produces desire and contributes to the perpetuation of this industry.

As another departure from previous works pertaining to the history of human growth hormone, this project follows the development of scientific notions of normal, abnormal, and cultural perceptions of perfect. Secondary works frame human growth hormone as a biological enhancement technology used by parents to help their children obtain perfection, yet their analyses lack a critical examination of the category "perfect" and "normal" as they fail to get at the root of these concepts and the role scientific medicine has played in establishing their cultural currency. Inspired by Georges Canguilhem's oeuvre, *The Normal and the Pathological*, this dissertation addresses medicine's methods of assessing and defining normal and pathological phenomena and framing pathology as a quantitative variation to an established physiology. Canguilhem argued that once experiences are quantified they become distorted within a continuum of abstract normalcy and pathology and he blamed the laboratory's role in scientific medicine as the culprit of obscuring natural variation.[9] This project adopts Canguilhem's premise and examines how public health contributed to supplying scientific medicine

[8] Gilles Deleuze and Félix Guattari, *Anti-Oedipus : Capitalism and Schizophrenia* (Minneapolis: University of Minnesota Press, 1983).

[9] Georges Canguilhem, *The Normal and the Pathological* (New York: Zone Books, 1989).

with continua, standards, and objectives, which also distorted natural variety and promoted similarity and sameness.

Historical scholarship on hormones, which uses the history of a hormone's discovery and therapy as a lens to "illuminate complex and changing relationships" within medicine, science, and society, is relevant to my proposed dissertation.[10] This dissertation tells the history of the human growth hormone industry in America as one filled with unpredictability, setbacks, and doubt and explores the long-term effects of the discovery of growth hormone on notions of short stature. The quest to discover GH harkens back to a time known as the "gold rush era of hormones," a term used by historians such as Alison Li to identify a flurry of hormone research during the 1920s and 1930s.[11] According to Nicolas Rasmussen, "hormones took pride of place as life's master molecules, and the endocrinologist took precedence over the geneticist as the scientist offering the means to control life."[12] While pre-World War II hormone history focused on discovery, post-war research emphasized therapy. Viviane Quirke's work on cortisone explored the post-war trend in medical and pharmaceutical research from infectious and chronic diseases and collaborations between private pharmaceutical companies and governmental agencies, such as the relationship between Glaxo and

[10] Elizabeth Siegel Watkins, *The Estrogen Elixir: A History of Hormone Replacement Therapy in America* (Baltimore: Johns Hopkins Press, 2007), 7.

[11] Alison Li, "J. B. Collip, A. M. Hanson and the Isolation of the Parathyroid Hormone, or Endocrines and Enterprise." *Journal of the History of Medicine and Allied Sciences* 47, no. 4(1992): 406.

[12] Nicolas Rasmussen, "Steroids in Arms: Science, Government, Industry, and the Hormones of the Adrenal Cortex in the United States, 1930-1950." *Medical History* 46, no. 3 (2002): 299.

Britain.[13] A similar emphasis in research and government-private collaborations also took place in America. The work of Harry Marks demonstrates the role of the National Institutes of Health, Merck, and physicians in relation to cortisone and ACTH.[14] This project contributes to knowledge of twentieth century hormone research, discovery, and therapeutic uses because the history of GH spans the entire century.

In 1976, Diana Long Hall and Thomas Glick urged historians writing about the history of endocrinology to use the stories of hormone discovery and therapy and the field of endocrinology in general as a means "to throw light on the intellectual and social history of the twentieth century history."[15] They pointed to the scientific controversy of endocrinology and problems the field faced in creating definitions, such as the definition of a hormone, as signs of deeper sociological issues at play. Historian Elizabeth Watkins's account of the history of estrogen provides a prime example of this type of history. She has revealed the subjectivity of endocrinology and explored a number of themes including "blind faith in the ability of science and technology to solve a broad range of health and social problems, the social and cultural stigmatization of aging, shifting meanings and interpretations of femininity and female identity, and the pitfalls of

[13] Vivian Quirke, "Making British Cortisone: Glaxo and the Development of Corticosteroids in Britain in the 1950s-1960s." *Studies in History and Philosophy of Science Part C: Studies in History and Philosophy of Biological and Biomedical Sciences* 36, no. 4 (2005): 645-74.

[14] Harry Marks, "Cortisone, 1949: A Year in the Political Life of a Drug." *Bulletin of the History of Medicine* 66, no. 3 (1992): 419-39.

[15] Diana Long Hall and Thomas F. Glick, "Endocrinology: A Brief Introduction." *Journal of the History of Biology* 9, no. 2 (1976): 233.

medical hubris in the twentieth century."[16] *The Estrogen Elixir* is not only an example of a social history of a hormone but it also speaks to women's history of health sciences as it probes issues about gender.

Women's history of health sciences has contributed to the deconstruction of contemporary notions of the biological nature of gender and sex and inspires this dissertation. Early works by Ann Douglas Wood, Carroll Smith Rosenberg, and Charles Rosenberg examined how science naturalized the weakness of middle-class women and medicine was used to treat the failings stemming from femininity; by the early 1990s feminist historians started to probe deeper into the scientific construction of sex to expose the medical invention of sex.[17] Alice Dreger analyzed science's role in the reification of sex, gender, nurture, and nature by producing clear-cut knowledge based on the body during the late nineteenth and early twentieth century. She claimed that medical men in Britain and America created procedures to determine the sex of those with "questionable sex" that included the examination of gonads and external organs.[18] Other historians have also explored medicine's role in determining sex, the processes by which scientific and medical notions of sex and gender have migrated to the social fabric, and the impact of science's privileged epistemological position in naturalizing social relations. This project

[16] Elizabeth Siegel Watkins, *The Estrogen Elixir: A History of Hormone Replacement Therapy in America* (Baltimore: Johns Hopkins Press, 2007), 1.

[17] Ann Douglas Wood, "The Fashionable Diseases": Women's Complaints and Their Treatment in Nineteenth-Century America," *Journal of Interdisciplinary History* 4, no. 1(1973): 25-52 and Carroll Smith-Rosenberg and Charles Rosenberg. "The Female Animal: Medical and Biological Views of Woman and Her Role in Nineteenth-Century America," *The Journal of American History* 60, no. 2 (1973): 332 – 356.

[18] Alice Domurat Dreger, *Hermaphrodites and the Medical Invention of Sex* (Cambridge, Mass.: Harvard University Press, 1998).

explores the influence of social and cultural notions of gender and sex on the discovery and therapeutic use of human growth hormone.

A series of works from the emerging field of Men's Studies contributes to the framework of this dissertation with its use of the concept of hegemonic masculinity (a term first used by R.W. Connell). In Men's Studies, gender is not simply an axis of power with femininity/woman and masculinity/male positioned as polar, but equal forces; rather, gender works as a hierarchical system where in which a certain type of masculinity associated with whiteness, heterosexuality, and a buff physique, is preferred over other forms of masculinity and femininity.[19] A series of publications has addressed how hegemonic masculinity has played a role in men's and women's health, medicine, and science. Ben Barker-Benfield's "The Spermatic Economy" linked the rise in drastic gynecological surgeries and phobia towards male masturbation with the growing pressure men faced to be self-sufficient as they remained morally subordinate to women during the late nineteenth century.[20] Jesse Berrett's work focused on the relationship between male anxieties about weight and the ebbing tide of manhood in post-WWII America.[21] A growing number of feminist works have also considered the impact hegemonic masculinity has had on men, women, and the health sciences and have contributed to the ongoing reformulation of the concept of hegemonic masculinity. The works of Laura Davidow Hirschbein and Elizabeth Watkins on the relationship between age, masculinity,

[19] R. W. Connell, *Masculinities* (Berkeley: University of California Press, 1995).

[20] Ben Barker-Benfield, "The Spermatic Economy: A Nineteenth Century View of Sexuality," *Feminist Studies* 1, no 1 (1972): 45-74.

[21] Jesse Berrett, "Feeding the Organization Man: Diet and Masculinity in Postwar America," *Journal of Social History* 30, 4 (1997): 805 - 825.

and hormones have revealed the importance of youth in the construction of masculinity.[22] Hegemonic masculinity has proven to be a useful tool of analysis in examining the history of the human growth hormone industry as it illuminates how cultural notions of gender perform as a series of prescripts placed on women, men, science, and medicine.

Disability studies also theoretically grounds this dissertation by challenging medical notions of difference - based on a deficit model, avoidance to conflate disability with illness when describing a patient or person, and inclusion of the voices and perspectives of those deemed afflicted - to raise awareness of unconscious discrimination and beliefs promulgated by the medical model.[23] Taking a cue from the work of disability historians, this dissertation tackles how notions of sameness, normalcy, and disability have influenced perceptions of short stature in America during the 20th century.[24] In doing so, it contributes to existing disability scholarship by grappling with one of the core issues of the field, the definition of disability. At the root of the debate around the meaning of disability is the language of ability. Ability, like gender and race, operates in society as an axis of power with its implied premise and preference of normalcy and uniformity. Any attempt to define difference within this enuciative modality perpetuates the cultural bias for sameness and similarity. The goal of this project is not to construct a new term for disability or to put short stature through a type of disability test in order to

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[22] Laura Davidow Hirschbein, "The Glandular Solution: Sex, Masculinity, and Aging in the 1920s" *Journal of the History of Sexuality* 9 (2000): 277-304 and Elizabeth Siegel Watkins, The Medicalization of Male Menopause in America" *Social History of Medicine* 20, no.2 (2007): 369-388.

[23] Catherine J. Kudlick, "Disability History: Why We Need Another "Other,"" *The American Historical Review* 108, no. 3 (June 2003): 763 – 93.

[24] Tobin Siebers, *Disability Theory (*Ann Arbor: University of Michigan, 2008).

determine whether it is one or not; rather, this dissertation demonstrates how the axis of ability operates within a modern context by mapping out important events and trends in history that have contributed to the stigmatization and pathologization of short stature.

A wide range of scholarship, including the history of hormones, feminist scholarship on gender in medicine, men's studies on hegemonic masculinity, and disability studies, informs this dissertation. While existing work on the history of human growth hormone industry highlighted the dark side of GH and used it to predict a dystopic future of medical technology, this dissertation examines the broader social, cultural, medical, and scientific contexts of the history of GH. I peel back the superficial reasoning of its existence to reveal the inner-workings of an industry based on desire and heightened expectations.

Organization of the Dissertation

Taking into consideration the dynamic relationship between public health, scientific medicine, cultural norms, and pediatric care, this work begins by analyzing how nineteenth and early twentieth century efforts by public health reformers inspired scientific standards for stature of the normal healthy child, which unintentionally created systems of standardization that stigmatized normative physical deviancy, including short stature. Chapter One describes the transference of the stigmatization of short stature from the world of reformers to the clinic, a process which pathologized this somatic reality and made it worthy of medical intervention. Chapter Two examines the early decades of growth hormone therapy and how events during this time period helped frame growth hormone therapy for the rest of the twentieth century. During medicine's scientific transformation in the first several decades of the twentieth century, physicians looked

towards laboratories for effective therapeutics and gazed inside the body for causes of pathologies. While scientists and surgeons searched to unlock the internal physiological mystery of human growth, growth hormone extracts served as the pharmaceutical industry's answer to short stature even though they were unreliable, impure, and inconsistently effective. Up until the late 1950s, drug companies made these extracts accessible to physicians and funded research to perfect them. This chapter not only investigates the tumultuous decades of inconsistently effective growth hormone therapy it also examines the porous boundary between commercial and laboratory science, and the social exchange between therapeutics, the cultural demands for corporeal similarity, and the marginalization of those deemed different. Chapter 3 focuses on the legacy of the period between animal-based growth hormone therapy and human growth hormone therapy on the growth hormone industry. As cynicism grew over the therapeutic efficacy of growth-promoting pharmaceuticals in the 1950s, psychology texts and advice books for parents popularized the psychoanalytical notion that biological deficiencies in children, including short stature, caused an inferiority complex. The decline of infant mortality rates during the first three decades of the twentieth century contributed to child experts' emphasis on children's psycho-social development and normal physical growth. Psychoanalysis highlighted the inter-relationship of the two, which reframed the meaning of biological variation. Although pediatric endocrinology and psychoanalysis are often considered disparate medical fields, they converged on short-statured, male, youthful bodies in the post-World War II era and together transformed short stature into a psycho-social risk factor in need of treatment. Chapter 4 sheds light on the synergy between the availability of effective HGH therapy, the creation of national standards of growth,

sociologists' increased interest in heightism in America, and the upsurge of child psychologists' concern over short stature in childhood from the early 1960s to the early 1980s. It also examines how this mosaic of professional pursuits pertaining to stature provided the perfect tableau for the selling of growth hormone on the free market beginning in the early 1980s, a market which was drastically altered by the Creutzfeldt–Jakob disease (CJD) outbreak linked to cadaver human growth hormone therapy in 1984 and the introduction of synthetic growth hormone in 1985.

This dissertation purposely ends in the mid-1980s. I employed this tactic as an attempt to recover a portion of the history of the growth hormone industry commonly overshadowed by the role of growth hormone in the rise of biotechnology and the impact of recombinant growth hormone on the quantity of GH. The era before recombinant human growth hormone (rHGH) therapy is often told as one plagued by limited resources, substandard technology, and a small degree of success. But this portrait of pre-1985 growth hormone therapy in the U.S. is misleading. Throughout the twentieth century, growth hormone therapy was seen as an effective treatment for GHD as it saved thousands of children from lives of "hellish dwarfism."[25] Even its well-documented supply issue was much more complicated than what it seems on the surface as claims of limited amounts of growth hormone were over-reported by medical experts and clinicians in the hopes of encouraging Americans to donate their pituitary glands to science and by advertisements for rHGH in the mid-1980s, that claimed that biotechnology had solved the problem of limited supply by providing "virtual endless quantities…for every child

[25] Lloyd Shearer, "We Can End Dwarfism!" *San Diego Union*, *Parade Magazine* August 22, 1965, cover, MSS 72, Box 13, Folder 1, Mandeville Special Collections Library, University of California San Diego.

who needs it – or will ever need it."[26] In the case of the history of the growth hormone industry, hindsight is not 20/20.

This dissertation aims to explore how the histories of human growth hormone therapy and the pathologization of short stature found each other during the era of scientific medicine. While the pathologization of short stature speaks to the medicalization of somatic realities perceived as deficits, the quest to discover, isolate, and use growth hormone reveals the development in medicine to search inside the body for causation instead of outside in the environment. Once their stories intertwined during the mid-twentieth century, the short, middle-class, full-of-potential, white boy became the poster-child for the growth hormone industry. Together these histories make us question the implications of the medicalization of social stigmas, the reflexivity between pathology and treatment, and how height matters.

[26] Genentech, Inc. Protropin, "Out of Today's technology tomorrow's growth", *Journal of Pediatrics* 108, no. 1 (January 1986): 27A-31A .

Chapter 1 – Short Children and Long Hours: Nineteenth Century Roots of the Modern Stigmatization of Short Stature and the Medicalization of Height

> Boy on right Charlie Burton-9 Ozark Mill. This anaemic [sic], hollow chested, stoop shouldered under-sized and weight, said—"Been in mill 6 or 7 years. 12 years old. Haint grown none for 5 years. Doff at night and get 60 cents. Couldn't stand the sweepin' at the other mill, so mother moved us over here so I could get a job at doffin'." "Night work is 12 hours at a stretch." His sister (14 years old) has been spinning for 6 years. Makes 50 cents a day…Other boy--Frank Goodson--Been in mill 6 years. This mill was running nights at the time the photograph was taken. Location: Gastonia, North Carolina.[1]

This caption provided the context for a photo of two boys taken in 1908 by child labor activist Lewis Hine. As the official photographer of the anti-child labor organization, the National Child Labor Committee (NCLC), Hine toured the country, documenting children at work and collecting evidence for the NCLC campaign for federal child labor legislation. His field notes provided captions for many of his photographs and an additional opportunity to sway the opinion of the viewer of his images. Hine used the caption of this photo of Charlie Burton and Frank Goodson to convey how harmful industrial work had been. Anemic, hollow-chested, and undersized,

[1] Lewis Hine,"[Boy on Right Charlie Burton-9 Ozark Mill,]" Gastonia, North Carolina, November 1908, National Child Labor Committee Collection, Library of Congress Prints and Photographs Division, Washington, D.C.

Charlie embodied the abusive nature of industrial work. Unlike antebellum reformers' use of moral suasion, progressives employed scientific evidence to convince Americans of the evils of child labor. While the progressive campaign against child labor was a single-issue cause, its campaign material had far-reaching repercussions in the popular and medical interpretations of small stature in childhood.

This chapter sheds light on how efforts by governmental administrators and reformers, concerned about the health of the future leaders and citizens of the United States, contributed to the modern social stigmatization of short stature and the medicalization of children's height. It examines the process in which British labor reformers measured children and used the data to establish how waif-like, dirty, small bodies evidenced maltreatment worthy of government regulation and the adoption of these potent visual messages by American reformers in their efforts to end child labor in America and promote their universal notion of childhood. The practice of measuring children in order to save them moved beyond the world of nineteenth century reformers and served as a useful procedure in the surveillance of healthy children in twentieth century America and contributed to the medicalization of stature. By the 1930s, parents, school administrators, and instructors, along with pediatricians and nurses, played important roles in overseeing the health of well-children, with physicians, as the medical experts, assuming the expert function of diagnosing and treating substandard growth. Although the discrimination of short stature can be traced back to antiquity, the modern trends detailed in this chapter ushered in a unique sensibility of this cultural bias, one based on Enlightenment philosophy and influenced by the rise of capitalism, championed

by reformers, endorsed by science and medicine, popularized by public health campaigns, and taken up as an effective tactic in the medical observation of children.[2]

Enlightenment Concerns about Industrialization and Children's Well-Being

The reasons why and how short stature operates in American society today date back to the eighteenth century when Enlightenment thinkers believed that the health of citizens and systems of government were connected.[3] Enlightenment philosophers criticized tyrannical governments, which did not favor reason and fairness, on the basis that they caused the poor health of citizens; instead they praised representative governments, which did value the tenets of Enlightenment, for their ability to nurture healthy bodies. This way of thinking, in part, provided the theoretical foundation for the American colonists' successful rebellion against Great Britain as the revolution symbolized an open opposition to divine right tyrannical authority, as it championed natural rights and protected personal rights. Revolutionaries, including Benjamin Rush and Thomas Jefferson, believed their new democratic government would engender healthy bodies although they did not officially declare health as an unalienable right. Rush claimed, "the creator had so designed the human body that it would flourish when it lived in harmony with its political and social environment and conversely He had so framed the political order that human health was fostered by good social institutions."[4]

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[2] Betty M. Adelson, Dwarfism: *Medical and Psychosocial Aspects of Profound Short Stature*, (Baltimore: Johns Hopkins University Press, 2007), 2-6.

[3] Immanuel Kant and Lewis White Beck. *Critique of Practical Reason and Other Writings in Moral Philosophy* (Chicago: University of Chicago Press, 1949).

[4] George Rosen, "Benjamin Rush on Health and the American Revolution," *American Journal of Public Health* 66, no. 4 (1976): 397.

Democracy, Rush and Jefferson believed, was Enlightenment philosophy realized and therefore would promote healthy living.

While the revolutionaries may have thrown off the shackles of British government oppression, they found it more difficult to rescue Americans from the grips of industrialization, and by the late eighteenth and early nineteenth centuries textile mills and small factories popped up throughout the countryside across the northeast. Rush and Jefferson tried to use their influence to caution against rapid urban growth. They contended that industrialization disrupted the natural rhythm of life and brought forth unsanitary conditions, which jeopardized mental and physical well-being. Words turned into action as Jefferson attempted to halt the rise of industry in the northeast during his presidency. He encouraged Americans to pursue an agrarian ideal and promoted an "Empire for Liberty" based on small family farms. Ironically, a series of miscalculated moves by Jefferson during his presidency caused industrialization to expand.[5]

By the 1830s, the northeast was in the midst of an industrial revolution, which ushered in urbanization and poor living conditions, but also new employment opportunities. Although native-born males were the largest group of early manufacturing workers, women and children found work in the first large-scale mills erected in New England in the 1820s.[6] According to historian of medicine Thomas E. Cone, "[i]n 1820 about half of all textile workers in Massachusetts, Connecticut, and Rhode Island were

[5] George Rosen, "Political Order and Human Health in Jeffersonian Thought," *Bulletin of the History of Medicine* 22, no. 1(1952): 32-44.

[6] Robert Hamlett Bremner, *Children and Youth in America: A Documentary History Vol. 1, 1600-1865* (Cambridge, Mass: Harvard University Press, 1975), 145-146.

children, and in 1832, boys under twelve comprised 43 percent of cotton mill workers."[7] Children were poorly paid, worked long hours, and were often unable to attend school. While some states tried to regulate child labor, workers and employers usually did not comply with the seldom-enforced laws. Regarding the high rate of non-compliance, American educator and politician Horace Mann stated that "it is obvious that children of ten, twelve, or fourteen years of age may be steadily worked in our manufactories, without any schooling, and this cruel deprivation may be preserved for six, eight, or ten years, and yet during all this period, no very alarming outbreak will occur to rouse the public mind from its guilty slumber."[8] As U.S. legislators failed to protect working children, regulatory legislation experienced more success across the Atlantic and became an inspiration for American anti-child labor reformers.

European Efforts to Protect Working Children

During the late eighteenth and early nineteenth century, British public health officials identified children as the most innocent victims of the harsh realities of industrial work and focused on persuading government to regulate child labor. Public health officers and social reformers collected scientific data to document the impact that brutal working conditions had on children and to convince government officials to pass regulation. They conducted surveys, in which they measured and compared the stature of working children to that of non-working children. Their results demonstrated how industrial work was harmful to these children. Children working in the factories were small and, therefore not as healthy than their non-working counterparts, according to

[7] Thomas E. Cone, *History of American Pediatrics* (Boston: Little, Brown and Company,1979), 95.

[8] Ibid., 95-6.

public health officials. Reports based on growth surveys influenced public policy throughout Europe with Britain being the first to pass regulatory laws, known as the Factory Acts, aimed to protect working children and women.[9] These acts, beginning with the 1802 Health and Morals Regulation Act, limited the number of hours women and children could work, restricted where they could be housed, and provided maximum hours for specific ages all in the hopes of improving the health of the workers.[10] The scientific data collected by public health officials helped the passage of the Health and Morals Regulation Act. Reformers' ability to sway legislation using statistics about stature demonstrated the power of evidence in influencing governmental policy and inspired future growth studies.

Outraged by business owners' non-compliance with the 1802 Health and Morals Regulation Act, the British government assigned public health advocate Edwin Chadwick to orchestrate a project to investigate the level of misconduct. Chadwick's work contributed to the passage of the 1833 Factories Regulation Act and set a standard of measuring height as a mechanism to determine the health of working children. His 1832 public health project assigned medical commissioners to investigate how harmful working conditions were on children by measuring their height, weight, and overall stature, and compared the results with data collected from non-working children. As expected, the measurements proved that factory children on average were shorter than other children. This data substantiated accusations made about the causal relationship between unsafe working conditions and poor health in children. It also became the basis

[9] J.M. Tanner, *A History of the Study of Human Growth* (New York: Cambridge, 1981), 147.

[10] A. Aspinall, E. Anthony Smith, and David C. Douglas, *English Historical Documents 1783-1832* (New York: Routledge, 2000, first published 1959), 782.

of Chadwick's 1833 *Report on the Employment of Children in Factories* and inspired the passing of the Factories Regulation Act that same year.[11] Influenced by the scientific data collected, synthesized, and presented to legislators, this factory act placed additional restrictions on child labor and linked the health of children to working conditions. It prohibited children under nine years of age from working in various types of factories, required specific accommodations for workers between the ages of nine and thirteen, and demanded that children be examined by "a surgeon or medical man who shall certify on inspection of the child that he believes it be of the full growth and usual condition of a child of the age prescribed."[12] It also made factory inspectors responsible for conducting checks to make sure factories from their district adhered to the new, stricter regulations. Even though many factories failed these inspections, the law allowed retribution for non-compliance. The success of Chadwick's work and the publication of his findings inspired subsequent child labor reform projects throughout Europe and helped transform short stature into an indicator signaling substandard working and living conditions, which compromised the health of children. By the mid-nineteenth century, short stature joined a series of other somatic realities, including small frames and waif-like body types, to constitute a system of reference used by reformers and legislators on both sides of the Atlantic to document the harm done to children by industrialization.

While Britain continued to break new ground in the size and breadth of their public surveys, French reformers got their turn to examine the health of working children in 1832 when the newly reinstated *Académie des Sciences Morales and Politiques*

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[11] Tanner, 147.

[12] G.M. Young and W.D. Hancock, *English Historical Documents, 1833-1874* (New York: Routledge, 1956), 934-949.

appointed well-known public health advocate, Dr. Louis-René Villermé, to investigate working conditions in textile factories throughout France. While he conducted his epidemiologic work, Villermé remarked, "If following my tour a maximum duration of work for children in factories should be adopted, I would certainly be well rewarded for all of my trouble. This law, which would only be a copy of one passed in England not long ago, is absolutely demanded by conscience and humanity."[13] His fieldwork included measuring and comparing the height of working children to non-working children and his reports documented the deficiency in height of the former and advocated for the end of their exploitation. In 1840, his findings were issued in a report entitled *Tableau de l'état Physique et Moral des Ouvriers: Employés dans Le Manufactures de Cotton, de Laine et de Soie,* and a year later France passed its first child labor law. While the legislation was weakly enforced, Villermé continued to conduct field studies, publish reports, and work with other reformers to convince the government for more restrictions, as he believed "the circumstances which accompany poverty delay the age at which complete stature is reached and stunt adult height."[14] In 1871, several years after Villermé's death, France finally passed a law that extended restrictions on child labor.[15] The measurements of thousands of working children contributed to the law's passage as Villermé and other reformers used small frames, waif-like body types, and short stature as a system of reference signaling mistreatment. By the 1880s, the meaning of short, frail, tiny bodies in France and Britain transcended mere numbers on a ruler or a scale, as

[13] Tanner, 164.

[14] Ibid.

[15] Lee Shai Weissbach, "Child Labor Legislation in Nineteenth-Century France," *The Journal of Economic History* 37, no. 1 (March 1977): 268-271.

they became indicators of the impact of poverty and exploitation brought onto helpless children by industrialization.

The Progressive Interpretation of Height and the American Anti-Child Labor Campaign

After the Civil War, America's industrial revolution went into high gear. Industrial capitalism brought dangerous working conditions, filthy housing, and diseases to America. Faced with low wages and no social welfare system, poor families often sent their children off to find industrial employment.[16] Although agricultural employment dominated child labor from the 1880s to the 1930s, industrialization opened up new jobs. Young people delivered newspapers and telegrams, shined shoes, made brooms, worked in mills, and mines, and did piecework alongside their parents at home.[17] As industrialization exacerbated inequalities between the rich and the poor, American union organizers, social reformers and public health officials continued the antebellum crusade to help those victimized.

Throughout the nineteenth century, American reformers and public health advocates, including John H. Griscom and Jacob Riis, documented the horrible working and living conditions of the poor but stopped short of using measurements of stature to scientifically prove the ill effects of industrialization on the poor. Instead, they stuck to employing anecdotal evidence and moral suasion to convince Americans the need for government regulation and the protection of children. While neither used a statistical approach, their reports on the horrible living and working conditions of the poor in New

[16] Lee A Craig, *To Sow One Acre More: Childbearing and Farm Productivity in the Antebellum North* (Baltimore: Johns Hopkins University Press, 1993), 9.

[17] Robert Whaples, "Child Labor in the United States" *EH.Net Encyclopedia*, edited by Robert Whaples, October 7, 2005, http://eh.net/encyclopedia/article/whaples.childlabor.

York City convinced enough legislators to pass local regulatory laws.[18] The accomplishments of these advocates for more government regulation were overshadowed by the 1900 census, which indicated (incorrectly) a rise in child labor.[19] Reformers would have to draw upon the scientific method for a more rigorous and persuasive presentation than moral prose and tear-jerking photography in order to rid America of this social ill.

Twentieth century Progressives shifted the tone of the American anti-child labor movement and adopted the European scientific strategy of comparing measurements of children to demonstrate the harmful effects of industrial work. Progressives believed that through public campaigns and investigative reporting that documented the social ills stemming from laissez-faire capitalism, they could influence public opinion and move average citizens to demand action from authorities. Progressives advocated for a series of reforms, which included providing vocational training to the poor, ending political corruption, and establishing minimum public health standards. Many Progressives focused their reform efforts on poor mothers and children, as they seemed the most innocent victims of the blatant exploitation brought on by unbridled industrialization. Progressives established settlement houses, provided training services, built playgrounds, and advocated for the establishment of widows' pensions and the end of child labor.[20]

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[18] Their two seminal works are: John H. Griscom, "Sanitary Condition of the Laboring Population of New York City" (New York: Harper & Sons,1845) and Jacob Riis, *How the Other Half Lives*, *Studies Among the Tenements of New York* (New York: Sagamore Press, 1890).

[19] Robert Whaples, "Child Labor in the United States" *EH.Net Encyclopedia*, edited by Robert Whaples, October 7, 2005, http://eh.net/encyclopedia/article/whaples.childlabor.

[20] Walter I. Trattner, *Crusade for the Children: A History of the National Child Labor Committee and Child Labor Reform in America* (Chicago: Quadrangle, 1970), 47.

Home to over thirty settlement houses, countless humanitarian organizations, impoverished immigrant enclaves, and unprecedented wealth, New York was a hotbed of Progressive reform and continued to lead the way in implementing regulatory legislation during the first decades of the twentieth century. In 1902, Florence Kelley, Lillian D. Wald, and other reformers created a temporary committee to investigate child labor in New York. Their findings revealed that child labor was rampant in their state despite restrictive regulations already in place. Subsequently, they lobbied for stricter legislation, a battle they won. Two years later, the committee decided to extend their efforts, renamed themselves the National Child Labor Committee (NCLC), and took their crusade national.[21]

The NCLC aimed, as they put it, to "properly inform" the public about the prevalence and perversity of child labor and to inspire a "[n]ational sentiment upon the subject" that would persuade the passage of legislation detailing increased government regulation.[22] The NCLC created a model law based on pieces from existing legislation and advocated for its passage state by state. However, it wanted more; the NCLC aimed for a federal anti-child labor law.[23] With their goal in mind, NCLC activists focused on their grassroots movement, which included a passionate anti-child labor campaign and reframing of the notion of "childhood." NCLC members lectured about how child labor was un-American in the way it exploited the most vulnerable members of society and contributed to race suicide and degeneracy by not allowing children to experience "physical protection," "happiness," and a "useful education," three components of what

[21] Ibid., 56 – 58.

[22] Ibid., 59 – 60.

[23] Ibid.

the NCLC had coined the "new vision of child." This new vision promoted the concept of a "normal childhood," which meant an upbringing that would mold children into healthy, happy, educated citizens ready to lead the next generation, and served as the backdrop for the anti-child labor movement.[24]

Like other Progressive organizations, the NCLC used investigative reporting to persuade Americans to demand the abolishment of child labor in the United States.[25] The NCLC's leaders traveled to areas where many industries notorious for their exploitation of children were located and lobbied for an increase in government regulation, organized anti-child-labor committees, and lectured about their eyewitness accounts of the horrors of child labor. In order to increase the credibility of their claims about child labor and the potency of their message, members of the NCLC hired Lewis Hine as its official full-time photographer in 1908. Hine was no stranger to investigative photography. While a teacher at the Progressive-minded Ethical Culture School in New York City, he photographed immigrants being processed at Ellis Island. He also had previously free-lanced for the NCLC, worked for the National Consumers League, and photographed for the seminal Progressive project, the Pittsburgh Survey. Heavily funded by the Russell Sage Foundation, the Pittsburgh Survey aimed to use the methods of social science to document working conditions in an industrial city, and to employ the data collected in convincing its audience about the need for reform. Organizers of the Pittsburgh Survey also hoped their study would serve as a model for future projects. Hine's ideas fit well with these larger goals. He opposed blaming the poor for their poverty and hoped his

[24] National Child Labor Committee (U.S.), *Child Labor and Social Progress: Proceedings of the Fourth Annual Meeting, Atlanta, Georgia* (April 2-5, 1908), 6-7.

[25] Trattner, 70.

images of working children would stir compassion from middle-class Americans, who would urge government officials to bring an end to child labor in America. Motivated by his cause and the organization he worked for, Hine used small stature as a visual code to communicate the inappropriateness of factory work for children, the maltreatment of employees, and the unhealthy state of working conditions.[26]

Lewis Hine worked for the NCLC from 1908 to 1918 and served as a photographer, field data collector, and director of the exhibits department. He traveled throughout the country, first documenting industries most known for exploiting children, including the mining industry in West Virginia, textile mills in the South and New England, and the tobacco industry and canneries in the Gulf States. During a site visit, he did his best to document the working conditions of children by using the tools of the social scientist: field notes, interviews, and photographs.[27] Sometimes he lied to employers about the true subject of his photos, telling them he was interested in capturing images of the machines at work. If he was refused entry to the workplace altogether, Hine would wait outside the factory to catch a photo of the children on their way home or to work.[28]

In order to convince Americans that child labor needed to be further regulated by the government, Hine attempted to document its existence and to show how certain types of work, such as factory work or mining, compromised children's health. It is important

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[26] Kate Sampsell-Willmann, *Lewis Hine as Social Critic* (Jackson: University Press of Mississippi, 2009), 59-62.

[27] Naomi Rosenblum, "Biographical Notes," In *America and Lewis Hine* by Alan Trachtenberg (New York: Aperture, 1977), 18 -19.

[28] Sampsell-Willmann, 55.

to note that Hine and other reformers made a distinction between healthy and harmful child labor.[29] While they had no qualms about children working on a family farm or learning a trade through an apprenticeship, they did take issue with jobs that took children away from school, exploited them as cheap labor, and were physically dangerous. Consequently, in order to rally support from other Progressives and Americans alike, Hine's lens gravitated towards capturing frail, small, and pathetic bodies stuck at work.

An indicator of age, maltreatment, and/or compromised health, small stature mattered to Lewis Hine, the NCLC, and Progressive reformers. Understanding the power of the perceived relationship between health and height, Hine communicated the short stature of his subjects by strategically placing children in his photos and providing captions, which often alluded to their smallness and/or provided their "exact" height. This visual technique is evident in a photograph taken outside the front steps of Loray Mill in Gastonia, North Carolina. The image includes seven male workers, with one male worker in the background standing in the entrance of the mill and a group of four small boys featured in the center of the photo. Two taller men stand on either side of the boys, providing a contrast in height, to communicate to the viewer that the four small workers in the center are boys.

[29] Ibid., 77.

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When photographing children inside factories, Hine often placed his subjects near large machinery to provide a sense of scale and of their small, as was the case with a series of photographs taken in South Carolina and Tennessee.[31] In one image, two huge machines tower over a girl working as a spinner at the Lancaster Cotton Mills in South Carolina; her factory surroundings help demonstrate her short stature. In a photograph featuring Leo, an eight-year-old worker at Elk Cotton Mills in Fayetteville, Tennessee, Lewis has the young worker stand barefooted in front of a textile machine while he gazes at the camera. His small stature is conveyed by the frame behind him and other taller workers featured in the background of the spinning room. Small-statured, shoeless workers were preferred for Leo's job, which was picking up bobbins stuck in the open space in the middle of the frame. Young boys like Leo were paid a daily flat rate to climb the machines to retrieve the bobbins. Accentuating Leo's small body, Hine's photo aims to depict the vulnerability of this young boy hired for this dangerous job.

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[30] Lewis Hine, "[Boy with Coat in Hand Is 11 Years Old]" Gastonia, North Carolina, November 1908, National Child Labor Committee Collection, Library of Congress Prints and Photograph Division, Washington, D.C.

[31] Russell Freedman, *Kids at Work: Lewis Hine and the Crusade against Child Labor* (New York: Clarion Books, 1994), 22.

 [32]

Although Hine believed his photographs could convince Americans that child labor hurt children and should be abolished, he also collected field notes to complement his visual testimony. Hine wrote captions for his photographs based on these field notes, and hoped photo and caption together would create a "photo story" of child labor in America. The captions often described the subject's location, included quotes from the children, and recorded the duration of children's work, pay, and health. Hine was methodical in his approach to measuring the height of his subjects. Unable to use a ruler to measure the children, he memorized the length between the button and the floor of each of his vest's buttons. While on site, Hine measured the children with his vest and recorded the measurements on a concealed notepad.[33] Consequently, he was not only able to visually demonstrate the small stature of his subjects, he featured specific measurements of them in his photo captions.

Hine's captions allowed him to punctuate certain somatic realities of his subjects, to provide additional context bringing to light the dangers of child labor, and to better

[32] Lewis Hine, "[Leo, 48 Inches High, 8 Years Old.]" Fayetteville, Tennessee, November, 1910, National Child Labor Committee Collection, Library of Congress Prints and Photographs Division, Washington, D.C.

[33] Ibid., 29.

control the message of his photographs. In the photostory below Hine aimed to gather facts about this working girl to indicate how factory work had compromised her health and hindered her opportunity to experience a "normal childhood." Her stature in particular provided evidence of the effects of unhealthy working conditions on young girls. By capturing the perfect image and composing compelling prose, Hine wanted to convince viewers that factory work was harmful and to move them to demand legislatures to start passing laws protecting children.

> The Mill: One of the spinners in Whitnel Cotton Mill. She was 51 inches high. Has been in the mill one year. Sometimes works at night. Runs 4 sides - 48 cents a day. When asked how old she was, she hesitated, then said, "I don't remember," then added confidentially, "I'm not old enough to work, but do just the same." Out of 50 employees, there were ten children about her size.[34]

Various newspapers, Progressive journals, and NCLC publications featured Hine's photos and captions in the hopes of raising awareness about child labor. NCLC leaders included slides of Hine's work in their lectures to further document the

[34] Lewis Hine, "[One of Spinners in Whitnel Cotton Mfg. (N.C)]" Whitnel, North Carolina, December, 1908, National Child Labor Committee Collection, Library of Congress Prints and Photographs.

exploitation of children they reported on and the NCLC made a small income from renting these slides to other reformers hoping to do the same. Hine himself presented his work at NCLC meetings, advertised his services, and lectured to the public about what he saw were the horrors of child labor. He also served as the official photographer for non-NCLC projects including the 1911 Child Welfare Exhibit held at the 71st Regimental Armory in Manhattan, which demonstrated his talent in creating a convincing visual argument against child labor. Hine placed photos documenting smiling, proportionate, similar-statured children experiencing and benefiting from the "new vision of child" as they played on jungle gyms and sat at their school desks ready to learn and juxtaposed them with images of short-statured children at work, operating massive machinery and risking their lives doing dangerous tasks.[35]

After several years with the NCLC, Hine became the director of the exhibits department and further influenced the dissemination of his work and the message of the organization by creating exhibitions and posters. The Panama Pacific International Exposition in San Francisco and the Panama-California Exposition in San Diego hosted NCLC exhibits curated by Hine. Hine's exhibit panels sometimes only used the written word to convince attendees about how children should experience a childhood and that working in unsafe conditions was un-American. For example, one of his panels stated: "Child labor IS FUNDAMENTALLY WRONG: It is a contradiction of the basic principles of this free republic that upon the SHOULDERS of a CHILD who has not attained full physical development, had a reasonable time for play or education, there

[35] Sampsell-Willmann, 81.

should be put the smallest fraction of the burdens of modern competitive life."[36] Hine's exhibits provided an even more comprehensive context than captions alone and contextualized short-statured children not only as victims of industrialization but also symbols of a society that had veered away from its fundamental democratic principles.

By the time he left the NCLC, Hine was considered the most successful photographer of social welfare in the country, due to the abundance and wide distribution of his work.[37] Hine's photographs influenced the way Americans envisioned and interpreted short stature, although the NCLC's anti-child labor movement had to wait until 1938 when the federal government finally regulated child labor with the passage of the Fair Labor Standards Act. According to Hine's imagery, short, frail children needed the most protection against the exploits of industrialization. His photos still serve to document the exploitation of child labor during the turn of the century. Even though his photographs serve as an important record of poor working-class children in early 20th century America, one must not overlook the calculated composition of each image and the power these images had in popularizing the idea that imperfect bodies tell us that something is wrong.

Anthropometry and the Emergence of Growth Surveys in America

Those engaged in anthropometry codified the anecdotal data from reformers and contributed to the normalization of average measurements and the pathologization of short stature by conducted large growth surveys of children. The establishment of population statistics of children's body measurements further solidified the social

[36] Ibid., 82.

[37] Daile Kaplan, ed. *Photo Story: Selected Letters and Photographs of Lewis W. Hine* (Washington, D.C.: Smithsonian Institution Press, 1992), 57.

stigmatization of short stature and the medicalization of height. Population statistics had grown in importance during the mid-19th century with the publication of Charles Darwin's *The Origin of Species* (1859), which fueled scientists' curiosity to better understand human variation. As information about populations was gathered, speculation grew over the influence of genetic inheritance, the potential meanings of body stature as an indicator of mental ability, the power of so-called biological markers (such as race and gender) on personhood, and humanity's ability to direct human evolution, a strategy known as eugenics. Inspired by Darwin's idea of natural selection, anthropometry, the science of measuring, took on the study of human measurements to better understand variation and was often infused with the eugenic perception of Anglo-Saxon excellence. Scientists scurried to document what physically made people different as the first step in exploring ways human variation had been and could be influenced.[38] Henry Bowditch was one of those scientists in the United States.

Henry Bowditch received his medical degree from Harvard and then traveled to France and Germany in 1868 where he studied physiology and worked in the laboratories of Claude Bernard in Paris and Carl Ludwig in Leipzig. There he found his passion, scientific medicine. When he returned to Boston, Bowditch became an Assistant Professor of Physiology at Harvard Medical School and served on Boston's school committee. While a member on the committee, Bowditch orchestrated a major growth survey to study human variation amongst the schoolchildren of Boston. The object of his study was to "determine the rate of growth of the human race under the conditions which

[38] Angelo Albrizio, "Biometry and Anthropometry: From Galton to Constitutional Medicine," *Journal of Anthropological Sciences* 85 (2007): 101-23.

Boston presents."[39] Bowditch wanted to assess the rate of growth of various races, immigrants, natives, and girls and boys living in Boston and compare his findings to previous European studies, including a study conducted by M. Quetelet in the early nineteenth century. Quetelet had measured Belgian girls and boys and his findings revealed "girls are, at no period of their lives, taller than boys of the same age," which was contrary to reports from Manchester and Stockport claiming that girls were taller and weighed more than boys when they were thirteen and fourteen. These differing findings contributed to the debate about whether girls throughout their development ever superseded the growth of boys. If so, as growth surveys from Manchester and Stockport suggested, that meant girls, at certain points during childhood were, on average, superior to boys, which was an alarming proposition for some scientists.

Bowditch's Boston Growth Survey was the first of its kind in the United States and data derived from it became the foundation for subsequent studies. Bowditch collected close to 24,500 measurements and conducted thousands of interviews with children. Based on his findings, he concluded girls weighed more and were taller than boys between eleven and fourteen years of age, children of American-born parents living in Boston were taller and heavier than children of foreign-born parents, private school boys were taller and weighed more than their public school counterparts, and finally, geography, climate, and living conditions played a role in growth, all which were pressing issues in the field of anthropometry. Bowditch's findings were published in a series of reports of the Board of Health of the State of Massachusetts, which Bowditch chaired during the late 1870s.

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[39] Henry Pickering Bowditch, *The Growth of Children* (Boston: Albert J. Wright, State Printer, 1877), 4.

In 1880, the Massachusetts Board created a circular about its growth survey and distributed it to various institutions encouraging them to collect similar statistics. The Board was curious to explore the influence of environment on the growth of children and "the physique of adults," to investigate the relationship between immigration and "the physique of a race," "to compare and contrast the effects of city and country life on growth and development," and to investigate "the relationship between disease and growth rate" at a larger scale.[40] Those interested in anthropometry and lucky enough to have the resources to execute a large study responded to Massachusetts' request. Two of the most well-known of these post-Bowditch studies were the 1881 Milwaukee study orchestrated by G.W. Peckham and a study in St Louis organized by Dr. W. T. Porter. Each study was massive. In 1881 G.W. Peckham, a biology teacher in Milwaukee interested in charting the growth of German immigrant children, took measurements of 10,000 children between the ages of four and eighteen, and ten years later Dr. W.T. Porter curious about the relationship between school performance and physique measured 33,500 public school children in St. Louis.[41] While these two surveys varied in their goals they, like Bowditch, found schools to be the perfect clearinghouses for their work and were excited abut their contributions to the growing data of the health of American children and together provided various averages in height, which were used as healthy norms that should help assess a child's height.

In schools across the country students were rounded up, measured, interviewed, and assessed, in the name of anthropometry, sometimes to the dismay of parents and

[40] Douglas Cole, *Franz Boas: The Early Years, 1858-1906* (Seattle: University of Washington, 1999), 142.

[41] Tanner, 216-217.

onlookers. People questioned the validity of the studies and the practice of those conducting the measurements. While teaching at Clark University in 1890, Franz Boas, best known for his anthropological work on Native Americans, was attacked by the *Worcester Daily Telegraph* (WDT) when he began collecting measurements during his growth study of schoolchildren in Worcester, Massachusetts. The Worcester school board had approved Boas' use of their students in an attempt to further explore the relationship between differential growth rates, body measurements, and mental development. Boas planned to record a series of measurements, including height, weight, head size, and the personal history of each child measured by using the most up-to-date equipment, such as calipers. He saw this study as a wonderful opportunity to research human variation, as Worcester had recently experienced an influx of immigrants from diverse locations eager to work in its factories, and the public school system counted half of its population as "foreign-born" or "children of immigrants."[42]

Boas' project hit a snag when it became embroiled in a feud between Clark University and Worcester journalists and residents who were distrusting of those affiliated with the new university. As Boas geared up for his study, journalists challenged its validity and his reputation. Reports claimed "children at school have their anatomies felt of and the various portions of their bodies measured for no reason established in science," and that Boas was a man sporting dueling scars on his face, and an immigrant from Germany "unknown to Worcester, either personally or by established reputation, except as the representative of an institution under a blood red cloud." One report painted a picture of the collection of measurements as an opportunity for Boas "to

[42] Cole, 142-143.

measure the thighs of Worcester schoolgirls."[43] The Worcester Daily Telegraph brought "the caliper question" to its readers and created a ballot for them to fill out as they voted on whether the study should continue. While this affront on the Worcester study was more personal than criticism drawn by other growth studies, it does reflect the resistance from parents and the community when it came to conducting scientific studies on children. Even after receiving such harsh criticism, the school board continued to support Boas and his four assistants. While Boas' team measured and interviewed pupils, a journalist from the WDT observed their execution of the study. Even though the local media was so opinionated and boisterous, Boas was able to secure "permission from 80 percent of the parents" and claimed he did not measure any child without parental consent.[44] While Boas left Worcester and Clark University shortly after the conclusion of his growth study due to a rift between the faculty and school president G. Stanley Hall, he continued his work in children's growth and coordinated a major continental anthropometric study for the Chicago Columbian Exposition in 1893.

Boas' anthropometric study for the Chicago World's Fair was extensive and advanced his career in this field. He collected children's measurements from various North American cities including Toronto, Canada and Oakland, California, and merged his findings with previously published studies, a common practice in anthropometry, to accurately represent the growth and health of North American children and to establish a set of population standards. A total of nearly 90,000 children between five and eighteen

[43] Ibid.

[44] Ibid., 143.

were involved.[45] A display featuring this work was shown in the anthropology building of the fair among other exhibits about various native peoples of North America, which also incorporated anthropometric data. Whereas Boas' motivation for his growth study and the inclusion of measurements in his exhibits featuring Native Americans reflected early anthropometric attempts to document human variation by comparing and contrasting population standards, his work also helped established normal growth rates in children when his findings were published in an 1898 U.S. Commissioner of Education report and became the standards used when measuring schoolchildren until the 1920s.[46]

Anthropometry was not solely an attempt to establish population statistics; many scientists and educators were also interested in the possible relationship between physical stature and rate of growth, personality, and intellectual potential. Housing thousands of students, schools served as conducive sites for these studies. In 1889, the new U.S. Commissioner of Education, William Torrey Harris, took notice of the growing number of anthropometric studies conducted in America's public schools and included some of their findings into his annual reports. Harris believed education had the potential to save a child from crime and poverty and wondered if physical traits could provide clues as to what pupils might be the most susceptible to personal decline. As this idea gained merit in scientific circles at the end of the 19th century, Harris decided to hire Arthur MacDonald to conduct research to further explore the connection between physical features, the potential of instruction, and the capacity of the mind. In 1892, MacDonald left his position as a docent at Clark University, joined the Bureau of Education, and

[45] Ibid., 241.

[46] Frank Spencer, *History of Physical Anthropology: An Encyclopedia*. 1(1997), 189 and Tanner, 491.

quickly established his role as the "Specialist in Education as a preventive of Pauperism and Crime."[47]

MacDonald was eager to dive into his work. During his tenure at the bureau, he attended two European conferences on criminality and anthropology, wrote several books about the relationship between physical stature and the mind, and conducted multiple studies on schoolchildren attending Washington D.C. public schools.[48] In "Experimental Study of Children Including Anthropometrical and Psycho-physical measurements of Washington School Children," MacDonald justified his endeavors, reported on his methods and findings, and provided conclusions. His work with schoolchildren in D.C. spanned four studies: "one was a special study of 1,074 children, which considered the cephalic index and sensibility to heat and locality upon the skin, with relation to sex, mental ability, and sociological conditions" and was conducted by MacDonald himself, another was an "anthropometrical and sociological study of all of the school children, based upon measurements by the teachers," the third "was a purely psychological inquiry as to comparative mental ability in the different school studies as reported by the teachers," and "the fourth was a study of the abnormal children in the schools as reported by the teachers."[49] This report, published by the Bureau and reprinted in a variety of other mediums, included his intent, a description of the experiments conducted on schoolchildren, and the collection of their body measurements. His studies were meant to provide insight into normal child growth and development; as he stated, "as pupils are

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[47] James B. Gilbert, "Anthropometrics in the U. S. Bureau of Education: The Case of Arthur MacDonald's 'Laboratory,'" *History of Education Quarterly*, 17, no. 2 (Summer 1977): 169.

[48] Ibid., 179.

[49] Ibid.

examined periodically to test their mental growth and improvement, it is just as necessary to fare that their physical condition and development be ascertained, so that progress may be gained in body as well as in mind." MacDonald, like many of those involved in anthropometry, believed in taking a long series of measurements in order to assess physical condition; he described how he measured children's heads, sitting height, standing height, their hand grasp strength, and responses from shocks administered to their temples. He recruited teachers to help him with his study; they measured their pupils and gave assessments of their students' ability by filling out questionnaires.

Even though MacDonald was concerned with many of the educational issues of the day (including the maximum level of work suitable for a child in different periods of growth and the possibility that during growth spurts, the vital force in children was overtaxed, which made them unable to learn), his conclusions ran the gamut and often implicated certain body structures, including short stature. He presented his psychophysical analysis and findings alongside anthropometric work in his reports.[50] MacDonald linked intelligence with short stature by proposing that "bright boys are in general taller and heavier than dull boys" and class to stature by arguing that "children of the nonlaboring classes have, in general, greater height, sitting height, and weight than children of the laboring classes."[51] Shortly after the publication of his findings, MacDonald's investigation of what he had called the "normal modern civilized man" gave way to an obsession to establish a laboratory in the Department of Justice for the study of the criminal, pauper, and defective classes. He argued, "the government pays

[50] Ibid.

[51] Arthur MacDonald, *Experimental Study of Children*, (Washington D.C.: Government Printing Office, 1899), 998.

out hundreds of thousands of dollars for erection of monuments for the study of rocks, plants, and animals, it would seem proper that it pay out a few thousand dollars to study in a rigid, scientific way its greatest enemies – the criminal and abnormal classes."[52]

By the time MacDonald's laboratory campaign had reached full force and a few years before the publication of the Washington D.C. study, his relationship with his supervisor had turned sour due to a scandal around a book he had written about women with sexual abnormalities. He had collected his data by placing a fictitious personal ad in the paper. In 1903, Commissioner of Education Harris fired MacDonald; his dealings with MacDonald eventually turned him off to anthropometry completely. When asked to comment on the elimination of MacDonald's job, Harris stated, "to ask any teacher to measure children was a piece of impertinence."[53]

Pediatricians, Public Health Campaigns, and the Surveillance of the Well-Child

While MacDonald abandoned the study of the normal child and Harris' disdain for anthropometry persisted, those involved in pediatrics and the burgeoning field of child growth and development were increasingly interested in the usefulness of measurements to determine the well-being and development of the normal child during the late 19th century. In 1881, Henry Bowditch, inspired by his Boston growth survey, suggested the "importance of securing statistics in regard to the physique of growing children" and called attention to the "relation between growth and disease" during his lecture at the second annual meeting of the American Medical Association's section on

[52] Arthur MacDonald, *Man and Abnormal Man*, (Washington D.C.: Government Printing Office, 1905), 7.

[53] Ibid., 184.

pediatrics.[54] He previously had written about the possible relationship between growth and certain diseases, especially fevers, and by 1881 he seemed convinced of a causal link between disease and development and of the need for acquiring accurate statistics of average measurements of height and weight not only for establishing national standards but also for clinical guidelines.[55] Bowditch argued, "*it seems probable that the accurate determination of the normal rate of growth in children will not only throw light upon the nature of diseases to which childhood is subject, but will also guide us in the application of therapeutic measures*.[56] His recommendation to use anthropometric data as a diagnostic tool in clinical care came at a unique moment in the development of pediatrics. The success of preventive measures such as vaccination and improved sanitation in pediatrics during the 19th century encouraged physicians to emphasize disease prevention rather than disease treatment.[57] Subsequently the weighing and measuring of babies and children along with the assessment of these measurements became imperative practices in the surveillance of children's health during the twentieth century. As adults kept a watchful eye over children, the practice of weighing and measuring a child and assessing the data with established norms transformed into a strategic ritual in the surveillance of infants' and children's health.

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[54] Henry Pickering Bowditch, "The Relation between Growth and Disease," *Transactions of the American Medical Association* 32 (1881): 371-377. Italics in the original.

[55] Bowditch, *The Growth of Children*, 37.

[56] Bowditch, "The Relation between Growth and Disease," 373.

[57] Charles R. King, *Children's Health in America: A History* (New York: Twayne Publishers, 1993), 105.

Weighing and measuring an infant or child was not a new practice for physicians or parents. Early contributors to the field of pediatrics, such as Charles Michel Billard, had pointed to the importance of average measurements of growth in caring for children, in particular infants. Billard's 1828 influential text, *Traité des Maladies des Enfants Nouveau-nés et à la Mamelle* (which was translated into English in the 1830s) included a list of measurements of newborns based on a handful of Billard's observations in order to help physicians gauge the normalcy of infants under their care.[58] Subsequent pediatric texts instructed physicians to measure the height, chest, and other various anatomical sites and to weigh infants and children, and making measuring and weighing a part of the clinical regimen in caring for children, even though data establishing normal growth remained non-comprehensive.

Baby books and parent manuals also encouraged parents to weigh and measure babies. These tasks allowed parents to catch the beginnings of malnutrition or a malady before it was too late, as the infant mortality rate hovered around 150 per 1000 births during the 1890s.[59] Parent manuals and registers provided a more long-term approach to recording a child's growth and development than baby books and conveyed the importance of measuring infants to its user. Translated from French to English in 1872, *The Mother's Register* instructed mothers to record a series of measurements, developmental changes, and observations for the physician to interpret. Interchangeably using the terms growth and height, the register prompted mothers to record the growth of

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[58] Charles Michel Billard, *A Treatise on the Disease of Infants: Founded on Recent Clinical Observations and Investigations in Pathological Anatomy*, translated by James Stewart, second American edition translated from the third French edition (New York: J & H.G. Langley, 1839), Google Book, 35-38 and 548-550.

[59] Cone, 71.

their children by logging in height measurements from one to 18 years old and included a section where mothers could include additional notes regarding growth. One mother who recorded the growth of her son Harold used this space to mention, "rather short when a year and a half. After two years growth quite mixed."[60] The register encouraged the engagement of mothers in the health preservation and medical treatment of their children and established the authoritative role of the physician by suggesting that:

> just as there is … danger in not calling in the physician until disease has crossed the threshold of the house, not otherwise must the mother's observations begin, in some sort, from the first days of existence, and continue without interruption, so that she may have at hand the annals of the health of each one of her children, and need merely turn them over to the physician when he has been summoned in consequence of some indisposition.[61]

This mother's register gave mothers agency in taking care of children and expertise status to physicians, thereby forecasting the twentieth century roles of pediatricians and parents in the health preservation of well children. While physicians took cues from pediatric manuals and measured various parts of their small patients and parents jotted down their child's data into baby books and registers, assessing a child's measurements with established comprehensive standards did not take place until the late 1890s.

Bowditch's recommendation to measure patients and use statistical data from growth studies as diagnostic tools in assessing their growth complemented the professional trajectory of pediatrics, which was in full swing by 1890. The specialization

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[60] J.B. Fonssagrives, *The Mother's Register Current Notes of the Health of Children (boys). The Mother Records for the Physician to Interpret*, translated from French, (New York: John Ross and Company, 1872), n.p., Baby Books Collection, Biomedical History and Special Collections, University of California Los Angeles (hereafter cited as UCLA's Baby Books Collection).

[61] Ibid., 7.

of pediatrics came out of the conceptual application of evolution in better understanding the human lifecycle and with this change in thinking, childhood and adolescence became unique biological events worthy of their own study.[62] Throughout the 1880s and 1890s, pediatricians continued to carve out their niche in medicine. They met separately at the 1880 American Medical Association's annual meeting. The first journal dedicated to the medical care of children in the U.S. began in 1884 and four years later, physicians including Abraham Jacobi, J. Lewis Smith, and Luther Emmet Holt established the first professional society, the American Pediatric Society (APS) and authored the first pediatric textbook in the U.S. in 1897.[63]

Unlike other medical specialists, pediatricians remained holistic in their approach. They treated children in their entirety and continued to work with public health officials on preventive programs intended to keep little ones healthy. In return, public health campaigns popularized the medical surveillance of children's well-being and the importance of measuring and assessing their height and weight. Two particular campaigns, the National Year of the Child (1918) and the annual Child Health Day, brought public awareness to the importance of measuring children without disturbing the expert role of the pediatrician. They were organized by the most influential federal agency in the promotion of children's health during the first half of the twentieth century, the U.S. Children's Bureau, and succeeded in making the measuring and assessing of height and weight commonplace.

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[62] Alexandra Minna Stern and Howard Markel, *Formative Years: Children's Health in the United States, 1880-2000* (Ann Arbor: University of Michigan Press, 2002), 7.

[63] Ibid., 9.

Launched in the midst of America's involvement in World War I, the National Year of the Child's mission was to save "100,000 lives ordinarily sacrificed to infant disease."[64] The first phase of this campaign was the "Weighing and Measuring Test," which was a nationwide effort to weigh and measure babies and children under five years of age (understood as a sort of "stock taking") and was followed by a "Recreational Drive," which advocated for more designated play spaces for children, and a back-to-school and stay-in-school project.[65] The goal of the weight and measuring test was "to bring the message of child health"to, and great lengths were taken to examine as many infants and children as possible,[66] including opening special clinics in New York City and sending equipped trucks to rural areas in Ohio, Michigan, and Connecticut.[67] This all-out effort included every institution possible; by mid-year, even churches were asked to designate Sunday, August 4th as "Children's Sunday" to help carry out the measuring effort.[68] Mothers belonging to parishes were encouraged to have their children measured for their well-being and "to conserve the lives and health of the children of United States" as a measure of national defense.[69] The health of the next generation of soldiers and leaders had to be safeguarded, a point drilled home by the war raging overseas.

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[64] "To Save 100,000 Children." *New York Times*, January 25, 1918, 12.

[65] U.S. Children's Bureau, *Children's Year: A Brief Summary of Work Done and Suggestions for Follow-up Work*. Children's Year Follow Up Series no. 4, Bureau Publication no 67, (Washington D.C.: Labor Bureau,1920), 7-9, Maternal and Child Health Library, Georgetown University, Washington D.C., http://mchlibrary.info/history/chbu/20439.PDF.

[66] Sydney A. Halpern, *American Pediatrics: The Social Dynamics of Professionalism, 1880 – 1980* (Berkeley: University of California, 1988), 90.

[67] Ibid.

[68] "Children's Day in Church," *New York Times*, August 4, 1918, 23.

[69] "To Save 4,700 Babies Here," *New York Times*, July 29, 1918, 5.

During this first phase of the Year of the Child, the bureau distributed 7,606,303 cards "for recording and reporting the height and weight of America's children" in an effort to expedite and standardize the process.[70] Reinforcing the notion that this physical was an exam, the question "DOES YOUR CHILD PASS?" served as title of the report card. Each card was perforated with space on one side to record the weight and height of the child and a growth table to assess the normalcy of the measurements on the other side.[71] The examiner was instructed to first weigh and measure the child and record the results on the card. The front side of the card provided space for this data and included two prompts – "are the child's height and weight above, below, or equal to the average for his age?" and "is the child's weight above, below, or equal to the average weight for his height?" – which encouraged the recorder to assess the child's measurements using the height and weight table on the back.[72] Height and weight were separated by gender. Only one combination of height and weight for boys and girls was listed as the normal measurement for each age. Upon completion of the exam, one half of the record card was sent to the bureau while the other half was placed into the child's permanent medical record, allowing for this test to do double duty - provide public health information about the health of the population and serve as an important tool in the medical surveillance of a child.[73]

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[70] Halpern, 90.

[71] Item is in process of being cataloged. U.S. Children's Bureau's Weighing and Measuring Test material, UCLA's Baby Books Collection.

[72] Ibid.

[73] Ibid.

The growth table featured on the health report card instructed parents, educators, and public health officials not only to gather data but to assess it as well. The norms featured were derived from various sources including the 1916 version of L. Emmett Holt's *Diseases of Infancy and Childhood,* a textbook for pediatricians, Holt's personal communication with the Children's Bureau about the average measurements of 3-month-old boys, Bowditch's 1875 Boston growth survey, and an effort by F.S. Crum to gather measurements from Baby Health Conference sponsored by the American Medical Association.[74] Together this hodgepodge of data served as standards, and examiners were encouraged to advise a parent to take a child to a family physician if a serious deviation from the standards was found.[75]

The Year of the Child campaign was followed up by an annual celebration intended to "express in a public way the importance of child health and the need of its conservation." Beginning in 1923, Child Health Day served as an event to recognize all of the adults working together to ensure the health of America's children and celebrate good health and healthy habits. During the 1920s and 1930s Child Health Days featured "maypole dances, plays, pageants, marches, band music, games, and health drills,"[76] promoted teachers to "inspect the physical examination records, note physical defects of

[74] According to Tanner, Crum had gathered the measurements of 5,602 boys and 8,821 girls from 6 months to 4 years and more than 100 children of each sex were measured for babies up to three months from Baby Health Conferences sponsored by the American Medical Association in twenty-three states. Tanner, 491.

[75] U.S. Children's Bureau, *April and May Weighing and Measuring Test*, Children's Year Leaflet no. 2 part 2, Bureau Publication no. 38, (Washington, D.C.: Labor Bureau,1918), 3, Maternal and Child Health Library, Georgetown University, Washington, D.C.

[76] "Pupils Prepare for May 1," *New York Times*, April 22, 1928, 33.

their pupils and urge the parents to have the defects corrected,"[77] and provided an opportunity for volunteers to coordinate children's health events. Organizers of local activities involved a variety of institutions in a series of programs suggested by the American Child Health Association and the U.S. Children's Bureau. Women's clubs hosted medical examinations days as public relation events gearing up for May 1. At one of these events in Hollywood in 1925, mothers were instructed about how to take care of their children and the babies were given "a thorough mental and physical test," which included weighing and measuring the child. The exams were scored and the results "sent to the mother so that she may know the defects that need correction."[78] Department stores capitalized on Child Health Day by showcasing dioramas highlighting healthy habits, promoting health-conscious products for babies, and featuring medical exams, which included "the weighing and measuring of babies by a trained nurse," in their display windows.[79] Focused on promoting preventive pediatric care, Child Health Day festivities placed value on the weighing and measuring of children and the role of the medical expert in the fixing of physical defects.

Child Health Days also celebrated perfect health. Contests and programs often gave awards to children and infants who embodied perfect health or showed improvements from the previous year's examinations. The eugenic undertones of these programs are undeniable. Better babies contests, fitter families contests, and marriage counseling were all ways eugenicists tried to encourage better breeding. Better babies

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[77] "City to Observe Child Health Day May 1; Pupils to Take Part in Park Exercises," *New York Times*, April 29, 1928, N2.

[78] "Babies in Physical, Mental Tests at Hollywood," *Los Angeles Times*, April 17, 1925, A1.

[79] Frederic J. Haskin, "Celebration to Set New Mark," *Los Angeles Times*, April 13, 1928, 18.

contests had begun at the Iowa State Fair in 1911, when a clubwoman urged for babies to be assessed like cattle and created scorecards for this purpose. The widely read magazine *Woman's Home Companion* created a similar nationwide campaign a few years after and various women's groups throughout the nation hosted their own better babies contests. The Children's Bureau started participating in these contests and, concerned over a lack of standardization in scoring and needless competition, was able to get the AMA to work with the Bureau in creating standards. In the end a form was developed that helped judges assess health examinations given to contestants. Conducting by physicians, the examination was divided up into four tests – "mental and developmental measurements, physical examination, oral and dental examination, and eye, ear, nose, and throat." The baby with the best score was awarded the title of better baby and frequently had his/her photo published in the newspaper. During the 1920s, better babies contests often took place during the week of Child Health Day and their public displays of health examinations educated onlookers, parents, siblings, about the importance of measuring a baby's length while the winners of the contests served as examples of an infant with perfect physical traits, including height.[80]

Perfect health was also celebrated at schools during Child Health Day festivities. In 1928, New York City's celebration included the crowning of a girl as the Queen of May who was deemed in perfect health by Dr. J.L. Blumenthal, Director of Child Hygiene of the Health Department.[81] In the city of Mansfield in Richland County, Ohio, where Child Health Day was transformed from a one-day festival into a year-round

[80] "Register for Baby Week," *Los Angeles Times*, March 28, 1926, B1.

[81] "City to Observe Child Health Day May 1; Pupils to Take Part in Park Exercises," *New York Times*, April 29, 1928, N2.

program during the early 1920s, a blue-ribbon project was developed to celebrate healthy children. In order to receive a blue-ribbon award, a child had to be "mentally normal, free from physical defects, reasonably cooperative in the practice of healthy habits, and satisfactory in his behavior and attitude in the school environment." Each child awarded a blue-ribbon award was registered in the Blue-Ribbon Book and on Child Health Day, paraded through the streets of Mansfield "wearing blue-ribbon badges on which appeared the legend, "First Premium for Health."[82] Defect-free, robust, and similar, these bodies conveyed normalcy and health and served as visual representations of somatic standards.

Nationwide annual campaigns to conduct health examinations of children received ongoing support and endorsement throughout the 1920s by funds made available by the Sheppard-Towner Maternity and Infancy Protection Act (1921). The Sheppard-Towner Maternity Act subsidized a large number of public health programs and the creation of numerous infant welfare clinics, which provided year-round services to poor and middle-class families located in rural and urban areas.[83] Numerous and popular, infant welfare clinics developed services known as the well-baby conference: a series of tests to examine the development of a healthy child, which further solidified the scientific management of child growth and thereby endorsed the regular weighing and measuring of children and the reliance on growth charts to interpret weight and height.[84] Staffed by pediatricians and nurses, infant welfare clinics provided an opportunity for parents to

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[82] Glenn D. Rohleder, "Accomplishments of the Child-Health Demonstration of Mansfield and Richland County, Ohio," *Educational Research Bulletin* 6, no. 16 (November 9, 1927), 344.

[83] Gladys Huntington Bevans, "Science is Giving Mothers and Babies More of a Chance," *Chicago Daily Tribune*, June 2, 1928, 17.

[84] Halpern, 108.

have their children's health routinely monitored by medical experts trained in accurately weighing, measuring, and charting growth, a procedure introduced en masse in 1918.[85] Medical staff of infant welfare clinics recommended patients make repeated visits and recorded the growth and development of a child over a series of years, which established a required regimen in measuring height.[86] These clinics transformed the annual measuring of children into part of a routine examination intended to keep a watchful eye on the health of the well child and converted the weighing and measuring of height of a child and the use of growth charts to analyze the measurements into essential components of the medical management of child growth and development.

School officials also took on the task of weighing and measuring children and contributed to the medical surveillance of their students through screening tests but were instructed to refrain from assessing the data. In 1922, a report of the Joint Committee on Health Problems in Education of the National Education Association and the American Medical Association entitled *Health Service in City Schools of the United States* presented data from questionnaires filled out by 341 school superintendents throughout the country.[87] When asked about the frequency of "health or physical examination to discover defects that may be present," 323 superintendents responded. Asked about the frequency of examinations, 61 percent of them answered one per year, 17.3 percent twice

[85] U.S. Children's Bureau, *The Seven Years of the Maternity and Infancy Act* (Washington D.C.: Labor Bureau,1931), 1, Maternal and Child Health Library, Georgetown University, Washington D.C.

[86] Halpern, 88.

[87] This collaborative committee had been around since the 1910s to address health education and conditions in schools.

a year and only four percent said they had no health or physical examination.[88] Asked who conducted examinations, 82.6% of cities reported that it was a school physician, nurse, or both. And when reporting on which items were included in the health examinations, eyes ranked first at 89.3 percent, followed by ears (82.9 percent), and then teeth (74.3 percent). Height ranked 14th, and was tied with the nervous system at 34.5 percent.[89] These examinations were not intended to diagnose a student; rather, their goal was to refer students whose health seemed compromised to physicians. School medical officers often recorded examination findings on health cards. A mid-1930s text for school nurses featured copies of these cards, which included an area to record a student's physical growth. The text commented on "trends in weighing and measuring," claimed that "probably no health activity has been indulged in so frequently as weighing and measuring of school children" and reminded the school nurse in training that only a professional physician was equipped at using growth charts to interpret measurements.[90]

Parents also participated in the surveillance of children's health by using baby books and recording methods to track young ones' growth and development although there was no one standard in this practice. In *Mother Stork's Baby Book* from the mid 1900s, an entire page was dedicated to solely to the recording of height from birth to two years. Other books, such as *The Biography of Our Baby*, allowed parents to record

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[88] Joint Committee on Health Problems in Education and Thomas Denison Wood, *Health Service in the City Schools of the United States. Report of the Joint Committee on Health Problems in Education of the National Education Association and the American Medical Association* (n.p., 1922), Google Books, 13.

[89] Ibid., 15.

[90] Mary Ella Chayer, *School Nursing: A Contribution to Health Education* (New York Putnam, 1937), 97.

changes in height up until eight years of age. *Our Baby's Journal* was another baby book that placed the logging of weight and height together. While baby book instructions for the recording of measurements varied, most of them had a place to record height/length by the 1910s but did not include charts or tables for parents to analyze their child's statistics. This omission reaffirms the role of the parent as a recorder of measurements but not the interpreter, which remained the pediatrician's responsibility.[91]

While schools nurses and physicians and parents continued to play a role in the measuring of children, well clinic pediatricians and nurses' roles in the maintenance of children's health were short-lived. The American Medical Association (AMA) contributed to the failure of the renewal of the Sheppard-Towner Act by criticizing the law and the programs it funded. AMA's opposition to the Act caused a split between members of the American Pediatrics Society and inspired the creation of a rival pediatric professional association, the American Academy of Pediatrics in 1930, which maintained a public health sensibility until it buckled under the pressure of professionalization and played a role in the closure of more than four thousand well clinics. By the mid 1930s, free clinics for children were replaced by privately run doctors' offices. Though the end of the well clinics symbolized the growing divide between public health measures and private practice and the increasingly limited access poor Americans would have to preventive care during the remainder of the twentieth century, the measuring and weighing of children continued to play a pivotal role in the surveillance of children's health. Schools took on the responsibility of keeping health records, which kept track of a

[91] Albertine Randall Wheelan, *Mother Stork's Baby Book* (New York: Dodge Publishing Company, c.1904); *Biography of Our Baby: From Birth to Seven Years* (C. Junceau, c. 1941); *Our Baby's Journal* (Kansas City: Emery, Bird, Thayer Co, not after 1914), UCLA's Baby Books Collection.

student's physical growth at an institutional level, while parents often recorded their children's height using baby books and growth charts posted on walls.

Conclusion

Even with the demise of well-clinics, Child Health Day continued to be an annual event celebrated by Americans. In April 1937, Franklin D. Roosevelt anticipated the upcoming Child Health Day and called upon "the people of the United States … to consider and appraise child-health conditions and the community organization for child health and to plan for health protection for every child during the coming year." A public health campaign created by the U.S. Children's Bureau during the 1920s, Child Health Day served as a event to promote healthy habits, mobilize communities to launch "new child-health projects," and "celebrate gains made."[92] As the nation struggled to climb out of the Depression and questioned the progress made by New Deal legislation, FDR in his proclamation remarked on the strides made in child health services and stressed the importance of "safeguarding the health of children" in "protecting the vitality of the nation."[93]

"Health protection for every child" served as the slogan for the 1937 Child Health Day. The U.S. Children's Bureau hoped the day would serve, as it had for over a decade, as a "climax to the year's health program in the form of festivals, athletic contests, and special programs and exhibits featuring the growth and vigor of children and their safety from health hazards" and encouraged state health officials, educators, and

[92] U.S. Children's Bureau, "President's Proclamation," *The Child* 1, no. 11 (1937): 13.

[93] Ibid.

community groups to get involved.[94] The theme of health protection for every child set the tone for all promotional activities and materials as reflected in the official poster of the 1937 Child Health

[95]

This carefully constructed image communicated to its viewers the bureau's belief that a mother and a father along with a physician and a nurse were responsible for protecting a child's health and its perception of what healthy children looked like: clean, smiling, white children, exceptional in their sameness. A toddler serves as the central figure; his happiness is conveyed by his smile, his able-bodiedness by the steps he is taking, and his health by his robust stature while fertile rolling hills provide a backdrop and visually connect the health and stature of the toddler to the health of the country.[96]

Child health and better baby campaigns such as this one have been discussed by a series of historians, often within a eugenic context. Scholars such as Daniel Kevles have discussed these types of promoting health measures as an example of positive eugenics: approaches such as marriage counseling, genetic counseling, and fitter family competitions used by eugenicists to encourage the reproduction of what they deemed to

[94] Ibid.

[95] Ibid., 12

[96] Ibid., 12.

be desirable human stock.[97] Other historians such as Martin Pernick and Alexandra Minna Stern have cautioned against labeling these campaigns as "positive" and argue that it is important to understand these efforts as attempts to manipulate reproduction in the same vein as "negative eugenic" approaches (e.g., sterilization).[98] While the eugenic undertones of these early twentieth century child health campaigns have been well documented, to discuss these efforts only within this context is limiting. The cultural currency of these public health programs speaks to a long-standing connection between the health of a nation and its citizenry, a modern link rooted in Enlightenment philosophy and the rise of capitalism.

The poster campaign for the 1937 Child Health Day also depicts a new development in the attempt to sustain the health of America's youth, the emergence of a medical surveillance system. Everyone in the image is overseeing the health and development of the toddler. His older brother is getting him to walk by luring him with a baseball as his sister supports him as he takes his first steps. Mother and father parent from a distance, with mother looking down at the children and father staring straight ahead. Dressed in uniform, the pediatrician and nurse stand opposite to the mother and father and are ready to swoop in if needed. Equal in stature to the parents, the practitioners' dress reminds the viewer they and not the mother and father are the medical experts; however, although doctor and nurse might be well-versed in growth charts and

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[97] Daniel Kevles, *In the Name of Eugenics: Genetics and the Uses of Human Heredity* (New York: Knopf, 1985).

[98] Martin S. Pernick, *The Black Stork: Eugenics and the Death of "Defective" Babies in American Medicine and Motion Pictures Since 1915* (New York: Oxford University Press, 1996) and Alexandra Minna Stern and Howard Merkel, "Introduction," in *Formative Years: Children's Health in the United States, 1880-2000* (Ann Arbor: University of Michigan Press, 2002), 1-15.

conducting health examinations, they knew close to nothing when it came to treating short stature.

Chapter Two – "Utilize what we have and do the best we can."

The Discovery and Early Uses of Growth Hormone Therapy

At the sixty-fourth session of the California Medical Association's annual meeting in 1936, Dr. E. Kost Shelton shared his recent clinical findings regarding pituitary growth factor. Shelton's research signaled promise that someday physicians would be able to stimulate human growth and development with the use of a hormone extract, though the extracts used in his experiments were impure and the laboratory results of therapeutic effectiveness were inconsistent.[1] Dr. Hans Lisser, a pioneer of clinical endocrinology, seconded Shelton's positive sentiments in a post-paper discussion. Although Lisser was discouraged by the poor performance of anterior pituitary extracts in his clinical research, he remained dedicated to developing a growth-stimulating hormonal treatment and encouraged his peers "to utilize what we have, and do the best we can."[2]

During medicine's scientific transformation in the first several decades of the twentieth century, physicians looked to laboratories for effective therapeutics and gazed inside the body for causes of pathologies. While scientists and surgeons searched to unlock the internal physiological mystery of human growth, growth hormone extracts, though unreliable, impure, and inconsistently effective, served as medicine's answer to short stature. Pharmaceutical companies made these extracts accessible to physicians and funded research to perfect them.

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[1] E. Kost Shelton, "Pituitary Growth Factor: Some Clinical Considerations" *California and Western Medicine* 45, no. 1 (July 1936): 23.

[2] Ibid., 25. Commentary provided by Hans Lisser.

Although these growth hormone products did not work, this early phase of growth hormone therapy in America should not be overlooked. To begin a historical narrative of growth hormone therapy with the first reported cases of successful treatment in the late 1950s would reproduce a false story of progress and fail to reveal deeper systemic themes, which underlay scientific medicine regardless of its therapeutic rewards. By exploring early twentieth century growth hormone therapy, the scientific study of the pathology it aimed to treat (short stature), and the public's gendered fascination with extremely short adults, this chapter maps out the origins of the intense relationship between academic scientists, physicians, and pharmaceutical companies in hormone therapy. This chapter also examines the porous boundary between commercial and laboratory science, the cultural exchange between cultural demands for corporeal similarity, the marginalization of those deemed different, and therapeutics. Lisser's advice to "utilize what we have and do the best we can" might not have sounded reassuring to his contemporaries, but does reveal the modern starting point of medicine's efforts to treat, as Shelton suggested, "the myriad [of] sufferers from understature who crave a semblance of normal."[3]

Unlocking Human Growth Hormone

While treatises about the possibility of a message system that linked the brain and body function date back to Hippocrates, interest in the secretions from the body's ductless glands, including the testes, ovaries, adrenals, thymus, parathyroids, thyroid, and pituitary, intensified during the last half of the nineteenth century. This period marked an increase in physical examinations and diagnoses, the establishment of universal standards

[3] E. Kost Shelton, "Pituitary Growth Factor: Some Clinical Considerations" *California and Western Medicine* 45, no. 1 (July 1936): 23.

pertaining to normal body functions (for example, heart rate and blood pressure), and laboratory research of organic mechanisms.[4] Researchers used scientific methods to better understand the endocrine system – the system of glands that secrete hormones to regulate the body. Advancements in scientific technology allowed scientists to develop a better sense of internal biological functions and reports were published on powerful regulatory substances found throughout the body. In 1855, French physiologist Claude Bernard put forth the concept of an internal secretion with his description of how the liver secretes glycogen.[5] The term hormone was coined in 1905 when British physiologists Ernest Starling and William Bayliss discovered a substance secreted by the intestine, which stimulated the production of digestive juices in the pancreas, naming it secretin and any type of chemical messenger a hormone.[6] A medical field dedicated to these chemical messengers, endocrinology, was developed during the late 19th century and early 20th century. The establishment of the group named "The Association for the Study of Internal Secretions" and the publication of the journal entitled *Endocrinology* in 1917 marked the formal beginning of this specialized medical pursuit in the United States.[7]

The endocrine system drew attention from various scientific and medical suitors, with its powerful physiological elixirs and regulatory role in multiple bodily functions. Scientific journals hailed the discovery of hormones from a long list of researchers and the value of these discoveries was often determined by their therapeutic potential. During

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[4] Michael Bliss, *Harvey Cushing: A Life in Surgery* (Oxford, 2005), 207.

[5] Elizabeth Watkins, *The Estrogen Elixir: A History of Hormone Replacement Therapy in America* (Baltimore: Johns Hopkins University Press), 12.

[6] Ibid., 13.

[7] Hans Lisser, "The Endocrine Society The First Forty Years (1917-1957)," *Endocrinology* 80 (January, 1967): 3.

the 1890s, clinical endocrinology often took the form of organotherapy, the consumption of organ extract products in the hopes of benefiting from active substances. Organotherapy emerged as a popular medical practice after world-renowned French physiologist and neurologist Charles-Édouard Brown-Séquard reported to the Société de Biologie of Paris how he successfully treated himself from the fatigue, physical weakness, dullness in intellect, poor urination, and constipation brought on by his old age by injecting himself with "a liquid obtained from the testicles of animals."[8] He postulated that the diminished action of the spermatic glands in older men caused a host of problems, which he experienced, and the substitution of crushed testes replenished the body and helped men experience the benefits of youth. Quickly thereafter, wide varieties of organ extracts were being used to treat diseases with varying results.[9]

Although most organ extracts did not deliver a cure, thyroid gland substances did prove effective. In 1891, G.R. Murray reported the successful treatment of a forty-six-year-old woman who suffered from myxedema (hypothyroidism) with the use of injections of thyroid juice. A year later, several reports were published about the successful use of thyroid tablets in helping "cretinous children".[10] However, other extracts were unable to produce similar results and organotherapy fell out of favor with

[8] Charles-Edouard Brown-Séquard, "The Effects Produced on Man by Subcutaneous Injections of a Liquid Obtained from the Testicles of Animal," *Lancet* (July 20, 1889): 105.

[9] Merriley Borrell, 'Brown-Séquard's Organotherapy and Its Appearance in American at the End of the Nineteenth Century," *Bulletin of the History of Medicine*, 50, no. 3 (Fall 1976): 309.

[10] Hans Lisser, "The Endocrine Society The First Forty Years (1917-1957)," *Endocrinology* 80 (January, 1967): 6.

physicians during the first decades of the twentieth century.[11] Despite the otherwise poor record of organotherapy, pharmaceutical companies continued to pump out organotherapeutic medicines, which promised remedies for a myriad of problems from short stature to old age. A business plan outlining glandular marketing was articulated in a 1917 internal memo from the pharmaceutical company Parke Davis:

> …it will be profitable that we prepare and market various glandular preparations that at the present time are but little used. Some of these we will not be able to aggressively promote, but for all of these products there are enthusiasts who are using them and reporting excellent results. We have certain "prize" products of glandular nature such as pituitrin, corpora lutea, thyroid extracts, that we deliberately know are good and we push them without any misgivings. Naturally we hesitate to add other products we cannot equally promote, but none the less I raise the question as to policy of quietly adding several new preparations, quietly letting it be known that we have them available but making no effort to force their adoption and use by the physician. Sooner or later one of these obscure glandular extracts will swing into prominence and usefulness much as did pituitrin upon its advent to oxytocic activity.[12]

Even though the list of new promotions, which included "[p]ituitary, whole gland desiccated,"[13] demonstrated the dying field of organotherapy, pharmaceutical companies and endocrinologists clung to the concept behind this type of therapy, "namely the making up for a deficiency by supplying the needed amount of hormone which the

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[11] Elizabeth Watkins, *The Estrogen Elixir: A History of Hormone Replacement Therapy in America* (Baltimore: Johns Hopkins University Press), 14.

[12] C.J. Marinus to Dr. King, memo 6 February 1917, Series 1: Joint Research Notebooks, Box #8, Lab Book #33, 756-757, Parke, Davis Research Laboratory Records, Archives Center, National Museum of American History, Washington, D.C. (hereafter cited as Parke, Davis Laboratory Records).

[13] Ibid.

patient requires, but which his own gland fails to elaborate in adequate quantities," and remained hopeful that future hormones would be as effective as thyroid. [14]

Endocrinologists had a love-hate relationship with commercial medicine. While the discovery of a hormone might have brought a scientist fame, it didn't pay the bills. Pharmaceutical companies made money from scientific discoveries while scientists exploited these companies' commercial quest for profit by having corporations supply them with funding, equipment, and even dinner. In addition, the wide distribution of a hormone added to its value. One only has to look as far as the story of the discovery of insulin to see how the symbiotic relationship between pharmaceutical companies and academic laboratories unfolded and played a role in the emerging field of endocrinology.

The quest to isolate this hormone was international, as diabetes amounted to a gruesome death sentence. By the 1910s, European medical researchers discovered that internal secretions produced by the pancreas played a regulatory role in digestion and that there was a relationship between an internal secretion and diabetes. Nicolas Constantin Paulesco, a Romanian experimental physiologist, was first in isolating and naming the "antidiabetic internal secretion," but his efforts were overshadowed by the landmark work of Frederick Banting and Charles Best of the University of Toronto. They not only isolated insulin but also began testing their extract on humans. It was their ability to both isolate and effectively use insulin therapeutically, which enabled them to surpass Paulesco's findings. Even with this accomplishment, Banting and Best needed to be able to make insulin in large batches and ensure its purity in order to give their scientific breakthrough meaning to clinicians, but they struggled with the latter. The American

[14] Hans Lisser, "The Endocrine Society The First Forty Years (1917-1957)," *Endocrinology* 80 (January, 1967): 80.

pharmaceutical company Eli Lilly and Company aided the University of Toronto in creating purer insulin in large quantities and in return, the University of Toronto and Eli Lilly divided up the North American insulin market. Insulin's media frenzy was unprecedented as articles depicted the way it was able to resurrect comatose diabetics dying from diabetic keto-acidosis and served as a perfect advertising campaign for insulin and the field of endocrinology. Endocrinology's popularity was on the rise and so were Eli Lilly's profits.[15]

While experimental endocrinologists often collaborated with pharmaceutical companies in various ways, they sought to disassociate themselves from them in order to maintain legitimacy with their peers. In an article about the first forty years of the Association for the Study of Internal Secretions (later renamed The Endocrine Society) for the journal *Endocrinology*, Hans Lisser commented on the ridicule endocrinologists received because of their close relationship with corporate ventures. Lisser stated that "[e]ven in 1933, 11 years after the beneficent discovery of insulin, a world-famous investigator …received a round of laughter … when he began his talk at the Congress of American Physicians and Surgeons meeting in Washington D.C." with "to be an endocrinologist among the practicing profession today means too often to be primarily concerned with making fat ladies thin."[16] Other medical experts did not take endocrinology seriously because profit-driven companies often used its scientific findings as the modern promise found in their tonics and elixirs.

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[15] Alison Li, *J.B. Collip and the Development of Medical Research in Canada: Extracts and Enterprise*, (McGill-Queen's University Press, 2003).

[16]Hans Lisser, "The Endocrine Society The First Forty Years (1917-1957)," *Endocrinology* 80 (January, 1967): 6.

Criticism came from within the field as well. In 1921, Harvey Cushing, a pioneer in American endocrinology, cautioned endocrinologists to "look out for the character of its clinical advance agents," and called some endocrinologists "endocriminalogists" because he felt they were rushing the scientific process in order to get products to market. Cushing argued that pharmaceutical companies, eager physicians, and rush-to-judgment researchers had actually slowed progress in the field because they were able to get the medical press to intermix their "advertising leaflets" with abstracts from medical experts. It soon began difficult to decipher the difference between descriptions crafted by pharmaceutical companies and reports on medical research with what Cushing called "actual value." According to Cushing, this type of advertising encouraged "the administration of pluriglandular compounds" for a "multitude of symptoms, real and fictitious."[17] He was particularly critical of how corporate-funded research on the pituitary gland caused the pathologization of normal variance in humans. Cushing observed that "suddenly before our eyes there was found to exist a large group of individuals whose physical peculiarities, previously regarded as within normal physiologic limits, were due to a disordered function of this obscure gland."[18]

While some researchers remained cautious about the promise of endocrinology and outsiders continued to question its legitimacy, scientists' desire to discover hormones and pharmaceutical companies' profit motives were too harmonious to be denied during the 1920s and 1930s. Contemporary commentators and historians have referred to this time period as the "gold rush era" for hormones. If this was indeed the case, the pituitary

[17] Harvey Cushing, "Disorders of the Pituitary Gland: Retrospective and Prophetic," *The Journal of the American Medical Association* 76, no. 25 (July 18, 1921): 1726.

[18] Ibid.

gland could be considered one of the mother lodes of the "endocrine gold fields" consisting of at least eight hormones.[19] Known as the master endocrine gland, the pituitary gland plays a pivotal role in the hormonal regulation of many physiological processes throughout the body. Located at the base of the brain and weighing 0.02 ounces, it is composed of two lobes, the anterior and the posterior. The posterior pituitary is an extension of the hypothalamus and stores and secretes the hormones oxytocin and vasopressin, which it receives from the hypothalamus. The anterior pituitary stores and secretes many hormones, which regulate several physiological processes, including growth and reproduction, and is regulated by neurosecretory cells in the hypothalamus.[20] The pituitary gland's plethora of hormones and its location in the brain obscured early efforts to fully understand its specific contents and physiological roles.[21]

The relationship between the pituitary gland and growth was first established during the mid to late nineteenth century. Throughout the century, scientists were intrigued by specific medical cases of adults and children who demonstrated excessive growth. In 1885, French neurologist Pierre Marie proposed the term "acro-megalie" for this physiological phenomenon after observing multiple cases of patients who experienced a host of uncontrollable symptoms due to excessive rapid growth including "a peculiar, noncongenital hypertrophy of the upper, lower and cephalic extremities." An increase in autopsies conducted on people stricken with acromegaly during the late 19th

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[19] Hans Lisser, "The Endocrine Society The First Forty Years (1917-1957)," *Endocrinology* 80 (January, 1967): 10.

[20] Neil A. Campbell and Jane B. Reece, *Biology* 7th ed. (San Francisco: Pearson, 2006), 950-52.

[21] E. Kost Shelton, "Pituitary Growth Factor: Some Clinical Considerations" *California and Western Medicine* 45, no. 1 (July 1936): 20.

century proved pituitary tumors as the culprits of their uncontrollable growth and established biological plausibility that pituitary gland tumors resulted in excessive growth.[22] Subsequent research in European laboratories at the turn of the century linked other growth disorders, including gigantism and infantilism, to a malfunctioning pituitary gland.[23]

On the other side of the Atlantic, Harvey Cushing played a pivotal role in early research involving the pituitary. Already a well-established brain surgeon with a private practice in Baltimore and an associate professor of surgery at Johns Hopkins Hospital, Cushing got involved in physiological and clinical research concerning the pituitary gland in 1909, after he conducted his first operation on a man with acromegaly. He presented his work at the American Medical Association's annual meeting later that year and was quickly recognized as one of the leading authorities of the pituitary in the U.S.[24] Patients suffering from possible pituitary disorders flocked to Baltimore for treatment and provided an opportunity for Cushing to further his clinical research. Through his clinical work and laboratory research, Cushing contributed to existing medical scholarship by suggesting that overproduction not underproduction of an as-yet unidentified hormone was the cause of some growth disorders.[25]

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[22] J. M. Pearce, "Pituitary Tumors and Acromegaly (Pierre Marie's Disease)," *J Neurology and Neurosurgery, and Psychiatry* 73, no. 4 (2002): 394.

[23] Harvey Cushing, *The Pituitary Body and its Disorders: Clinical States Produced by Disorders of the Hypophysis Cerebi* (Philadelphia: Lippincott, 1912), 46.

[24] Michael Bliss, *Harvey Cushing: A Life in Surgery* (Oxford, 2005), 205.

[25] E. Kost Shelton, "Pituitary Growth Factor: Some Clinical Considerations" *California and Western Medicine* 45, no. 1 (July 1936): 30.

Cushing's laboratory research, clinical cases, and synthesis of sixty years of scientific research became the basis for his influential 1912 work, *The Pituitary Body and its Disorders: Clinical States Produced by Disorders of the Hypophysis Cerebi.* The book was divided into three parts – part one, "Anatomy, Physiology, Pathology, and Chemistry;" part two "Clinical Manifestations of Disordered Function;" and part three "Incidence, Symptomatology, and Treatment" – and filled with copious illustrations, making it a favorite amongst physicians and scientists.[26] *The Pituitary Body* provided readers with a synopsis of the most current research on the pituitary taking place in Europe and the United States and an exposition of Cushing's theories as to what physiological process this master gland controlled. While some of his hunches were disproved quickly after the book's publication, other claims had a long-lasting effect on pituitary research, including his idea that oversecretion caused gigantism in infancy and acromegaly after puberty, while undersecretion during one's early years "would prevent the onset of puberty" and "asexual regression" after puberty,[27] and his suggestion of the existence of "the hormone of growth."[28]

Although he did not discover a specific growth hormone [GH], Cushing came to believe that one such hormone could be a possible agent for growth abnormalities. When discussing the possible cause of gigantism/acromegaly, Cushing proposed that "*The disease*, *in short, is the expression of a functional instability of the pars anterior, doubtless brought about by some underlying biochemical disturbance which leads to the*

[26] Michael Bliss, *Harvey Cushing: A Life in Surgery* (Oxford, 2005), 218.

[27] Ibid., 209.

[28] Ibid., 212.

elaboration of a perverted or exaggerated secretion containing a hormone that accelerates skeletal growth."[29] Keeping in line with his models of hyperpituitarism (oversecretion) and hypopituitarism (undersecretion) in conceptualizing growth disorders, Cushing believed that "in conditions of primary hypopituitarism in young individuals, the hormone of growth presumably being wanting, there is failure on the part of the bones to elongate even though the epiphyses remain open."[30] Cushing's speculation sent researchers on a hunt that would span most of the first half of the twentieth century.

Herbert M. Evans was one of those hormone hunters aspiring to discover GH. Evans came across Cushing's work while attending medical school at Johns Hopkins and eventually became one of the prominent figures in experimental endocrinology. Evans took a more interdisciplinary approach in researching hormones than Cushing. His mentor at school was an anatomist, Franklin P. Mall, and when Mall presented him with any opportunity to further his medical research he took it. Evans spent summers researching in Germany with surgeons, chemists, and other anatomists, taught students, and accepted a job in Mall's laboratory after graduating. Evans was researching the ovarian cycle of rates when Benjamin Ide Wheeler offered him the chair of anatomy at the University of California, Berkeley in 1915. He took the position, and during his tenure at Berkeley, Evans created one of the most dynamic laboratories working on hormones and vitamins during the first half of the twentieth century.[31]

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[29] Harvey Cushing, *The Pituitary Body and its Disorders: Clinical States Produced by Disorders of the Hypophysis Cerebi* (Philadelphia: Lippincott, 1912), 252. Italics in the original.

[30] Ibid.

[31] George W. Corner, "Herbert Mclean Evans, 1882-1971," edited by National Academy of Sciences (Washington D.C.: National Academy of Sciences, 1974), 10.

Evans began his time at Berkeley by resuming his research on the ovarian cycle of rats and collaborated with Zoology professor Joseph Long. This collaboration resulted in a book, *The Oestrous Cycle in the Rat and Its Associated Phenomena* (1922), which contributed to existing scholarship and future research by stating that the "ovarian-uterine cycle is a general phenomenon." Their research also developed a new strain of albino rats for research experiments. [32] In 1920, Evans and Long had begun conducting experiments to show that there was a growth factor located in the anterior pituitary by injecting rats with pituitary extracts. They observed that rats administered with a posterior lobe substance did not grow, but that the rats given an anterior lobe material did. They concluded there must be a growth factor of the pituitary located in the anterior lobe, as the overgrown rats provided proof of the existence of a growth hormone. These rats catapulted Evans' career in experimental endocrinology, although it would take him and his lab over twenty years to isolate GH as indisputable proof of its existence.[33]

Evans conducted experiments throughout the 1920s and 1930s to demonstrate the type of physiological processes that growth hormone controlled, in the hopes that the actions it promoted might prove its existence. One long-term experiment focused on dachshunds. He selected this breed, known for its disproportionate body, because he wanted to see if GH could change proportion and not just growth. He removed the pituitary gland of two dogs and injected one with an extract made from canine pituitary glands. The dog that received no injections stopped growing while the other grew exponentially, although it stayed proportionately the same. The treated dog not only got

[32] Ibid., 14.

[33] Hans Lisser, "The Endocrine Society The First Forty Years (1917-1957)," *Endocrinology* 80 (January, 1967): 7.

bigger, but his skin grew as well, so that "the dermal folds … created … ringlets" and his hanging cheeks made him look like a bloodhound.[34] While Evans' published findings in 1932 demonstrated that the anterior pituitary regulated somatic growth, his research still lacked the evidence of a single isolated growth hormone.[35]

Without the isolation of growth hormone, many medical experts remained unconvinced. In 1942, physician Walter Marx, an associate of Evans, sent letters to him about meetings he had with chemists working for east coast companies who did not believe in the existence of GH and reported that a single growth hormone was questioned at the medical and scientific conferences he attended. Evans would later admit that his hunch about a single growth hormone was very tenuous until GH was finally isolated in the 1940s. He gave credit to the most vocal critic of his claim, well-known American endocrinologist Oscar Riddle, who had insisted that there was no single growth hormone and suggested instead that prolactin, the hormone he had discovered, might be responsible for the regulation of growth. The exchange between the two became so heated that at one conference they were forced by their colleagues to shake hands. Evans explained in a 1961 interview that they had "a long fight with growth hormone since we had to clean it up. This took us 30 years to do that.…What a hell of a claim I had not sustained. Riddle had a right to say that I was talking nonsense, didn't he?"[36] Riddle was

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[34] Transcripts from a 1961 interview with Herbert Mclean Evans, Herbert McLean Evans Biographical Papers, Memorabilia 1946-1970, MSS 92-18, Archives & Special Collections, UCSF Library & CKM (hereafter cited as Herbert McLean Evans Biographical Papers).

[35] William S. Barton, "Our Expanding Universe: A Department Interpreting the News in Science," *Los Angeles Times*, August 22, 1937, I15.

[36] Transcripts from a 1961 interview with Herbert Mclean Evans, Herbert McLean Evans Biographical Papers.

not far off in his calculation; scientists today believe that prolactin and growth hormone are derived from the same ancestral hormone.

Antuitrin-G: A Case Study in Commercial Growth Hormone

Instead of hunting for a single growth hormone, pharmaceutical companies tried to harness the growth-promoting potential of the anterior pituitary gland, in the hopes that successful results would speak to the existence of GH and the potency of their medicines. Even though clinical experiments of their preparations failed to provide definitive proof of GH, when medical experts reported on positive findings, hopes ran high. There was only one problem: the growth hormone preparations being tested were not causing the increase in growth in these studies; growth hormone is species-specific, making the commercial animal-based growth hormones ineffective in humans, a fact which became clear only in the 1950s. The case study of the development of Parke Davis' growth hormone preparation Antuitrin-G brings to light how pharmaceutical companies, physicians, and experimental endocrinologists dealt with this medical quandary without any knowledge of the true cause of GH's therapeutic ineffectiveness.

Parke Davis began offering growth promoting hormone-based therapy in the 1910s with an anterior lobe preparation. Although it was organotherapeutic, Parke Davis' scientists tested its potency using up-to-date research. In 1916, T. Brailsford Robertson, a professor of biochemistry and pharmacy at the University of California, reported that he had isolated a substance from the anterior lobe that had promoted certain growth changes in young rats and could possibly facilitate a rapid repair of wounds.[37] Robertson named this substance Tethelin. In 1918, Parke Davis tested its commercial

[37]Sol Hyman ed., "Tethelin Presented to the University of California by Doctor Robertson." *California State Journal of Medicine* 15, no. 6 (June 1917): 181.

anterior lobe preparation for Tethelin and found mixed results.[38] While scientists concluded that Tethelin was present in the commercial substance, only trace amounts were found.[39] Even though Tethelin's existence and curative properties were disproved in 1922, Parke Davis' attempt to examine its product for an extract demonstrates the transition this pharmaceutical company made from offering medicine based on organotherapy, the treatment of disease by administering whole glands, to hormone replacement.[40]

Parke Davis began offering hormone replacement to stimulate growth when it introduced an anterior pituitary hormone preparation, Antuitrin, in 1919. There were two different versions of the drug, Antuitrin A and B, and both were to be given to patients who were diagnosed with hypopituitarism. Before Antuitrin went commercial, Parke Davis distributed it to physicians to test it on their patients and continued to research its potency and effectiveness in its laboratory. Physicians who received this experimental drug wrote short reports of their experiences for Parke Davis.[41] While some reports seemed favorable, others were cautious in their assessment because of the short amount of time they had to test out Antuitrin on their patients. One physician stated that "anyone

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[38] C.J. Marinus to Dr. King, report "The Presence of Tethelin in Commercial Desiccated Anterior Lobe Substance," July 18, 1918, Series 2: Individual Laboratories Notebooks, Box #117, Lab Book of C.J. Marinus, 1919-1920, 19-21, Parke, Davis Research Laboratory Records.

[39] C.J. Marinus, final report, "Presence of Tethelin in Commercial Desiccated Anterior lobe Substance," October 8, 1918, Series 2: Individual Laboratories Notebooks, Box #117, Lab Book of C.J. Marinus, 1919-1920, 22-23, Parke, Davis Research Laboratory Records.

[40] Jack Cecil Drummond and Robert Keith Cannan, "Tethelin – the Alleged Growth-Controlling Substance of the Anterior Lobe of the Pituitary Gland," *Journal of Biochemistry* 16, no. 1 (1922): 53-9.

[41] "Historical Review," 1939, Box #34, Folder #36, Addenda 2006, 5, Parke, Davis Research Laboratory Records.

who reports on the physiological effects of Antuitrin 'A' and 'B' in such a short space of time is guessing."[42] In the end, Parke Davis decided that the clinical results were inconclusive and more laboratory research on this anterior pituitary product was needed.[43] Physicians would not have to wait until Parke Davis figured out if Antuitrin was effective, however; Antuitrin-A went on the market even though the trials were inconclusive.[44]

A pure growth hormone drug proved more difficult to manufacture than an anterior pituitary extract. Pharmaceutical companies were at a loss when it came to absolutely guaranteeing the purity of growth hormone products, as scientists were unable to isolate growth hormone until 1944.[45] Nevertheless, Parke Davis remained hopeful, and an article in a scientific journal reporting on Evans' success in promoting growth of hypophysectomized tadpoles with a growth-promoting product gave Parke Davis researchers reason to believe they could make a potent and pure commercial GH drug. In 1924, Dr. Aldrich, a Parke Davis scientist, tried but failed to imitate Evans' successful experiment.[46] The Parke Davis Research Laboratories decided they needed to work with

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[42] C.J. Marinus to Dr. Houghton, memo, October 15, 1919, Series 2: Individual Laboratories Notebooks, Box #117, Lab Book of C.J. Marinus, 1919-1920, 40, Parke, Davis Research Laboratory Records.

[43] Ibid, 41.

[44] C.J. Marinus to Dr. Houghton, memo "Activity of Anterior Lobe Extracts," July 19, 1920, Series 2: Individual Laboratories Notebooks, Box #117, Lab Book of C.J. Marinus, 1919-1920, 44, Parke, Davis Research Laboratory Records.

[45] Choh Li and H. M. Evans, "The Isolation of Pituitary Growth Hormone," *Science* 99, no. 2566 (March, 1944): 183-84.

[46] Dr. Bugbee to Dr. Houghton, memo, "Subject: Anterior Lobe of Pituitary," March 24, 1924, Series 1: Joint Research Notebooks, Box #16, Lab Book #71, January 1924-March 1924, 309, Parke, Davis Research Laboratory Records.

experts in the field and began collaborating with leaders in the field of endocrinology and pituitary research such as Harvey Cushing to develop a potent sterile growth extract in 1927.[47] The Research Laboratories also cooperated with Harvard Medical School in "developing a method of preparation" for large quantities of a growth hormone medicine. Parke Davis executives thought that teaming up with respected leaders in the field would ensure a pure, potent, and profitable product.[48]

In the fall of 1930, Parke Davis' employee Dr. Bugbee reported on the company's progress in hormone development at the American Chemical Society meeting. Parke Davis had made impressive strides with hormones from the anterior lobe of the pituitary gland and Bugbee provided details as to how experiments on animals had shown eleven distinct activities of the anterior pituitary, with one stimulating growth. Bugbee also informed the crowd that Parke Davis had managed to create a potent growth hormone product for human use. According to Bugbee, Parke Davis researchers had in "our hands ... the most potent preparations of the growth hormone."[49] This new anterior pituitary extract was named Antuitrin-G and it was the product of several collaborations between Parke Davis and academic researchers. Before Antuitrin-G went commercial, Parke Davis distributed it to physicians for ad-hoc clinical trials and continued conducting laboratory tests to determine its purity and potency. Initial results were good. In a 1932 internal memo from the department of experimental medicine, E.A. Sharp reported to Dr.

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[47] E.P. Bugbee to Dr. Houghton, letter, "Re: Dr. Harvey Cushing – Antuitrin," August 5, 1927, Series 2: Individual Laboratories Notebooks, Box #71, Lab Book of E.P. Bugbee, 1927, 546, Parke, Davis Laboratory Records.

[48] E. P. Bugbee, A. E. Simond and H. M. Grimes, "Anterior Pituitary Hormones," *Endocrinology* 15, no. 1 (1931): 41.

[49] Ibid.

Lesochier the excitement over Antuitrin-G by two physicians, Robert L Shaefer and William Engelbach. Sharp stated, "Dr. Robert L. Schaefer addressed the Noon Day Study Club of the Wayne County Medical Society … and was on the program of the Grace Hospital staff meeting … he stated that it (Antuitrin-G) is the only effective growth hormone available and contains about 15% of the standard of experimental preparations developed by Evans and Smith. He showed clinical records of patients who had been effectively stimulated by Antuitrin." Dr. William Engelbach, who was an associate of Schaefer and the first physician to inject a child with growth hormone, was reported as "very anxious to pursue his clinical observations with growth hormone."[50]

However, other physicians reported on their frustrations over not being able to duplicate successful results with Antuitrin-G. In a Parke Davis internal letter from July 23, 1932, Dr. Kamm reported to Dr. Bugbee about Antuitrin-G, stating that "no one (including Dr. Cushing) seems to be getting any results and we are almost forced to admit that there is little effect of our extract upon experimental animals."[51] Even Schaefer could not give the glowing report he and Engelbach had hoped for in the case of Antuitrin-G. Their clinical trials were inconclusive and Schaefer believed this had to do

[50] E.A. Sharp to Dr. Lescohier, memo, "Department of Experimental Medicine," April 18, 1932 Series 2: Individual Laboratories Notebooks, Box #72, Lab Book of E.P. Bugbee, 484, Parke, Davis Laboratory Records.

[51] Dr. Kamm to E.P. Bugbee, letter, "Re: Antuitrin-G," July 23, 1932, Series 2: Individual Laboratories Notebooks, Box #72, Lab Book of E.P. Bugbee, 873, Parke, Davis Laboratory Records. The list of those receiving Antuitrin-G is based on an internal memo, W.F. Kamm to Dr. Sharp, memo, "Research Department," October 1, 1932, Series 2: Individual Laboratories Notebooks, Box #72, Lab Book of E.P. Bugbee, 1150-51, Parke, Davis Laboratory Records, Archives Center, National Museum of American History. Names listed are "Dr. Cushing; Dr. H Lisser; Engelbach & Schaefer; Dr. Calder of Duke University; Dr. David Marine, Monte Fiore Hospital; Dr. Lerman, Massachusetts General Hospital; Dr. Bowie, University of Pennsylvania; Johns Hopkins Group; Dr. Chas T. Brown of San Antonio, Texas, Dr. A.C. Silverman of Syracuse, N.Y.; and perhaps Dr. H. H. turner of Oklahoma City in the future."

with the loss of potency in the growth hormone they administered to patients.[52] Frustrated over the results, Parke-Davis researchers started wondering if either a new hormone recently discovered by Dr. Riddle (which he reported to them in a letter) or changes to the processing of Antuitrin-G could improve their growth hormone product. Parke Davis also explained away the inconclusive results to the process of drug development in general.[53]

Though the data were inconclusive, the clinical experiments continued and Parke-Davis tried to better its product by tweaking it and its instructions for use. Most of all, Parke Davis encouraged physicians to give larger dosages of the drug to patients. Their advice did not work. Letters continued to come into the offices of Parke Davis reporting on physicians' dismal results. One letter from an Oklahoma doctor demonstrated the frustration clinicians felt with Antuitrin-G. He stated, "I wish you would advise me what clinical response some of the other men are getting from Antuitrin-G, as I am not at all satisfied with the results I have obtained."[54] By the end of 1933, Parke Davis scientists concluded that the "old extract was rather weak but that really potent extracts can be prepared."[55] That year, they went back to the laboratory to revamp Antuitrin-G.

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[52] William Engelbach and Robert L. Schaefer, "Endocrine Dwarfism," *Journal of American Medical Association* 103, no. 7 (August 18, 1934): 465.

[53] W.F. Kamm to E.P. Bugbee, letter, "Re: Antuitrin-G," July 23, 1932, Series 2: Individual Laboratories Notebooks, Box #72, Lab Book of E.P. Bugbee, 873, Parke, Davis Laboratory Records.

[54] W.F. Kamm to Dr. Sharp, letter, "Research Department," March 29, 1933, Series 2: Individual Laboratories Notebooks, Box #73, Lab Book of E.P. Bugbee and D.A. McGinty, 298, Parke, Davis Laboratory Records.

[55] Letter to Dr. Sharp from Dr. Kamm, Research Department, December 23, 1933, Lab Book of Dr. E.P Bugbee and Dr. D.A. McGinty, 937, Parke, Davis Research Laboratory Records.

Parke Davis had a new and improved version of Antuitrin-G in 1935 and was finally ready to commercialize its growth hormone product. Wanting to separate its product from the pack of other commercial anterior pituitary products, the company emphasized Antuitrin-G's purity and potency.[56] Parke Davis promised that its growth hormone was prepared "in a highly purified form, which when administered to adult rats in amounts of 0.5 milligram daily results in appreciable growth," and it was "entirely free of gonadotropic, thyteotropic, and adrenotropic factors."[57] The purity of the drug was important to those physicians wishing to treat dwarfism. If other hormones were present these additional hormones could ultimately stunt growth instead of promote it. However, the promise of its purity was impossible to make given that growth hormone had been discovered but not yet isolated.

Antuitrin-G was never potent and attempts to make it so failed. Unaware of the fact that only human and monkey growth hormone could spur growth in humans, Parke Davis scientists went to great lengths in making Antuitrin-G potent by adding more animal hormone. Preparations for injections sometimes included chunks of pituitary and there were reports that when the powder was added to a solution for injection, the solution appeared cloudy and "unsatisfactory" in appearance. The chemists responded by claiming that undissolved hormone remains ensured potency.[58] They were wrong. No

[56] Other pharmaceutical companies with anterior pituitary substances promoting growth on the market include Squibb, Wilson and Armour.

[57] Report, "Antuitrin G," February 1, 1935, Series 1: Joint Research Notebooks, 1910-1945, Box # 35, Lab Book #134, Laboratory Notes from Research Dept. Parke, Davis and Company, January - February 1935, 1460, Parke, Davis Research Laboratory Records.

[58] Memo to Mr. A. M. Holmes, December 22-23, 1936, Series 1: Joint Research Notebooks, 1910-1945, Box #39, Lab Book # 155, Laboratory Notes from Research Dept. Parke, Davis & Co, November-December, 630, Parke, Davis Research Laboratory Records.

matter how chunky or cloudy Antuitrin-G was it could not promote growth in humans since it was made out of non-human pituitaries.

Failing to consistently deliver growth, anterior pituitary preparations, including Antuitrin-G, brought "widespread skepticism" amongst physicians by 1937.[59] Dr. A. Wilmot Jacobsen and Dr. Arthur J. Cramer's 1937 study, based on their long-term therapeutic use of anterior pituitary extracts with children, received much attention. Their report highlighted ten cases, which reflected their success in using Antuitrin-G in combination with thyroid on various conditions, such as "dwarfism, infantilism, hypogonadism."[60] They concluded that in these cases, and especially in the case study representing a pituitary deficiency resulting only in short stature, that the most-effective treatment was a combination of Antuitrin-G and thyroid extract.[61]

While physicians were convincing themselves that Antuitrin-G worked by combining it with a thyroid extract, Parke Davis still wanted to create a growth hormone product, which could spur growth on its own. In 1938, it decided to collaborate with Dr. Bartz from the Institute of Experimental Biology, University of California, who worked under the direction of Dr. Herbert M. Evans. The collaboration brought forth a new version of Antuitrin-G in 1939.[62] While potency was still a top priority, purity was not.

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[59] A. Wilmot Jacobsen and Arthur J. Cramer, "Clinical Results of Anterior Pituitary Therapy in Children." *Journal of American Medical Association* 109, no. 2 (July 10, 1937): 101.

[60] Ibid.

[61] Ibid., 108.

[62] Letter to Mr. F. C. Taylor, January 5, 1939, Series 1: Joint Research Notebooks, 1910-1945, Box #44, Lab Book # 182, Laboratory Notes from Research Dept. Parke, Davis & Co, January – February 1939, 1385, Parke, Davis Research Laboratory Records.

In an internal letter, the new Antuitrin-G was described as a growth hormone product not "substantially free" of thyrotrophic and gonadotropic hormones and that its impurity did not have much therapeutic significance.[63] In fact, it was significant; the thyrotrophic and gonadotropic hormones were probably the only substances making Antuitrin-G clinically effective, although no one knew it at the time.

Pediatric Endocrinology and Growth Hormone Therapy in Children

Many physicians who conducted trials of commercial growth hormone preparations on young patients during the 1930s were part of a new breed of doctors engaged in the biochemical turn taken by investigative pediatrics during the inter-war period.[64] Investigative pediatrics during this time focused on specific issues such as dehydration and the hormonal regulation of children's growth, and contributed to the development of a series of pediatric subspecialties inspired by developments in scientific medicine and not public health. Pediatric endocrinology was one of those specialized fields. Taking root during the 1930s, pediatric endocrinology would become the field responsible for treating pathological short-statured children.

Dr. Lawson Wilkins is often credited as the father of pediatric endocrinology.[65] In 1935, Dr. Edwards Park, the head of pediatrics at Johns Hopkins, offered Wilkins the directorship of a pediatric endocrine clinic at the university-affiliated Harriet Lane Home. Even though Wilkins had been in private practice for the past twenty-five years and had

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[63] Letter to Mr. F. C. Taylor, January 23, 1939, Series 1: Joint Research Notebooks, 1910-1945, Box #44, Lab Book # 182, 1386, Laboratory Notes from Research Dept. Parke, Davis & Co, January – February 1939, Parke, Davis Research Laboratory Records.

[64] Delbert Fisher, "A Short History of Pediatric Endocrinology in North America," *Pediatric Research* 55, no. 4 (2004): 717.

[65] Ibid.

very little knowledge of endocrinology, he took the position. Throughout the 1930s, Wilkins' role was part-time, and he received no salary from Johns Hopkins. He continued his private practice, researched and taught pediatric endocrinology, recruited specialists to help with his research, and collaborated with Massachusetts General Hospital. Focusing on hormones and the role they play in growth and development and disorders that take place when endocrine glands malfunction, Wilkins researched thyroid deficiency, congenital adrenal hyperplasia (CAH), "precocious growth," "infantilism," pseudohermaphroditism, and goiters.[66] Wilkins did not clinically research diabetes, a disease he did not consider of the endocrine system. Diabetes also had its own subspecialty clinic at Harriet Lane Home ran by another doctor. The omission of diabetes in the field of pediatric endocrinology persisted for decades.

While Wilkins might be considered the father of pediatric endocrinology, he was not the sole practitioner in the field. There were other pediatric endocrinology clinics in the Unites States up and running by the late 1930s, including one at Michael Reese Hospital in Chicago, Illinois, and specialists who saw pediatric patients at the University of California Hospital's endocrine unit in San Francisco.[67] At these clinics, pioneers in the field tested hormone therapies to determine their clinical possibilities, as in the case of estrogen and pituitary extracts; observed the physiology of growth and development, such as ossification; and identified and observed syndromes and disorders due to hormone malfunction. They recorded data and developed diagnostic criteria, which

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[66] Ibid., 718.

[67] Research was being reported on from the Pediatric Endocrine Clinic at the Michel Reese Hospital in the late 1930s. See William Saphir Howell, and Ralph H. Kunstadter, "Human Serum "Response to Gonadotropic Hormone (Pregnancy Urine Extract)," *Endocrinology* 24 (1939): 182-86.

ended up providing the substance for the first pediatric endocrinology textbook, *The Diagnosis and Treatment of Endocrine Disorders in Childhood and Adolescence,* in 1950.[68]

Though pediatric endocrinology started to take root at university-controlled hospitals throughout the 1930s as historian Sydney Halpern has suggested, the field was largely unorganized. With only a handful of practitioners, no textbook, and no professional organization until the second half of the twentieth century, pediatric endocrinology was considered more a topic of basic and clinical research rather than a subspeciality in pediatrics.[69] A pediatrician could not even receive an American Board of Pediatrics' special pediatric certificate in endocrinology until 1976.[70] Even so, growth hormone therapy gained the attention of a variety of medical researchers and clinicians. During the 1930s various medical practitioners dabbled in growth hormone research and the administration of growth hormone therapy.[71]

With various medical experts conducting hormone therapy on children, a set of rules for growth hormone therapy was difficult to come by. In the 1920s, it was up to pediatricians to diagnose and treat hormonal disorders in children. In a 1924 address to the Portland Academy of Medicine, Dr. Hans Lisser, Chief of the Ductless Gland Clinic at the University of California Medical School in San Francisco, remarked that "the pediatrician is frequently confronted with preadolescent disturbances of glandular

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[68] Delbert Fisher, 719.

[69] Sydney A. Halpern, *American Pediatrics: The Social Dynamics of Professionalism, 1880 – 1980*, (Berkeley: University of California, 1988), 120.

[70] Ibid., 111.

[71] Ibid., 117.

function ..."[72] When it came to treating "skeletal undergrowth due to a lack of anterior lobe hormone," Lisser was cautious in recommending commercial anterior lobe substances. He deemed non-commercial anterior lobe substances effective in the "hands of trustworthy clinicians" but not on a consistent basis. Lisser found the commercial substances to be even less reliable.[73] If a clinician decided to give anterior lobe therapy a try, Lisser was adamant that therapy must last longer than just a few weeks or months.[74]

The anterior lobe preparations Lisser was referring to were given orally in tablets and by the late 1920s most medical experts believed they were therapeutically ineffective because GH lost its potency if not given by injection. The method of delivery of GH was addressed in 1930 when Dr. William Engelbach became the first physician to inject anterior pituitary extracts into undersized children to stimulate their growth. In June 1931, at the Fifteenth Annual Meeting of the Association for the Study of Internal Secretions, he described the treatment of the first human to receive treatment consisting of Evans' growth hormone. She was nine and a half years old, and Engelbach diagnosed her with hypopituitarism by comparing her measurements with standard measurements he had collected. Engelbach was able to rule out a thyroid condition because although she was of small stature she had what he determined to be normal intelligence. He oversaw her treatment for almost a year. During that period, this nine and a half year old girl grew 2.7 inches in height, 7.5 pounds in weight, .6 inches in head circumference, 1.7 inches in

[72] Hans Lisser, "Organotherapy, Present Achievements and Future Prospects," *Endocrinology* 9 (1925): 2.

[73] Ibid., 8.

[74] Ibid., 9.

the chest, and 1.3 inches in the abdomen after years of "arrested physical development."[75] Engelbach was pleased with these results and collaborated with Robert Schaffer on clinically testing Parke Davis' Antuitrin-G until he became terminally ill in the summer of 1932.[76]

Engelbach's positive case study inspired others to experiment with growth hormone injections on children. By 1936, there were thirty-six proposed published protocols of growth hormone therapy of children and no definitive answer as to a preferred preparation, dosage amount, or duration of treatment.[77] Most researchers favored laboratory preparations concocted by academic scientists over commercial anterior pituitary extracts because of their success rate in spurring growth in laboratory animals, while commercial products struggled to promise effective therapy because of the species-specificity required in GH therapy. By the mid-1930s, many studies recommended that growth hormone should be administered in combination with other hormones, most notably a thyroid extract.[78] Other medical experts, including Evans, emphasized the importance of having growth hormone extracts free of gonadotropic hormones, which could cause epiphyseal closure, which marks the end of skeletal growth.[79] While recommended dosage amount varied, most medical experts agreed that

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[75] William Engelbach, "The Growth Hormone: Report of a Case of Juvenile Hypopituitarism Treated with Evans' Growth Hormone," *Endocrinology* 16, no. 1 (1932): 19.

[76] "Dr. Engelbach Dies; Expert on Glands." *New York Times*, November 23,1932, 22.

[77] Leona M Bayer and H. Gray, "Pituitary Dwarfs: Their Growth and Treatment," *California and Western Medicine*, 47, no.4 (October, 1937): 228.

[78] William Engelbach and Robert L. Schaefer, "Endocrine Dwarfism," *Journal of American Medical Association* 103, no. 7 (August 18, 1934): 468.

[79] Emil Novak, "Glandular Physiology and Therapy: Anterior Pituitary and Anterior Pituitary-Like Substances," *Journal of American Medical Association* 104, no. 12 (May 23, 1935): 998.

growth hormone therapy needed to be longer than just a few months, as Lisser had suggested in the 1920s. Even though medical experts failed to set standards for growth hormone therapy or produce consistent positive results in clinical trials, most of them believed in a genuine need for a potent growth-promoting hormone in pediatric care.[80]

Media, Hormones, and Midgets

Grand stories of hormone research reached mainstream media, which fed into Americans' fascination with hormones during the 1920s and 1930s. Hormones seemed to possess unlimited amounts of possibilities especially after the successful use of insulin in diabetic cases. Reflecting popular interests, newspapers reported on endocrinology by featuring stories about hormone discoveries, both real and speculative, relaying science-fiction predictions of their potential uses, and featuring human-interest stories of hormone therapy. From promoting global peace to helping someone add a few inches in height, hormones seemed invincible and unstoppable.

Journalists kept track of growth hormone research and therapy and reported on developments in a way they thought would interest readers. For example, the discovery of the anterior pituitary gland's ability to promote growth was discussed in a 1923 *Los Angeles Times* article titled, "Doctors hear gland talk: Convention Told Height and Weight Can Be Regulated by Hypophysis Organ." The journalist boiled down Evans' paper about this scientific milestone and explained that "[t] he gist of it was to the effect that recent experiments with life forms ranging from tadpoles to rats and rabbits have given foundation for the belief that the size and form of the human body may in the near

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[80] E. Kost Shelton, "Pituitary Growth Factor: Some Clinical Considerations," *California and Western Medicine* 45, no. 1 (July, 1936): 23.

future be regulated by the feeding of secretions of animal hyphoysis gland."[81] A similar treatment was given to Evans' 1932 experiment with tadpoles that enabled him to "discover" growth hormone in the *Chicago Daily Tribune* article "Medicine Gets New Place in Gland Control: Perfected Extract Used to Guide Life."[82] These and other articles, which reported on growth hormone research, emphasized the future medical applications and scientific milestones in endocrinology.

Clinical experiments were reported in the same vein as growth hormone basic research. A 1931 *New York Times* article titled "Chemist Discovers 'Growth Hormone' – Dwarfs are Aided by Extract of Pituitary Gland, Buffalo Convention is Told" described William Engelbach's work on treating undersized children with injections of anterior pituitary extracts in a way that made treatment seem possible and effective.[83] Two years later, reports of more than two hundred children being successfully treated for "arrested growth" with "extracts of ductless glands" by a Dr. Theodore Zuck of the Brush Foundation in Cleveland surfaced. Zuck's claim was evidenced by "a boy who grew 8 ½ inches in twenty-one months. When the treatments started, he was 15 years and 4 months old, but his height average was only that of a boy 8 years and 7 months. Now his height is average for a boy of 13 years and 1 month and he is still growing."[84] While Zuck's work was unsubstantiated, it did provide promise to growth hormone therapy. Journalists

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[81] "Doctors Hear Gland Talk," *Los Angeles Times*, November 3, 1923, II1.

[82] "Medicine Gets New Place in Gland Control," *Chicago Daily Tribune,* April 22, 1932, 24.

[83] Staff Correspondent, "Chemist Discovers 'Growth Hormone'," *New York Times*, September 4,1931, 1.

[84] "Says Hormones Add Inches to Children," *New York Times*, February 22, 1933, 24.

wrote less about the failed clinical experiments and thereby distorted the trouble medical researchers faced with growth hormone therapy.

Personal stories contributed to the distorting positive light cast onto growth hormone therapy in the 1930s. In 1937 and 1938, the story of Eula Herbert's successful growth hormone therapy was reported on by multiple publications, including *Time* magazine. An article titled "Cornstalk" detailed Eula's two-year-long growth-stimulating therapy at New Orleans Charity Hospital. Eula, a teenager at the time, was given daily doses of thyroid and pituitary extract after she had stopped growing. The results were noteworthy as the magazine article remarked that Eula shot up like cornstalk. Described as a "shy little dwarf," Eula demonstrated her pride of her newfound height by stating, "I'm taller than Helen Hayes" (although this was technically untrue). Eula's story not only personalized growth hormone therapy for children, it also downplayed the invasive GH injections by focusing on her excitement with the results of her medical regimen rather than the treatment.[85]

If thyroid and pituitary extracts could make Eula grow as quickly as cornstalk, what else could hormones do? Americans enjoyed reading about hormones' potential during the 1920s and 1930s. Dr. Louis Berman's *The Glands Regulating Personality: A Study of the Glands of Internal Secretion in Relation to the Types of Human Nature* made it to the bestseller list during this time and spoke to Americans' fascination with hormones. First published in 1921, *The Glands Regulating Personality* was in its fourth edition by 1935 and had brought Berman considerable fame. Berman was educated and trained in experimental and clinical endocrinology and engaged in traditional research,

[85] "Medicine: Cornstalk," *Time*, August 1, 1938, http://www.time.com/time/magazine/article/0,9171,771170,00.html.

including the isolation of the secretions of the parathyroid glands. His work focused on the relationship between personality and hormones and the potential to manipulate the future of humanity through these chemical messengers. Berman promoted his ideas and book at numerous speaking engagements, where he would discuss the relationship between mood and hormones, food and biology, and the future of the human race and chemical messengers. In 1931, Berman made headlines when he implied that "glandular stimulation" science was on the verge of creating "[a] race of Supermen" composed of "glandular giants … endowed with genius at will." He estimated that "the average height … would be twelve feet and … would in exceptional cases reach sixteen feet."[86] His prediction of a giant race made good copy for journalists. While some reporters retold Berman's forecast for humanity as evidence of advancement in the field of endocrinology, others found his prediction to be preposterous.[87] Whether people agreed or disagreed with him, they had heard of "Dr. Louis Berman's twelve-foot man."[88]

Americans' fascination with more than one human race extended beyond future hormone-induced giants to the possibility of yet-to-be discovered races already in existence, including an ethnic group of small people. Often described as their own race, midgets were objects of fascination during the early twentieth century. By the 1910s, the term midget, while it is considered pejorative today, was not necessarily considered discriminatory and was given to people of small but proportional stature. In fact, the

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[86] "16-Foot Men Held a Gland Possibility," *New York Times*, December 16, 1931, 36.

[87] "Glandular Grandeur," *New York Times*, December 17, 1931, 22.

[88] Christer Nordlund, "Endocrinology and Expectations in 1930s America: Louis Berman's Ideas on New Creations in Human Beings," *Redorbit* (April 20, 2007) http://www.redorbit.com/news/science/908843/.

midget category was often framed by the most desirable of small stature. Mainstream media often explained a hierarchical categorization of small statured people with proportionate midgets at the top of the pyramids. Midgets' appeal was often based on their talent and identical but smaller appearance when compared to normal statured adults. By the mid-1930s there was public interest in these miniaturized adults as they seemed to have been from a bygone time and were facing extinction in the light of medical advancements, most notably hormone technology. In response, midget entertainers played off public interest by portraying a hyper-reality of their ordinary lives and themselves for the world to see.

During the nineteenth and early twentieth century, midgets and dwarfs along with novelty acts and people with physical, mental, and behavioral abnormalities entertained people at "freak shows." Bearded ladies, feetless men, conjoined twins, dwarfs and midgets, along with promoters and managers of shows, museums, and circuses made a living off their somatic peculiarities. Dwarfs and midgets were essential fixtures in these shows and drew large crowds. Promoters often included their small person in a personal photo in order to advertise one of their great treasures, as was the case in a nineteenth century photo of P.T. Barnum with one of his famous dwarfs, Commodore Nutt, a popular "curiosity" at his American Museum in New York City. Managers and promoters of circuses, such as the Ringling Brothers, Barnum and Bailey Circus and Sideshow, made sure to include their small entertainers (in this case the "doll family") in their advertisements.[89]

[89] Robert Bogdan, *Freak Show: Presenting Human Oddities for Amusement and Profit* (Chicago: University of Chicago Press, 1988), 4-5.

On occasion, advertising was so successful that it catapulted a small person into celebrity status, as was the case for General Tom Thumb. Born Charles Sherwood Stratton, General Tom Thumb worked for P.T. Barnum during the nineteenth century. Impersonating well-known figures, singing, dancing, and acting, Thumb was a very successful entertainer in part by toying with cultural notions of masculinity in his performances. As audiences gawked at his stature, General Tom Thumb impersonated historically significant figures such as Napoleon Bonaparte. Those who saw his show loved the way he would stay in character and over emphasize the mannerism of Napoleon, and reviews often highlighted his little stature and impeccable performances. Thumb was good at exaggerating masculine personas while his stature complicated his portrayals because his smallness made him appear not to be a fully developed man. This gendered performance drew audiences and became a staple in midget entertainment.[90]

While early museums and circuses often had at least one midget or dwarf, midget groups and communities had their own space in freak entertainment as specialty acts or vignettes referred to as midget towns or villages. The Singer's Midgets was a vaudeville troupe from Vienna who hit it big in the United States during the 1920s. As legend had it, the troupe was formed when its leader Carl Florian was a student at the Vienna conservatory. After visiting a midget town in a Viennese pleasure park several times, Florian decided to select thirty men and women from the town to create the group: The Singer's Midgets.[91] When newspapers reported on their performances, there was often mention made of The Singer's Midgets link to Vienna's midget town or an extinct race of

[90] "Tom Thumb in England," *Maine Farmer,* August 2, 1900, 7.
[91] "Midget Town Built First in Vienna Started Tiny Folk," *The Washington Post*, April 6, 1924, AA2.

small people depicted in fairy tales. For example, in a 1920 *Los Angeles Times* article, the journalists remarked that early elves might have been the prototypes of the present-day midgets and that the Singer's Marvelous Midgets "seem verily to have slipped from between the covers of a volume of fairy tales."[92]

During the early twentieth century, Americans also expected to view this small race at amusement parks and world's fairs where midget communities were exhibited. One of the earliest displays of a midget community was at Coney Island's Dreamland. Opened in 1904, midget city was referred to as one of the most interesting features of the new component of Coney Island. Estimated to house a thousand tiny inhabitants, midget city featured a Fire Department, midget circus and theatre, where Tom Thumb's widow and new husband performed. *The New York Times* remarked that even though at midget city, everything was "on the smallest possible scale," it was "perhaps one of the biggest features of the regenerated Coney Island."[93] This midget city was located in a prime spot and was a main draw until it and the Dreamland burnt down in a 1911 fire. Other amusement parks followed suit and featured their own midget communities during the early twentieth century.

Built to attract visitors for usually one year, World's Fairs featured midget communities. One of the most elaborate displays of midgets at a fair was at Chicago's Century of Progress World's Fair in 1933 and 1934. The fair commemorated the city's first one hundred years and aimed to be a "delightful place to visit again and again."[94]

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[92] "Marvelous Midget Beloved of Children," *Los Angeles Times*, September 12, 1920, III15.

[93] "New Coney Dazzles Its Record Multitude." *New York Times*, May 15, 1904, 3.
[94] Souvenir booklet, *A Century of Progress: Chicago World's Fair Souvenir, 1833-1933* (Chicago: The Arena Company, 1933), title page.

Amusement rides, replicas, performances, and sporting events added to the ambiance of this year-long event. Midget village was located in the midway area of the fair, a common fixture in most fairs where exhibits were more entertaining rather than informative. The midway included two freak shows, a "negro plantation show," a shooting gallery, and a midget village. The village portrayed midgets as a people from a long-gone era, as it was a replica of a fourteenth century walled Bavarian village but on small scale. There were shops, a mayor's office, police and fire departments, a jail, and a theater. Fair visitors were encouraged to become voyeurs as spots within the village, such as the hotel, offered opportunities for people to view "wee families at rest and leisure" according to the souvenir brochure.[95]

While a sign hanging over the village's entrance read "Home of the Smallest People on Earth," the souvenir brochure made it clear that the intent of the exhibit was to depict these midgets "as real human beings intent on their own tiny-world social, artistic, cultural and economic ways."[96] The midgets on display were dehumanized by being described as exemplar specimens of people normal in every way besides stature. Their normalcy also had a sprinkle of extraordinary-ness. The brochure suggested that the citizens of midget village exhibited "extraordinary strength in lifting heavy objects," lived longer than most people, were smarter than many "larger folks," and engaged in "[a] normality of sexual relations that has puzzled the world."[97] In the end, it was their normality even in sex that made them oddities. Since they were different, people

[95] Benjamin Klein, "Modern Lilliputia: The Story of Midgets," (1933): 3-22, Eugenics Record Office Records, 1670-1964, Box Series XII. Midget Schedules, Mss.Ms.Coll.77, American Philosophical Society, Philadelphia, Pennsylvania.

[96] Ibid.
[97] Ibid.

expected them to act differently, and the fact that midgets did not seem freakish in their behavior stunned onlookers.

Exposing the secret lives of midgets continued to draw onlookers and readers. The popular 1930s book *It's a Small World: All about Midgets* by Walter Bodin and Burnet Hershey claimed to reveal how small people lived behind closed doors and why they acted the way they did in public. A review in the *Chicago Daily Tribune* depicted the book as comprehensive in that it covered "everything about midgets' life, liberties, and pursuit of happiness."[98] Bodin and Hershey examined popular topics pertaining to midgets including sex, love, fame, and interpersonal relationships. The duality of midget entertainers' lives particularly interested Bodin and Hershey, and in particular the opposing ways in which small people performed their genders in public and private. The book began with a write up of an average morning for a midget named Tom. An entertainer, Tom lived in New York City and daily faced a barrage of problems due to his size from using a bathtub to encountering a dog on the street. According to Bodin and Hershey, Tom's average day was also filled with "booze, women, and food."[99] By the end of the day, Tom showed up at a vaudeville theater where he was about to perform. It is when he was reunited with other midgets that Tom changed. No longer did he need to be crass, womanizing, and over-the-top. Bodin and Hershey commented that Tom no longer had to over-exaggerate masculinity; instead, "all pretense could be dropped here

[98] "All About Midgets Is Interesting Book on 'A Small World'," *Chicago Daily Tribune*, May 26, 1934, 12.

[99] Walter Bodin and Burnet Hershey, *It's a Small World; All About Midgets* (New York: Coward-McCann, 1934), 17.

and a man could be exactly what he was, without either belligerence or apology. No need here for hypocrisy, or make-believe, before either men or women."[100]

Midgets traveled the fair circuit during the last half of the 1930s and entertained the masses through song, dance, and performing every day life. The California Pacific International Exposition in San Diego in 1935 featured a midget city. Located at Balboa Park, the fair had a wide variety of attractions, including performances from Native Americans, nudists, and midgets. Located in the Midway, its midget city housed one hundred small people and a farm with midget animals. After spending two years at the San Diego fair, several performers moved on to New York in 1939. Here, midgets found themselves on display and in direct contrast to the future. Firmly futuristic, the New York World's Fair opening slogan was "The Dawn of a New Day," and it took a practical look into the world of tomorrow by highlighting recent technology and innovations, such as the television. In contrast to these artifacts of progress, there was a midway section of the fair featuring various entertaining exhibits, including Midget Town. Producer and promoter Morris Gest organized the exhibit, which displayed over one hundred small people "living, working, and playing," and included a theatre for entertaining and a restaurant.[101] Like exhibits that came before it, Gest's Midget Town was a venue for entertainment, an offering of voyeurism, and a nod to yesteryear. Non-threatening, similar but different, and exotic, midgets tugged on the curiosity strings of Americans and were often exhibited in contrast to the nation's progress at world's fairs.

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[100] Ibid., 23.

[101] "The Amusements: Right This Way!" *New York Times*, April 30, 1939, 135.

Midgets often found themselves at the crossroads of entertainment and modern science during the first several decades of the twentieth century. At the Chicago's World's Fair, Midget Village became a laboratory for researching small-statured people. Professor Paul A. Witty, head of the psycho-educational clinic at Northwestern University, assessed their psychological health through mental tests. Midgets were prodded and measured by L.W. Wilkins and C.W. Dupertuis of Harvard as part of a larger anthropometric endeavor organized and operated by Harvard University. Known as The Harvard University Anthropometric Laboratory, this measuring exhibit at the Chicago fair was the site where over 3,100 people were measured and interviewed in hopes of getting a solid cross-section of Americans.[102] Eugenicists also took advantage of this exclusive grouping of midgets. Interested in the inheritability of short stature, eugenicist Harry Laughlin collaborated with the Harvard project and collected his own series of measurements for single-trait research. In the end, Midget Village's midgets not only amused the public but also entertained scientific interests. In a letter to the Managing Director of Midget Village, Nate T. Eagle, Laughlin thanked him for "the splendid collaboration which you and your staff gave to our investigators who are making research on anthropometric measurements and family histories of midgets. You have doubtless assembled the largest and most interesting collection of midgets ever brought together in one place."[103] Supposedly midgets were aiding in stature research outside of

[102] "List Anthropological Statistics, Made From Exposition at Chicago: Males Averaged 29 years and 68 inches in height," *The Harvard Crimson,* March 28, 1934, http://www.thecrimson.com/article/1934/3/28/list-anthropological-statistics-made-from-exposition/.

[103] Letter from Harry Laughlin to Nate Eagle, July 11, 1934, Eugenics Record Office Records, 1670-1964, Box Series XII. Midget Schedules, Mss.Ms.Coll.77, American Philosophical Society, Philadelphia, Pennsylvania.

the World's Fairs as well. Bodin and Hershey reported that midgets were actively participating in scientific research by submitting to experiments all over the world. They predicted that this research would help doctors "in the not so distant future …to control the growth of the body," which would allow science, "to fulfill the racial ideal of stature."[104] Ultimately, midgets offering themselves up as specimens contributed to the demise of midget entertainment.

By the late 1930s, midgets' freak status was seriously destabilized by journal articles and books opting to use medicine to explain these "human curiosities" rather than fantasy-like descriptions of a leftover ancient race. A 1937 *Collier's Weekly* article titled "Side-Show Diagnosis" by Hannah Lees depicts the reframing of freaks, which took place during the late 1930s.[105] Lees suggested that all of the real "side-show freaks" could be "fitted snugly between the pages of some medical textbook" because while they may be curiosities they were "more certainly … sick."[106] With the help of medical professionals who joined her at a sideshow, Lees began to diagnose a list of typical freaks one would see at a circus sideshow, including The Leopard Man (vitiligo), the Elastic-Skinned woman (skin tumor), and The Blue Man (Argyria). Every oddity had a medical explanation, according to Lees. Lees discussed how dysfunctional glands provided "the bread and butter of any side show" by creating the "Fat Lady, the Bearded Lady, the Midgets, the Giants and even the Ugliest Woman in the World."[107] She lumped giants

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[104] Bodin and Hershey, 60.

[105] Hannah Lees, "Side-Show Diagnosis," *Collier's*, June 5, 1937, 22.

[106] Ibid.

[107] Ibid.

and midgets together in their diagnoses, claiming that "exactly opposite extremes" of the pituitary gland caused these conditions. Lee suggested that "[c]ontrary to legend, these attractions have seldom inherited their freakishness…. Nature seems to be pretty smart about keeping the human race fairly average, and when the pituitary misbehaves it is more than likely to have a side effect on sexual development. So most Midgets never grow up sexually…"[108] The medical depiction of these small entertainers featured in this article stripped them of their mystery and their sexuality, which made it difficult for audiences to just sit back and enjoy the show. Midgets were no longer extraordinary; they were sick. By 1940, Americans' understanding of what made people miniature changed from fantasy to science and small-statured adults' size was pathologized.

Even so, midget displays and performances did not abruptly end because of an increased frequency in articles diagnosing them; instead, these artistic interpretations of small people made their way onto the silver screen. In the late 1930s, two historic films, one featuring male dwarfs, *Snow White and the Seven Dwarfs* (1937), and the other showcasing a midget race, *The Wizard of Oz* (1939), debuted and had a profound and long-lasting impact on Americans' perception of small statured men in particular. The influence the animated *Snow White and the Seven Dwarfs* has had on the cultural perception of short adult men should not be overlooked. Known collectively as the Seven Dwarfs, Doc, Grumpy, Bashful, Sleepy, Happy, Sneezy, and Dopey served as comedic relief for an otherwise very serious fairytale. Their descriptive and non-threatening names made this group of dwarfed men living together in the woods appear harmless. Void of any hint of threatening masculinity, the dwarfs whistled while they worked, took

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[108] Ibid., *35.*

care of Snow White, and lived communally. The dwarfs were lovable and entertaining and represented the lives of small-statured men to millions of moviegoers. Although they were dwarfs and not midgets, these characters' portrayal of short men on the silver screen helped solidify the stereotype of the short man as not quite an adult male.[109]

Earning eight million dollars in international box office receipts, *Snow White*'s success led Hollywood's producers on a "wild search" for comparable stories. L. Frank Baum's book, *The Wonderful Wizard of Oz,* seemed to be the logical story choice for the next blockbuster movie and by 1938 *The Wizard of Oz* was in production by Metro-Goldwyn-Mayer.[110] *The Wizard of Oz* is about a girl (Dorothy) from Kansas who is trying to find her way home after landing in Oz. At the beginning of the movie, Dorothy meets a large group of singing and dancing midgets called Munchkins. This race of midgets was first described in the 1900 novel. While the book described Munchkins as being "not as big as the grown folk…but neither were they very small" and dressed in gender specific garb, in the movie they were dressed flamboyantly and presented as proportionately perfect and very midget-esque.[111] Their performance on screen was reminiscent of the over-the-top shows put on by The Singer's Midgets. In fact many Munchkins were part of this famous troupe.[112]

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[109] Walt Disney Films, *Snow White and the Seven Dwarfs* (1937; Burbank, California: Walt Disney Enterprises, 2009), DVD.

[110] "Screen News Here and In Hollywood: 'The Wizard of Oz' in demand following the box-office success of 'Snow White,'" *New York Times*, February 19, 1938, 19.

[111] L. Frank Baum, *The Wonderful Wizard of Oz* (New York: Knopf, 1900), 5. Victor Fleming, Noel Langley, Florence Ryerson, Edgar Allan Woolf, Harold Rosson, Mervyn LeRoy, Judy Garland, et al. *The Wizard of Oz*, (1939; Turner Entertainment Co. 1999), DVD.

[112] Stephen Cox, "Kid Munchkins reunite; Snubbed at a Walk of Fame ceremony, former child actors who performed with the adults reminisce," *Los Angeles Times*, December 3, 2008, E3.

Singing, dancing, and performing proportionate perfection, the Munchkins of Oz reflected a long tradition in midget entertainment in the United States, which included gendered stereotypes of small men. For example, perhaps the most memorable number featuring munchkins in the *Wizard of Oz* was the Munchkin parade celebrating Dorothy's killing of the wicked witch. In this musical performance, the audience learned about the death of the witch and was introduced to the Munchkins of Oz. Treated like children, the Munchkins were instructed by Glenda the good witch to "come out to play" after Dorothy's house fell on the witch and killed her. The Munchkins obeyed, rejoiced, and sang, about the death of the wicked witch of the west. At the end of the musical performance, three small women emerge from the crowd representing the "Lullaby League" to welcome Dorothy to Munchkin Land. After their performance, three men take center stage. In child-like costumes and odd-sounding voices, these three men claimed they represent the "Lollipop League" and welcomed Dorothy with a song and a giant lollipop. The portrayal of small statured men in the Wizard of Oz was not trend-breaking. These male performers played within the parameters of cultural notions of masculinity, which ultimately confined them to a child-like state.

Conclusion

Due to the popularization of sideshow diagnoses, Munchkins were a dying breed by 1940, but the gendered stereotypes of midget men persisted and found its way into the medical analysis and treatment of small stature. Scientific medicine framed short stature as an affliction in need of a remedy, which made a midget less of an attraction and more of a subject for medical research. As Bodin and Hershey suggested at the end of their

oeuvre about small people: "[w]hen the scientists have learned all the secrets of our mysterious glands it is not improbable that midgets…will go the way of the dodo, the dinosaur and the pterodactyl, themselves the victims of faulty glands, into oblivion."[113] But during the 1920s and 1930s, medicine came up short when it came to curing small stature and by the mid-1940s, "utilizing what we have," which was ineffective growth hormone pharmaceuticals, appeared futile. Nevertheless, researchers remained confident that a cure was in the near future. This hope inspired pharmaceutical companies and academics to keep searching for a breakthrough and contributed to the ongoing medical stigmatization of short stature. Even though scientific medicine during the first half of the twentieth century failed to effectively treat short stature due to a growth hormone deficiency, it succeeded in convincing Americans that midgets needed medical treatment and that short stature was pathological.

[113] Bodin and Hershey, 311-312.

Chapter 3 - "I am just dying to grow taller. It's agonizing to be short."

Short Stature as a Psychosocial Risk Factor in Need of an Effective Cure

On August 1, 1937, the *New York Times* reported on well-known endocrinologist Dr. Oscar Riddle's proclamation that "hormones from the pituitary gland might be used in the near future to overcome inferiority complexes and possibly develop backward, retiring individuals into geniuses."[1] According to the article, a remedy was needed, as psychiatrists recently discovered that short stature hindered people from fully utilizing their natural intelligence and drive. Different from the previous predictions, which sounded more like science-fiction lore of how gland extracts would be used in the near future to make a race of giant sized geniuses, Riddle confidently postulated the possibility of self-help through systematic injections of growth hormones. These injections would "convert the individual from a mediocre worker into a competent, confident person able to use his intelligence, which might be that of a genius, to its maximum possibilities," with the only missing link being a therapeutically potent growth hormone preparation.[2]

Searching for an effective therapy to treat short stature was not new. Throughout the first several decades of the twentieth century, medical experts conducted human experiments hoping to discover a growth hormone product strong enough to increase the height of their patients. The mixed results of these clinical trials were optimistically reported at first, but by the mid-1940s hope turned into dismay in some part due to the isolation of growth hormone. Dr. Choh Hao Li's 1944 isolation of growth hormone from the pituitary of an ox not only brought an end to the speculation of the existence of a

[1] "Scientists Predicts Pituitary Treatment Will Overcome the 'Inferiority Complex,'" *New York Times* August 2,1937, 34.

[2] Ibid.

single growth hormone but also allowed medical experts to better determine the composition and effectiveness of existing growth hormone pharmaceuticals.[3] Medicines touting purity performed poorly in clinical trials. Cynicism over the therapeutic potency of growth-promoting drugs grew as psychology texts and advice books for parents popularized the psychoanalytical notion that a biological deficiency in children, including short stature, caused an inferiority complex. As infant mortality rates declined during the first three decades of the twentieth century, child experts' concerns over children's health shifted from life and death issues to psychosocial adjustment and normal physical growth. Psychoanalysis highlighted the interrelationship of the two, which reframed the meaning of biological variation and inspired a continued holistic approach in the field of pediatrics. Although pediatric endocrinology and psychoanalysis are often considered disparate medical fields, they converged on short-statured, male, white youthful bodies in the post-World War II era and together transformed short stature into a psychosocial risk factor in need of treatment.

This chapter aims to pinpoint the moment when growth-promoting therapy became synonymous with treating short boys in the hopes of making them tall. Recent scholarship on the history of the human growth hormone industry has underestimated and miscalculated the roots of the gender disparity in GH therapy.[4] Since the 1940s, boys

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[3] C. H. Li and H. M. Evans, "The Isolation of Pituitary Growth Hormone," *Science* 99 no. 2566 (1944): 183-184.

[4] Susan Cohen and Christine Cosgrove, *Normal and Any Cost: Tall Girls, Short Boys, and the Medical Industry's Quest to Manipulate Height* (New York: Tarcher, 2009) and Melody Peterson, *Our Daily Meds: How the Pharmaceutical Companies Transformed Themselves into Slick Marketing Machines and Hooked the Nation on Prescription Drugs* (New York: Farrar, Straus and Giroux, 2008) and Peter Conrad, *The Medicalization of Society: On the Transformation of Human Conditions into Treatable Disorders* (Baltimore: Johns Hopkins Press, 2007) and David

have been targets for growth-promoting therapy as gendered growth charts, diagnoses, and treatments have all played a role in the medical quest to treat short-statured boys. By 1945, gender trumped race and class when it came to the assessment of children's height as the various growth charts used by pediatricians, public health officials, and school administrators segregated data by sex, and norms for boys were less forgiving of small stature than for girls. Gender also mattered when it came to medical diagnoses as medical textbooks placed special emphases on boys afflicted with recently named physiological disorders causing short stature. Even treatment was gendered. By 1950, pediatric endocrinologists advised the use of the male hormone testosterone in cases of short stature due to an anterior pituitary hormone deficiency. Their official recommendation contributed to a synergy between treatment and patient and affirmed the notion that a surge of masculinity would save boys from the perils of short stature. Even once medical experts figured out how to use cadaver human growth hormone [cHGH] to treat short stature and cHGH replaced testosterone as the preferred medical regimen, the link between boys and growth-promoting therapeutics did not waiver; in fact, the human growth hormone industry would end up benefiting from it.

Pathological Height and Pediatrics

During the 1940s, as an increasing number of child experts observed, debated, and theorized about what constituted a "normal" childhood, human growth and development became increasingly understood as a series of medicalized events, a

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J. and Sheila Rothman, *The Pursuit of Perfection: The Promise and Perils of Medical Enhancement* (New York: Pantheon, 2003).

phenomenon articulated by Peter Conrad in *The Medicalization of Society*.[5] Conrad warns that when normal events are medicalized, "human difference is susceptible to being considered a form of pathology."[6] Such was the case with short stature in children during the 1940s. In an article for the April-May 1943 issue of the *Ciba Symposia*, Wilton Marion Krogman, an associate professor of Anatomy and Physical Anthropology at the University of Chicago, commented on the modern study of human growth as popular and complex. According to Krogman:

> Growth was conceived by an anatomist, born to a biologist, delivered by a physician, left on a chemist's doorstep, and adopted by a physiologist. At an early age she eloped with a statistician, divorced him for a psychologist, and is now being ardently wooed, alternately and concurrently, by an endocrinologist, a pediatrician, a physical anthropologist, an educationalist, a biochemist, a physicist, a mathematician, an orthodontist, a eugenicist, and the Children's Bureau![7]

Even across this wide spectrum of experts, most agreed that a child was "not a small replica of the adult;" rather, his physical composition, mental faculties, and behavior separated him from his older counterpart.[8] While variations of rates in development regarding physical growth, motor skills, and personality were acknowledged, certain milestones were identified. It was expected that most children would get their first tooth

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[5] Peter Conrad, *The Medicalization of Society: On the Transformation of Human Conditions into Treatable Disorders* (Baltimore: The Johns Hopkins University Press, 2007), 148.

[6] Conrad, 148.

[7] Wilton Marion Krogman, "Principles of Human Growth," *Human Growth - Ciba Symposia* 5 (1943): 1458.

[8] John E. Anderson and Florence L. Goodenough, *How Normal Children Grow: Their Physical, Mental and Character Development* (New York: The Parents' Publishing Association, 1930), 2.

by eight months, refine their walking skills when they were two to three years of age, and sexually mature in their teens.[9]

Pediatricians were mindful of these milestones and regarded the auditing of growth as an important measure in assessing the health of a child. In this context, short stature warned of a possible serious physiological disturbance, a chronic or acute illness, or inadequate nutrition, all of which could impact normal growth and development. While pediatric textbooks recommended that doctors routinely take a series of measurements that included body weight, height, chest, and head at every examination, the height and weight measurements were considered the "fundamental base for the appraisal of development and physical condition."[10] Height and weight were charted over time and assessed using norms represented on growth tables and charts. Even though growth charts and tables had become common fixtures in pediatric textbooks by the 1940s, their presentations had evolved. In the early twentieth century, growth charts were mostly tables featuring data from anthropometric surveys. Those who conducted the surveys were credited in the tables and variations in measurements between studies were discussed in the text surrounding the graphics. Important determining factors such as race, class, or if the children attended public or private school, were often included.[11]

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[9] Richard M. Smith and Douglas A. Thom, *HEALTH: Physical, Mental, and Emotional* (Boston: Houghton Mifflin, 1936), 22, and Anderson and Goodenough, 24.

[10] Werner Kornfeld, "The Anthropometric Approach to the Practice of the Pediatrician," *Child Development* 18, no. 3 (1947): 113.

[11] Textbooks consulted: J.P. Crozer Griffith, *The Diseases of Infants and Children*, 1st ed., 2nd ed. revised and reset, and 3rd ed (Philadelphia: W.B. Saunders, 1919, 1938, and 1935 respectively) and L. Emmet Holt, *The Diseases of Infancy and Childhood: For the Use of Students and Practitioners of Medicine*, 1st ed., 4th ed., 6th ed., and 11th ed. (New York: Appleton, 1897, 1908, 1913, and 1940 respectively).

Beginning in the late 1930s, these caveats for the data presented in tables and charts started to be omitted. With this change, growth tables turned into charts with percentile curves representing average growth as healthy and preferred, which prompted further investigation in the case of any extreme deviation from the median, and anthropometric surveys connected to the data were relegated to chapter endnotes.[12] These subtle but meaningful alterations disengaged measurements collected from growth surveys from their origins and further presented the data as normal and healthy rather than data documenting a certain population. Ironically, gender was the one factor that remained linked to the measurements and the continuance of gender-specific standards had tremendous implications on the treatment of short stature in children because it took less variation for boys to be considered pathologically short than for girls.

As growth charts acted as diagnostic gateways in pediatric care, the patient would be examined for chronic infections and the parents questioned about their child's diet if abnormal growth was detected. Once constitutional and environmental culprits of short stature (i.e., race, social class, hereditary factors, and environment) were ruled out and illness or a nutritional problem seemed not to be the cause, a hormone deficiency was considered. Pediatricians understood that growth continued as long as the thyroid and growth hormone were active and the gonads were not.[13] Skeletal growth ended when

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[12] L. Emmett Holt, John Howland, and Rustin McIntosh, 11th ed. *(*New York, Appleton, 1940), 12.

[13] Murray B Gordon, "Diseases and Disorders of the Endocrine System," In *Therapeutics of Infancy and Childhood* (Philadelphia: F. A. Davis Company, 1942), 2641-2642.

gonadal activity caused epiphyseal closure.[14] Any irregularities in this hormonal trifecta resulted in growth abnormalities, including delayed sexual maturation and short stature.

Medical experts speculated that lesions hindering the production or release of a growth-promoting hormone caused short stature and delay in sexual maturation, though verification of this type of obstruction could only be made postmortem. Thus, physicians had to rely on the body for clues. In order to investigate possible endocrine disorders, pediatric textbooks recommended physicians conduct a physical examination, take x-rays of various skeletal sites, including "the skull, sella turcia, long bones, and wrists," and take blood and urine samples to determine basal metabolism and blood chemistry.[15] Since these tests could not definitely determine if the child had a severe or mild growth hormone disorder, diagnosis happened more as a process of elimination.[16] If no other underlying deficiency, such as diabetes, hypothyroid, precocious puberty, and non-pituitary forms of dwarfism was identified as the reason for the short stature, physicians often considered an anterior pituitary hormone disorder.

Anterior pituitary deficiencies causing a delay in growth and development were known as pituitary dwarfism but there was a series of sub-categorizations further classifying this dysfunction. A cluster of disorders (Fröhlich's Syndrome, Laurence-Moon-Biedl Syndrome, and Congenital Pituitary Dwarfism, otherwise known as Levi-Lorian Dwarfism) were characterized by delayed sexual maturation, pudginess, and short stature, which resulted in a type of endocrine infantilism. While these diagnoses were not

[14] Ibid., 2641.

[15] Ibid., 2645.

[16] Ibid.

necessarily sex-specific, boys feminized by these disorders were highlighted in textbook descriptions. Even though both boys and girls diagnosed with Fröhlich's Syndrome were obese, short, pale, suffered from headaches, and experienced a delay in the development of secondary sex traits, boys experienced more severe problems than girls because it problematized their masculine traits. The boys' obesity usually produced "female contours," and their voices stayed "soprano," while the growth of the penis, testicles, and scrotum was considerably retarded and sometimes buried in fat.[17] Children with "delicate finely chiseled features, soft pale skin, slender skeleton, poorly developed musculature, general hypoplasia,"[18] hypoglycemia, wrinkly skin, and a poor immune system were considered to be congenital pituitary dwarfs, otherwise known as Levi-Lorian dwarfs, which was believed to be a result of an underproduction of multiple growth promoting anterior pituitary hormones. These children were referred to as "Dresden dolls" as their appearance resembled a type of perpetual infantilism.

Perhaps the most ambiguous description of a growth disorder causing short stature was the acquired form of anterior pituitary deficiency of growth. A description of the disorder from a 1942 pediatricians' textbook reveals the fluidity of this diagnosis:

> The acquired form of anterior pituitary deficiency of growth is characterized by a short stature, which ranges from marked dwarfism to moderate stunting, depending upon the severity of the damage and the age of the onset. The general appearance varies from one stimulating the congenital type to that of a normal child who looks younger than his age. The child may be obese, thin, or normal in nutrition. Bone development and sex development may be normal or retarded.[19]

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[17] Holt, 739-40.

[18] Gordon, 2642-2643.

[19] Gordon, 2644.

Given this account, the one identifiable constant characteristic of this type of pituitary dwarfism was short stature of varying degrees. The sex-segregated height and weight standards and gender bias in the portrayal of endocrine disorders found in pediatric textbooks provided the backdrop for descriptions of pathologies that caused stunting and placed physicians on high alert for short stature in young boy bodies.

While classifications of growth hormone disorders causing short stature evolved, effective treatment was in a state of flux by the mid-1940s.[20] The successful lab experiments with growth hormone preparations from the 1920s were difficult to mimic in the clinic, where positive results seemed hard to come by. During the 1930s and 1940s, controversy raged about the effectiveness of the sole use of anterior pituitary compounds as a viable mode for treating delayed growth and pituitary dwarfism and the usefulness of growth hormone pharmaceuticals. Promotional material produced by growth hormone manufacturers tried to steer the debate. For example, during the 1940s, Armour Laboratories, one of the major growth hormone producers, produced, published, and nationally distributed to practicing physicians an informational booklet titled *The Pituitary Gland*. This pamphlet was intended to be a instructional piece for practicing physicians to learn more about pharmaceutical products offered by Armour, including "Growth Complex" and "Anterior Pituitary Powder and Tables" as well as the "pituitary gland, its functions, disorders, and therapy."[21] Throughout the educational pamphlet, the names of the medicines offered by Armour were typeset in all caps, making them pop out of the text describing clinical conditions warranting their use.

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[20] Holt, 739.

[21] Armour Laboratories, *The pituitary gland: Clinical application of its hormone factors*, revised edition (Chicago: Armour and Company, 1944), 3.

Growth Complex and Anterior Pituitary Power and Tablets were Armour's two types of preparations intended to treat short stature caused by pituitary dwarfism (Lorian-Levi type). Growth Complex contained adrenotropic and lactogenic factors, which Armour deemed "essential to body growth, and normal development.[22] As with the anterior pituitary preparations Evans used in his experiments, Growth Complex was intended to promote only stature and not sexual maturation. In fact, the advertisement at the end of the book stressed that it was stripped of gonad hormones and thyroid and therefore "suitable for children when skeletal and visceral growth" were the desired outcomes. [23] Results in growth were predicted "within two or three months."[24] Armour's advertising of their Anterior Pituitary Powder and Tablets addressed scientists' shared opinion of the ineffectiveness of orally administering anterior pituitary preparations by claiming that their products were "still employed extensively and with apparent success as a means of accelerating growth and development in the pituitary types of retarded growth or dwarfism prior to the closure of the epiphyses."[25] To ensure success in using these tablets and powder, the ad recommended the extracts be taken in conjunction with a vitamin-rich diet or vitamin supplements. Although Armour did not heavily advertise their growth hormone products in medical journals, this marketing campaign reveals

[22] Ibid, 64.

[23] Ibid.

[24] Ibid.

[25] Ibid., 65.

efforts to sell to physicians a physiological idea of a growth-promoting hormone found in the anterior pituitary along with its medical answer to "retarded growth or dwarfism."[26]

During the same time, the Parke-Davis Research Laboratories were busy at work with Dr. Bartz from Evans' lab at the University of California in improving the process for manufacturing its growth hormone drug, Antuitrin G.[27] The company was struggling with what it internally called an "unsatisfactory product" and attempted to make its growth hormone powder more soluble, less irritable, and more potent.[28] In March of 1944, an article in *Science* detailing Dr. Choh Li's isolation of growth hormone inspired Parke-Davis researchers.[29] Li's research gave credence to the existence of a pure protein anterior pituitary growth hormone and provided hope to Parke-Davis Research Laboratories in its twenty-year quest to create a commercial growth hormone product that was effective. Researchers at Parke-Davis duplicated portions of the process articulated by Li when manufacturing Antuitrin G; however, Li's method to isolate GH did not yield large enough quantities needed for clinical and basic research let alone pharmaceutical manufacturing. In 1948, another medical expert in growth hormone, Dr. Alfred E.

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[26] Ibid.

[27] Monthly Report, "Antuitrin, Growth, Project No. 9769" January 1940, Series 1: Joint Research Notebooks, 1910-1945, Lab Book #183, 775 Laboratory Notes from Research Dept. Parke, Davis and Company, Parke, Davis Research Laboratory Records, Archives Center, National Museum of American History, Washington, D.C. (hereafter cited as Parke, Davis Research Laboratory Records).

[28] Ibid, Letter, April 24, 1944, 1432**.**

[29] C. H. Li and H. M. Evans, "The Isolation of Pituitary Growth Hormone," *Science* 99, no. 2566 (1944): 183-84.

Wilhelmi, spearheaded research that offered a new preparation, which provided enough GH for scientists and clinicians alike.[30]

As scientists fine-tuned the purification process, Li's isolation of GH brought hope for those suffering from short stature. Some individuals were so eager for growth hormone to reach the market that they personally contacted Li. In October 1945, Li received a letter from Helen Chin, a self-identified Chinese-American engineering graduate student inquiring about his research. She wrote: "I know you and your scientific associates haven't yet figure out the molecular stucture (sp.) of the pituitary (sp.) growth hormone, I am afraid of using these pituirty (sp.) hormone extracts on the market for it might do more harm than good." At 5'2", she confessed in the letter: "I am just dying to grow taller. Its agonizing to be short" [all spelling and grammar are from the original].[31]

Journalists reported positively about Li's accomplishment as well. In 1947, the popular magazine *American Weekly* reported on Li's isolation of growth hormone with an article called "We're GETTING BIGGER Again." Author Allen Greenacre suggested that the recent rise in height among Europeans and Americans had to do not only with a change in diet but also with a physiological change in the level of growth hormone secreted by the human pituitary gland. He went on to wonder what the future held for individuals who desired to be bigger and then shifted his focus to the therapeutic future of growth hormone. Greenacre reported science's progress in harnessing the therapeutic power of GH: "For one year he [Li] injected it [GH] three times weekly in a 10-year-old

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[30] A. E. Wilhelmi, Jacob B. Fishman, and Jane A. Russell, "A New Preparation of Crystalline Anterior Pituitary Growth Hormone," *Journal of Biological Chemistry* 176, no. 2 (1948): 735-745.

[31] Letter, Folder: "C-misc, 1944 – 49," Choh Hao Li Papers, MSS 88-9, Archives & Special Collections, UCSF Library & CKM (hereafter cited to as Choh Hao Li Papers).

Hawaiian girl who was only as tall as a child of four. In that time she grew two and a half inches, but her mother took her back to Hawaii and he doesn't know what has happened to her since."[32] The reader was left to wonder not only about the girl but also about when growth hormone would become available to patients.

Ironically, the isolation of GH and the further refinement of the purification process did not give way to a more therapeutically potent growth hormone drug because of the hormone's species-specificity. Therefore, while pharmaceutical companies refined their products and sent them to scientists and clinical researchers to determine their effectiveness, the results were not good. For example, in 1949, Armour Laboratories asked several research teams to study the refined version of a growth hormone preparation but none of the researchers were able to report positive findings.[33] Researchers claimed that Armour's GH products did facilitate "linear growth, weight gain and nitrogen retention"[34] in laboratory experiments involving rats and dogs, but they did not do the same for people, and in some cases it caused patients to lose their appetite and made them experience "listlessness, vomiting, malaise, nausea, negative nitrogen balances and other toxic effects."[35] These negative findings were a huge blow for growth hormone manufacturers and pediatric endocrinologists eager to help their patients become taller.

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[32] Allen Greenacre, "We're Getting Bigger Again." *The American Weekly* April 7,1947, 14.

[33] William A. Reilly, Lawson H. Wilkins, and William C. Deamer, "American Academy of Pediatrics, Inc. Proceedings and Reports, Round Table Discussion, Endocrine Therapy in Childhood," *Pediatrics* 6, no. 6 (December 1950): 917.

[34] Roger A. Lewis, Robert Klein, and Lawson Wilkins, "The Effect of Pituitary Growth Hormone in dwarfism with Osseous Retardation and Hypoglycemia and in a Cretin Treated with Thyroid," *Journal of Clinical Investigation* 29, no. 4 (1950): 460.

[35] W. A. Reilly, et al., 917.

Pediatric endocrinologists sought out alternative therapies after the failure of GH in its pure state. In 1946, William Deamer of University of California Medical School read a paper at the annual American Pediatric Association's meeting about his success in promoting growth in understatured boys with hard tablets of testosterone, supplied by Ciba, the same pharmaceutical company that funded the endocrine clinic where he worked. Deamer reported that he led a team of researchers in treating five boys with disparate bone and chronological ages with testosterone and that each one of their subjects grew. Researchers, parents, and children were pleased with the results of treatment, according to the report. Deamer commented, "[e]ach time the patient's trousers had to be lengthened was an occasion for rejoicing and the psychological benefits of the increased rate of growth were very real."[36] First identified in 1935, testosterone was quickly synthesized and used in clinical trials to treat various ailments by the end of the 1930s. However, treating short stature with testosterone was somewhat tricky since it caused some patients to become aggressive, develop masculine sex traits, and experience an early closure of bones, which ended the growth process. Deamer addressed some of these side effects by suggesting they were welcomed. In his report, he remarked on the increased aggressiveness of two boys in the study as "a desirable feature of the treatment."[37] A leader in the field of pediatric endocrinology, Deamer inspired others to officially endorse testosterone as the preferred treatment for short-statured

[36] William C. Deamer, "Stimulation of Growth in Boys by Sublingual Testosterone Therapy," *American Journal of Diseases of Children* 75, no. 6 (1948): 859.

[37] Ibid.

children, even though girls were ostensibly left out of the picture with this medical recommendation.[38]

At the1949 American Academy of Pediatrics-sponsored (AAP) roundtable discussion of endocrine therapy in childhood, Deamer, Riley, and Wilkins, all leaders in the field, recommended the "male hormone" for "symmetrically understatured" children. Wilkins suggested that no growth hormone therapy had been effective in humans.[39] In the case of short stature due to a growth hormone disorder, the effectiveness and appropriateness of the available treatment reframed the perception of the patient of growth-promoting hormone therapy. Boys' bodies responded better to testosterone therapy than girls, as there were fewer complications, more benefits, and appropriate somatic results. Also, the social problems boys had with being short were seen as more pressing for them and their parents than for girls. Subsequently, young short-statured boys became the desired patients for consumers of growth-promoting hormonal therapy.

Pediatric Endocrinology

Pediatric endocrinologists' recommendation carried weight in the medical field as they became the undisputed experts in treating short stature in children by the 1950s. These specialists gained prestige and influence over pediatrics during the 1950s, marked by the publication of the first edition of the textbook *The Diagnosis and Treatment of Endocrine Disorders in Childhood and Adolescence*.[40] This book provided descriptions

[38] William A. Reilly, Lawson H. Wilkins, and William C. Deamer, "American Academy of Pediatrics, Inc. Proceedings and Reports, Round Table Discussion, Endocrine Therapy in Childhood," *Pediatrics* 6, no. 6 (December 1950): 917.

[39] Ibid.

[40] Delbert A. Fisher, "A Short History of Pediatric Endocrinology in North America," *Pediatric Research* 55, no. 4 (2004): 719.

of common pediatric endocrine disorders, diagnostic criteria, and therapeutic options. Other editions followed and additional reference books were published in order to disseminate up-to-date information to pediatric endocrinologists, pediatricians, and general practitioners.

While pediatric endocrinology publications provided a more precise understanding of growth disorders linked to anterior pituitary hormones, they were unable to offer a diagnostic test for determining growth hormone deficiency, other than collecting body measurements. The best they could do was rule out other possible causes for short stature, including low Adrenocorticotropic hormone (ACTH) levels or insulin intolerance. If the specialist did suspect a growth hormone deficiency (GHD), even less could be done.[41] During the 1950s, experts were keenly aware that pituitary growth hormone was "the only agent known to be capable of stimulating growth without at the same time accelerating skeletal maturation,"[42] but it was not clinically available. Therefore, they continued to recommend testosterone throughout the decade, even though it accelerated epiphyseal closure, and caused female patients to take on masculine traits, including the growth of moustache hair, enlargement of the clitoris, and "hoarseness of the voice."[43]

Growth Charts

[41] Nathan B. Talbot, Edna H. Sobel, Janet W. McArthur, and John D. Crawford, *Functional Endocrinology: From Birth Through Adolescence* (Cambridge: Harvard University Press, 1952), 466.

[42] Ibid., 472.

[43] Letter from Dr. Roberto Escamilla to Dr. Cyril M. MacBryde, March 28, 1929. Choh Hao Li Papers.

Without a laboratory test for growth hormone, growth charts served as a fundamental diagnostic tool for the specialist, pediatrician, and anyone else concerned about a child's health, including school nurses. Most American children encountered a ruler and a chart at school during a health exam. By 1960, the youth of America spent the majority of their childhoods receiving an education, and schools became the place where health examinations served as opportunities to identify unhealthy children and refer them to a pediatrician or specialist for further care. Charged with the responsibility of discovering children suffering from malnourishment or an invisible physiological disorder, school physicians, nurses, and teachers relied on the recording, tracking, and assessing of multiple measurements. During the late 1940s, the Joint Committee on the Health Problems in Education of the National Educational Association and American Medical Association (a collaborative council that had been in existence for thirty years) attempted to assist schools in their medical assessment endeavors by standardizing the measurements recorded, the procedures followed during the physical, and the norms used in interpreting the data. The result was an instructional booklet titled *Physical Growth Record*, which allowed school physicians and nurses, physical education instructors, and even rural schoolteachers to systematically record and interpret height and weight measurements of pupils in elementary and secondary schools using an identical format.[44]

The *Physical Growth Record* was a four-page, sex-specific booklet with charts intended to record the growth in height and weight of a child from four to eighteen years of age. Developed by Dr. Howard V. Meredith of the Iowa Child Welfare Research Station and Dr. Harold C. Stuart of the Department of Maternal and Child Health at the

[44] Howard V. Meredith, "A Physical Growth Record for Use in Elementary and High Schools," *American Journal of Public Health* 39, no. 7 (July 1949): 878.

Harvard School of Public Health, the booklet was intended to aid school programs that did not allow for extensive anthropometric surveys but still aimed to keep a watchful eye on pupils' growth and health. A child's height and weight were to be measured at least three times a year and recorded in his/her booklet. The data was placed on the booklet's charts, which featured "five normative zones – Tall, Moderately Tall, Average, Moderately Short, and Short."[45] A child had to represent one of these normal growth zones in order to be considered healthy. Failure to measure up into any of these five zones and to consecutively stay in a zone often meant a referral to a pediatrician.

Based on body measurements taken on white children attending the University of Iowa experimental elementary and high schools during one or more years from 1930 through 1945, the charts featured in the *Physical Growth Record* were considerably limited in scope. This fact was not lost on its creators. Stuart and Meredith tried to compensate for the shortcomings of their data. In the footnotes of an article explaining the *Physical Growth Record*, Meredith cautioned against the universal use of their charts because the group of children used as the data sample was comprised of "white children of northwest European ancestry living under better-than-average conditions" and did not represent a large swath of America's population.[46] He suggested school programs employ additional charts or make their own when assessing non-white children. At the same time, Meredith was comfortable with the use of his charts when measuring working-class white children. He, like others in their field, believed that the exclusive data set did not

[45] Meredith, 881.

[46] Ibid.

inappropriately skew curves serving for norms on charts; rather, the upper-class white children provided a type of optimal norm.[47]

The Stuart-Meredith charts had a profound impact on the measuring of children. Otherwise known as the Harvard-Iowa charts, these diagnostic tools became common fixtures in schoolrooms, pediatric offices, and public health clinics and replaced the Baldwin-Wood charts from the early part of the century. Up until the mid-1970s, school programs continued to rely on the Harvard-Iowa charts in health examinations. Pediatricians also gravitated to them as diagnostic tools as they became familiar with the charts in school. Pediatric textbooks during the 1950s, 1960s, and 1970s included their own variation of the Stuart-Meredith charts. Different from those featured in *The Physical Record*, height and weight charts found in pediatric textbooks used percentiles as curved-lines or standard-deviations to represent normal theoretical growth patterns instead of zones, which lent themselves to more rigorous analysis of measurements. Also, data from Stuart's growth surveys were added into the mix as data from the Harvard School of Public Health Longitudinal Studies stood for norms for children from birth to five years. Ironically, the Harvard Study was based on values from working-class Boston children and not middle-class children from Iowa, which in some way diversified the data but also added to the confusion because the norms seemed disjointed between infants and children. The Stuart-Meredith charts were used by physicians and public health officials in the United States and abroad for nearly thirty years.[48]

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[47] Ibid., 884.

[48] Tanner, 491-492.

Still other charts and methods tried to play a role in the assessment of children's growth and health. Two additional diagnostic tools in assessing children's growth during the 1950s were William Sheldon's body type formula and Norm Wetzel's grids. According to historian Heather Prescott, psychologist William Sheldon's method of sizing up body type and predicting personality was one of the most popular in the U.S. for adults and by the mid-1950s, it had trickled down to children. Sheldon suggested everyone could be categorized into one of three basic body types – endomorph (fat, round), mesomorph (muscular), or ectomorph (skinny) – and that each body type had its own personality – fun-loving, aggressive, and sensitive.[49] Pediatric textbooks in the 1950s and 1960s featured images of Sheldon's classification. A boy with a pudgy middle exemplified endomorphy, a proportionate boy represented mesomorphy and a fragile small boy served as the example of ectomorphy. The text linked each body type to a specific growth speed and height. Endomorphs matured early and were tall into late childhood, ecotomorphs developed later and were shorter longer, and mesomorphs were somewhere in the middle.[50] While some child development experts took issue with Sheldon's theory being applied to children and adolescents, these three categories considered an overall composite instead of analyzing single measurements, and insinuated a correlation between stature and personality, which based on this classification system interpreted short statured boys as sensitive, fragile, late bloomers.

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[49] Heather Munro Prescott, "'I Was a Teenage Dwarf': The Social Construction Of 'Normal' Adolescent Growth and Development in the United States," In *Formative Years: Children's Health in the United States, 1880-2000*, edited by Alexandra Minna Stern and Howard Markel (Ann Arbor: University of Michigan Press, 2002), 160.

[50] Waldo Nelson, *Textbook of Pediatrics, with the Collaboration of Eighty-One Contributors* (Philadelphia: Saunders, 1959), 44.

Wetzel's method was another measuring program, which stressed a holistic approach when evaluating growth and development. Since the 1930s, Dr. Norm Wetzel was a vocal opponent of the current state of measuring children against charts because most of them did not adequately consider growth speed and failure. Using complex mathematical equations, Wetzel had created grids that were composed of channels instead of single curves that represented normal growth. The Wetzel Grid planned to correct this oversight as it valued measurements that indicated a child's growth speed, size, and shape.[51]

While the Wetzel Grid offered a new way to think about normal growth, it endorsed a preference for the average and disdain for the short. In an April 1950 *Life* magazine article titled, "How Children Should Grow: Grid discards 'average size,' charts progress of seven body types," images served to help the reader gain a better sense of the Wetzel method, including one featuring a replica of the grid with children standing on it to represent the seven different channels [A1-A3, M, and B1-B3]. The better-looking child represents "M" or the average channel and the short stocky child represents "A1," a less desirable norm.[52] Another image further stigmatizes the "Channel A1" with a short stocky child. A photo of female pole climbers was intended to represent the relationship between stature and physical performance. While each girl represented classic performance from her channel, the girl representing the average channel performed best, while the girls standing in for "A3," the channel of the stocky, was unable to get off the

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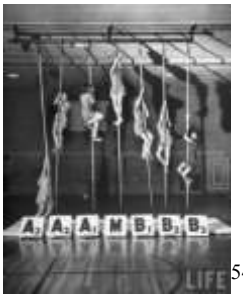
[51] Harold C. Stuart and Howard V. Meredith, "Use the Body Measurements in the School Health Program," *American Journal of Public Health and The Nation's Health* 36, no 12 (December, 1946): 1370-1371.

[52] "How Children Should Grow: Grid Discards 'Average Size,' Charts Progress of Seven Body Types," *Life*, April 10, 1950, 80-81.

floor and onto the pole. Although Wetzel aimed to even out the playing field when it came to interpreting a child's growth as normal and healthy, the descriptions of the channels revealed his bias for the average, or what Wetzel called, "M."[53]



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Even though the Stuart-Meredith charts did beat out Sheldon's system and Wetzel's grid in terms of longevity and use, the latter two tools spoke to a growing interest in the causative relationship between mental health and physical growth in the field of child development. While Sheldon's contribution to the discussion was somewhat simplistic since he linked personality traits to each of his classifications, Wetzel's contribution to the discussion was more sophisticated. He suggested that his grids worked "as a sort of alarm box for many physical defects," because they took into consideration growth speed and therefore were able "to prove for the first time that normal physical growth can actually be retarded by emotional disturbance."[55] Unfortunately, the cumbersome mathematical demands required by the Wetzel grid along with a couple of miscalculations he made caused the demise of his system of tracking the growth and

[53] Ibid., 82.

[54] Ibid.

[55] Ibid., 79.

health of children.[56] Nevertheless, the association between growth and one's psychological state continued to be a hot topic in the field of child development in part because of the growing popularity of psychoanalysis.

Inferiority Complex

In mid-twentieth century America, a psychoanalytical revolution in the understanding of human behavior emphasized a body-mind connection, which inevitably contributed to the reframing of short stature in boys as a psychosocial risk factor. Alfred Adler was first to postulate that a stunted child could suffer from an inferiority complex. A practitioner and theorist of the "new psychology," psychoanalysis, Adler worked with Sigmund Freud in Vienna until he established a rival school based on the idea that a sense of inferiority drives people and not the libido as Freud suggested. Adler's psychoanalytical theory of the human drive was known as individual psychology.[57] He suggested that the sense of inferiority was rooted in communal living because the group dynamic caused every person to strive "for a measure of security and totality which shall make continued existence tolerable, a fate which is inextricably linked to the fate of his group."[58] According to Adler, feelings of being inferior began in infancy and continued throughout one's life. If not dealt with appropriately, this powerful agent in personality development could create what he called an "inferiority complex."[59]

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[56] Stanley Marion Garn, "Physical Growth and Development," *American Journal of Physical Anthropology* 10, no. 2 (June 1952): 186-187.

[57] H. M. Kallen, "Psychology Without Compromise," *The Dial*, March 1925, 236.

[58] Review of *Problem Children*, by Alfred Adler, *The British Medical Journal* 2, no. 3684 (August 15, 1931), 300.

[59] Lewis Way, *Alfred Adler: An Introduction to His Psychology* (New York: Pelican Books, 1956), 6.

During the mid twentieth century, Adler's ideas swept the nation and his term "inferiority complex" became part of America's jargon,[60] as it jumped from psychoanalytical discourse to everyday banter. Inferiority complex was used to explain a whole host of phenomena. In 1940, the *Washington Post* reported on how some religious figures used it to explain the trouble behind the country's inability to recover from the Great Depression as a way to get parishioners to understand that "America needs to lose its national inferiority complex if it is to conquer the 'giants' of unemployment, overproduction, poverty, insecurity and cynicism."[61] During the war, journalists reported on the Japanese character as being one based on an inferiority complex, which caused them to be outstandingly courageous in combat but unable to face their own shortcomings.[62] It brought levity to pressing situations such as race relations in the United States. A cartoon featured in the African-American newspaper, the *Chicago Defender*, should a white woman teaching a classroom of African American women at the "utilities company cooking school" where the lesson for the day was "Southern Fried Chicken." The caption read: "Gee ladies, all of a sudden I've got an inferiority complex!"[63] By the mid-1950s, inferiority complex worked as a linguistic device, which implied feelings of being mediocre and the mishandling of these emotions at any scale.

Adler was particularly interested in early childhood development and his interpretation of how children dealt with inferiority complexes changed the way

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[60] Margery Mansfield, "Understanding Adler," *Forum* 79 no. 4 (April 1928): XII.

[61] "Faith Needed in This Age, Clerics Say," *Washington Post*, August 5, 1940, 11.

[62] "Can Japan Take It?" *Washington Post*, April 23, 1942, 14.

[63] Jay Jackson, Comic 4, *Chicago Defender*, August 19, 1944, 13.

Americans understood, treated, and dealt with biological differences in children.[64] Adler argued that children were not immune to inferiority complexes. He, like other psychoanalysts, believed that by age five, a child was set "toward success or failure," and for Adler that meant that an inferiority complex in childhood could have a lasting impact throughout one's life.[65] The child, according to Adler, was a prototype, which was "like an unripe fruit, if there is some trouble with it, if there is a worm, the more it develops and ripens the larger the worm grows."[66] Children with biological deficiencies were particularly prone to a disastrous adulthood if they did not deal with their inadequacies with a professional psychologist. According to Adler, "the child who is born with imperfect organs…immediately feels inferior, feels always in danger, hesitates to meet any new situation and is anti-social.[67] These children, and anyone facing feelings of inferiority, had two options. They could address their feelings with a professional who would help them get to the underlying issue, a method Adler termed "useful," or they could overcompensate for their perceived inadequacy by succeeding with something other than what was causing them to feel inferior, a tactic he referred to as "useless."

While his terminology of useful or useless tactics did not catch on, Adler's example for a "useless" approach in dealing with an inferiority complex related to small stature would end up having a profound impact on people's perception of short men. In

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[64] Alfred Adler, *The Science of Living* (Garden City: Garden City Publishing Company, 1929), 173.

[65] Genevieve Forbes Herrick, "Holds Plane of Life is Fixed in First 5 Years," *Chicago Daily Tribune*, February 16, 1927, 33.

[66] Adler, 181.

[67] Herrick.

his book *The Science of Living*, Adler clarified his notion of a useless approach by describing a case study of a short boy acting like Napoleon in order to compensate for his feelings of inadequacy. According to Adler, this boy exhibited an inferiority complex when he slept "with arms crossed on his breast, like Napoleon."[68] Researchers had observed the boy's unusual bedtime posing during a sleep study and after investigating further, they realized that "the boy was actually imitating his teacher that he adored but due to a lack of funds he was not able to continue his education." Once he left school his family made him work in a restaurant "where the patrons had all derided him because he was undersized."[69] The boy's inferiority complex was rooted in his small stature, and he had attempted to escape feelings of humiliation in his sleep by acting like his favorite teacher, who happened to have similar mannerism to Napoleon, according to the researchers. The boy's actions, the researchers' interpretation, and Adler's assessment of this boy's behavior and his previous psychoanalytical interpretation of Napoleon as having a psychological complex gave the foundation for the phrase later used to express short men's angst: Napoleon complex.[70] Although the term had been used before, it did not necessarily refer to short men acting cocky because they were making up for their stature.[71]

Parenting Advice and Psychoanalysis

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[68] Adler, 93.

[69] Ibid., 94-95.

[70] Ibid. and "Dr. Adler on Complexes," *Los Angeles Times*, February 17, 1929, B4.

[71] Christine Sadler, "Officials War Raid Wardens Against 'Napoleon' Complexes," *The Washington Post*, January 27, 1942, 26.

The influence of psychoanalysis on parenting advice caused increased concern over the psychological damage wrought by biological abnormalities in children. Beginning in the late 1930s, as infant mortality rates continued to decline, parents worried more about their children's mental health and the impact that childhood experiences had on their adult lives – a trend complimented by this new psychology. A 1951 comic from *Los Angeles* made light of how psychoanalytical notions, such as the inferiority complex, reframed parent-child relations. In it, the father rolls up his sleeve with the intention of disciplining his son who has made a mess, but his facial expression shows he is worried about the repercussion. The short little boy with a big mouth reminds his dad that the lasting negative impact of hitting him would cause an inferiority complex. The comic's caption reads, "[g]o ahead, go ahead, give me an inferiority complex!"[72] With psychoanalysis, one wrong parental move and the child would be damaged forever. This parenting trap placed common childrearing actions in contempt and new stress on first-time parents. In a 1950 *Life* magazine article titled "How to Survive Parenthood," journalist Robert Coughlan played off psychoanalysis' popularity by calling the palpable level of parental anxiety prevalent in post-World War II America "neuroses-neurosis."[73]

During the 1930s, psychoanalysis brought a new chapter to expert parenting advice in the U.S. In the beginning of the twentieth century, experts suggested that mothers, due to their intuition and Christian ethics, knew best when it came to parenting.

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[72] Comic 24 – No Title, *Los Angeles Times*, November 4, 1951, J31.

[73] Robert Coughlin, "How to Survive Parenthood: Theories on How to Raise Children Have Come Full Circle as Parents Get 'Neuroses-Neurosis' Wondering What to do with and to the Kids," *Life*, June 26, 1950, 112.

A mother was told to trust her instincts, conduct her affairs in an honorable way, love her children, and reward good behavior and pray for "divine intervention" when these tactics failed.[74] In the 1910s, the tide turned. Experts urged mothers "to put their children on a strict schedule and to punish them when they were wrong."[75] During the 1920s and 1930s, these ideas were elaborated and made more rigorous by John B. Watson, a behaviorist and psychiatry professor at John Hopkins. After observing children in the field, Watson conducted an experiment on a child to determine the possibility of conditioning children. Known as the little Albert experiment, Watson's experiment on the son of an employee of the Harriet Lane Home for Invalid Children led him to postulate that the human infant was born with three emotions, fear, love, and anger, and the rest of the child's personality was a result of his upbringing. Through the many articles he wrote for popular journals and his 1928 book *The Psychological Care of Infant and Child*, he encouraged parents to treat their children like young adults, which meant teaching them how to adhere to a strict schedule, giving them handshakes instead of hugs, and letting them resolve difficult moments on their own. Their success in adult life depended on them learning independence and adhering to schedules. Watson speculated that this type of parenting would be successful because children were universally all the same and even predicted that if parents adhered to his program its success would bring an end to marriage and families living in separate dwellings.[76]

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[74] Ibid., 116.

[75] Ibid.

[76] Ibid.

While parental advice based on behaviorism found an audience in women's magazines during the 1920s, its popularity started to decline during the 1930s. In the 1920s, 100% of the articles featured in three of the most popular women's journals (*Ladies Home Journal*, *Women's Home Companion*, and *Good Housekeeping*) advocated for some type of behaviorist advice for parents, but by the 1930s the tone of the articles was changing. Only 75% of the articles featured any type of let-them-cry-it-out theory, and by 1945, no article advocated for an upbringing inspired by the theories of behaviorism.[77]

A kindler and gentler approach began to replace the strict regimen of behaviorism during the 1930s as some advice books promoted hugs not handshakes, stressed happiness over regimen, and celebrated the differences found in children. In a 1936 advice book titled *Health: Physical, Mental, and Emotional*, the authors declared "there is no average baby … the individuality of each one is manifest both in his physical and mental growth and in his development … What a stupid world it would be if every child conformed perfectly to a set pattern! A healthy baby is a happy baby." [78] The book stressed the importance of providing the right guidance to children so they could learn to make healthy choices. The focus was to guide the parent to guide the child and used psychoanalytical theory in its approach.

Psychoanalysis favored understanding over training when it came to helping children learn from challenges that arose from being biologically different. This 1936

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[77] Celia B. Stendler, "Sixty Years of Child Training Practices," *Journal of Pediatrics*, 36, no. 1 (1950): 125.

[78] Richard M. Smith and Douglas A. Thom, *HEALTH: Physical, Mental, and Emotional* (Boston and New York: Houghton Mifflin, 1936), 13.

advice book also discussed the issue of physical difference by stressing that "[w]hether he is hard of hearing, cross-eyed, lame, undersize, or deformed in some way … the child may become extremely sensitive regarding the handicap, and feel inferior because of his inability to compete on an equal basis with his companions.[79] Hence, it was up to the parents to get the child to "reach the point of appreciating his abilities and trying to use them in the best way, and of admitting his shortcomings and trying to improve."[80] Throughout the 1940s and 1950s experts continued to stress the link between psychological troubles and physical disabilities and to champion a level-headed approach when dealing with biological deficiencies. They emphasized parents' responsibility to teach and allow the child to be happy so s/he would grow to accept his/her somatic reality so that s/he would not become a neurotic adult. During this time period, psychoanalysis caught the attention of child development experts eager to offer parents a modern way of childrearing that valued personality development, emphasizing good emotional health through the feeling of security rather than imitating parents' good behavior.[81]

Inspired by psychoanalysis, the widely popular *Common Sense Book of Baby and Child Care* by Dr. Benjamin Spock espoused the importance of personality development by making children feel safe and loved, the role of mothers in helping their children grow, and the expertise of the pediatrician. Written in a conversational tone, the book began with the phrase, "trust yourself, you know more than you think."[82] With lines such

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[79] Smith and Thom, 223.

[80] Ibid., 226.

[81] Stendler, 132.

[82] Benjamin Spock, *The Common Sense Book of Baby and Child Care* (New York: Duell, Sloan and Pearce, 1957), 1.

as this, Spock empowered mothers without disturbing the expert role pediatricians played in childrearing. Spock encouraged mothers to observe their children and then to parent in response to them while the pediatrician oversaw the whole situation. He stated, "don't be afraid to trust your own common sense. Bringing up your child won't be a complicated job if you take it easy, trust your own instincts, and follow the directions your doctor gives you."[83] First released in 1946, *Common Sense* quickly became a best seller and by 1950, over a million copies were sold annually.[84]

Though Spock championed parental common sense, he cautioned against parents' intuition in overcompensating for their child's physical difference. His advice was that although "[a] defect quite naturally upsets the parents to some degree," they must "treat him naturally."[85] This Adlerian approach encouraged parents not to overreact or the child might develop a complex. According to psychoanalysis and Spock, a parent's failure to accept a child's biological abnormality had disastrous effects on that child's emotional health. Spock illuminated the importance of parents being accepting of their children's "handicaps" in an example highlighting how a mother and father influenced their short son's self-perception. The story featured a ten-year-old boy who was shorter than his eight-year-old sister. Spock stated that the parents saw this vertical difference as "a real tragedy," and took their son to a series of doctors who agreed that their the boy was short for no pathological reason. The parents overreacted by making their son eat more,

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[83] Spock, 3.

[84] Rima D. Apple, *Perfect Motherhood: Science and Childrearing in America* (New Brunswick, Rutgers University Press, 2006), 117.

[85] Spock, 578.

shielding him from his true stature in relation to his sister or other boys, and reminding him of his intelligence.[86] Instead of accepting his height and addressing his short stature directly, the parent projected how devastated they were about their son's height. Spock suggested, "[t]here is enough rivalry among boys so that an individual who is short feels some disappointment, anyway. But the two factors that make the biggest difference are the boy's general happiness and self-confidence, and how easily the parents accept his shortness."[87]

Mothers read Spock. According to historian Rima Apple, they wrote about his doctrine in letters to the Children's Bureau, reported on their positive experiences with his advice in women's magazines, and showed their appreciation for him in surveys.[88] While Spock's advice book might have calmed anxious first-time parents' nerves by championing their hunches, promoting play and fun time, and touting the benefits of hugs from Mom and Dad, his set of guidelines offered little wiggle-room when it came to parenting children who were biologically different, including short-statured children. Parents were advised not to overcompensate for any deficiencies and to teach their children to accept their bodies, which were difficult rules for some moms and dads to follow.[89]

Effective Human Growth Hormone Therapy

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[86] Spock, 580-581.

[87] Ibid.

[88] Apple, 108.

[89] T. R. Van Dellen, "How to Keep Well: Tallness and Shortness," *Chicago Daily Tribune*, October 31, 1958, 10.

When it came to short stature, pharmaceutical companies tried to help concerned parents by developing a drug for children suffering from short stature due to growth hormone deficiency. During the 1950s, pharmaceutical giants continued to pump money and resources into growth hormone [GH] research and development, which created a profit-driven relationship between academia and the corporate world. Some researchers, including University of California's Dr. Choh Li, made the best of this funding and simultaneously worked with multiple companies on a series of projects. For example, Li collaborated with Dwight J. Ingle of the Upjohn Company on a project to experiment with ACTH (adrenocorticotropic hormone) and GH after receiving a grant for twenty-five thousand dollars from Merck Pharmaceuticals for his work on ACTH and so-called "other hormones."[90] Li's next breakthrough in GH research came with the assistance from another pharmaceutical company, Eli Lilly.

During the early 1950s, Li postulated that growth hormone's therapeutic ineffectiveness in humans had to do with its species-specificity. He began working with monkey pituitaries supplied to him by Eli Lilly to help prove his hypothesis. Lilly had supported Li's work on ACTH beginning in the fall of 1951, and by the mid-1950s it was also backing his GH research. Li reported his promising results with retrieving clinically effective growth hormone from monkeys to Dr. Otto K. Behrens of Eli Lilly in 1955 and appealed to him for more glands. Li stated,

> Perhaps I should point out to you once more one of the reasons we are interested in getting monkey growth hormone is that clinical data so far reported in the literature using bovine growth hormone on its growth-promoting effect in human subjects is very discouraging. It is entirely

[90] Letter to Professor Choh H. Li from Dwight J. Ingle, February 14, 1951, Carton 2, Folder: Ingle, Dwight Upjohn Co, and Contract, March 24, 1950, Carton 2, Folder: Major Randolph T Merck & Co, Choh Hao Li Papers.

> possible this might be due to the species difference. Monkey growth hormone should be investigated to elucidate this point.[91]

He was right on track.

Eli Lilly met Li's request and those of other scientists throughout the country working on similar GH research. In 1955, as a byproduct of using monkey kidneys in its development of a polio vaccine, Lilly had enough monkey brains to share. By the summer of 1956, results started trickling in. Lilly received reports from A. Wilhelmi, the scientist who had fine-tuned Li's purification process of growth hormone, of his successful efforts in purifying monkey growth hormone, and from Knobil, a researcher at Harvard who was experimenting with its physiology.[92] Instead of informing Eli Lilly directly, Li published his findings in *Science*. His article "Preparation and Properties of Growth Hormone from Human and Monkey Pituitary Glands" postulated that beef growth hormone had failed to work in humans because it was chemically different to the one found in men.[93]

Performing and reporting on a successful clinical trial using cadaver human growth hormone (cHGH) to promote vertical growth was the next step in establishing effective human growth hormone therapy. Li had difficulty securing enough human growth hormone to conduct the experiment since Lilly had denied his request for human pituitary glands because he previously published his findings without first informing

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[91] Letter to Professor Choh H. Li from E. C. Kleiderer, September 4, 1951, Carton 2, Folder: Eli Lilly and Co, and Letter to Dr. Otto K. Behrens to Choh Hao Li, May 10, 1955, Choh Hao Li Papers.

[92] Letter to Dr. Choh Hao Li from Otto K. Behrens, May 24, 1956, Choh Hao Li Papers.

[93] Choh Li and H. Papkoff, "Preparation and Properties of Growth Hormone from Human and Monkey Pituitary Glands" *Science* 124, no 3235 (December 1956): 1293.

Behrens.[94] Li's next move was to work with Dr. Robert Escamilla of San Francisco who helped him find a human subject and enough HGH from pituitary glands extracted at autopsies conducted at Napa State Hospital. Together they treated a girl whose growth was compromised by a prolonged infection at six months of age.[95] Under their care, she began to grow, and by the fall of 1958, Li was ready to publish his findings and get credit for orchestrating the first successful case of effective human growth hormone therapy.

However, this was one growth hormone research race that Li lost. Dr. Maurice Raben, a physician and chemist at Tufts University, published a paper in August 1958 about his work with pituitary dwarfs at the New England Center Hospital, which described the successful treatment of a 17-year-old boy with HGH. In order to rush his findings to press, Raben submitted his report as a letter to the editor of the *Journal of Clinical Endocrinology and Metabolism*. In it, Raben reported that after ten months of human growth hormone therapy, a 17-year-old male pituitary dwarf increased 2.1 inches in height, representing a growth rate slightly greater than that of a normal child of the same height.[96] Though the increase in height with HGH might not be considered extraordinary in today's terms, Raben's letter evidenced the first effective case study in human growth hormone therapy. Dr. Choh Li first shared his findings at a conference later that year when he informed attendees that he had successfully treated a dwarf 11-

[94] Letter to Dr. Choh Hao Li from Otto K. Behrens, May 27, 1957, Choh Hao Li Papers.

[95] Letter from Robert Escamilla, September 25, 1958. Carton 4, Folder: Escamilla, Robert, Choh Hao Li Papers.

[96] Maurice S. Raben, "Treatment of a pituitary dwarf with human growth hormone," *The Journal of Clinical Endocrinology and Metabolism* 18, no. 8 (August 1958): 901-903.

year-old girl with cHGH. Under his care, she grew more than three inches in six months after years of no growth.[97]

Conclusion

Mainstream media reported on the first cases of successful HGH therapy with articles entitled "Hormones from dead persons' brains are making dwarfed children grow"[98] and "Find Pituitary Hormone Aids Girl's Growth."[99] These initial stories highlighted the tight supply and high cost of the hormone as well as the promise of helping small children grow faster but not ensuring "basketball players par excellence."[100] Journalists also reported on the use of both girls and boys as human subjects for these HGH clinical studies. Nevertheless, HGH therapy harbored a gender bias. Boys had been targets for growth-promoting therapy since the 1940s as gendered growth charts, diagnoses, and treatments framed the medical quest to treat short-statured children along gender lines. Psychoanalysis also contributed to the perception that short stature was more problematic for boys than for girls. Throughout the 1950s, evidence mounted about the perils of short stature for males. Based on examples in parenting books and Adlerian texts, boys were more susceptible to an inferiority complex due to short stature, and with only a limited amount of human growth hormone available, who wouldn't want to save a boy from a Napoleon Complex and society from someone with that complex?

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[97] "Dwarf Girl, 11, Grows 3 inches in 6 months," *Los Angeles Times*, August 24, 1958, A.

[98] Alton L. Blakeslee, "Hormones From Dead Persons' Brains are Making Dwarfed Children Grow," *The Washington Post*, March 29, 1958, A1.

[99] "Find Pituitary Hormone Aids Girl's Growth," *Chicago Daily Tribune*, August 24, 1958, 26.

[100] Blakeslee.

Chapter 4 - "We can end dwarfism!"

Living the Promise of Human Growth Hormone Therapy

On August 22, 1965, the cover of the *Parade* magazine section of *The San Diego Union* featured a smiling boy with the tagline "THIS BOY IS A DWARF" and a declaration in its banner claiming "WE CAN END DWARFISM!"[1] Journalist Lloyd Shearer reported on cover boy Harold Riley, as one of the lucky "little people" being "treated with human growth hormone" [HGH].[2] A junior in high school, Harold had "top grade" health and intelligence but was only 4-feet-5, even after he had grown more than five inches in the last two years due to the "miracle hormone" HGH.[3] Harold's treatment began after his mother first noticed his clothing size had not changed in years and took him to physician after physician, until a pediatrician finally diagnosed him with a growth hormone deficiency. The pediatrician referred Harold to a doctor who had a friend who worked at the National Institutes of Health (NIH). The insider was able to connect the Riley family with a medical expert receiving human growth hormone for clinical research from the NIH-affiliated National Pituitary Agency (the agency that ran the collection, processing, and distribution of HGH in North America from 1963 to 1985). Once treatment began, Harold experienced a two-year growth spurt.

The article reported how an avoidable limited supply of HGH had hindered the treatment of dwarfed children like Harold. Shearer argued that better access to the bountiful supply of HGH could cure the estimated 10,000 children in the U.S. whose

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[1] Lloyd Shearer, "We Can End Dwarfism!" *San Diego Union*, *Parade Magazine* August 22, 1965, cover, MSS 72, Box 13, Folder 1, Mandeville Special Collections Library, University of California San Diego.

[2] Ibid., 5.

[3] Ibid.

"height-shortage was caused by a dysfunction of the pituitary gland." Instead, therapy often experienced a series of abrupt stops due to unnecessary HGH shortages, as was the case for Harold. Mrs. Riley's frustration over the sporadic supply was included in the article. She stated, "if we can just get a steady supply of it, he stands a very good chance of growing another 8, 10, maybe 12 inches. Whenever I get a supply from the agency, I give him the shot myself…Harold is so close to making 5 feet, I just know he will. There's nothing I wouldn't do to normalize his life."[4]

This human-interest story gave readers hope and advice on how they too could help these needy children by willing their pituitary glands and encouraging friends and relatives to donate their glands to the National Pituitary Agency. Readers were also encouraged to volunteer to work with pathologists in their local neighborhood hospitals to contribute pituitary glands. The need was great, as the supply remained inaccessible because of people's failure to donate their glands. The article pointed out that approximately 1,500,000 people had died in 1964, yet only 50,000 pituitaries were collected. Shearer pleaded with his readers to donate by stating, "if you can, won't you please help, especially before it's too late, and the bones of some undersized boy or girl have fused, forcing the poor child into a life of hellish dwarfism."[5]

Measuring the success of HGH therapy in vertical inches gained, this *Parade* article documents not only Harold Riley's HGH therapy but also the common conflation of growth hormone deficiency and height. A large photo of Harold standing between a boy aged 14 and another boy aged 17 simultaneously displayed Harold's success and need for further treatment. The article also reveals cultural beliefs about the adversity

[4] Ibid., 5-6.

[5] Ibid., 6.

brought on by short stature. To encourage future donors to donate their pituitary glands, Shearer reported on the "waves of anger, pain, and supersensitivity of a child who is not like other children" and the hardships of being small.[6]

Unlike the 1920s, 1930s, and early 1940s when growth hormone products were abundantly available and the early 1950s when physicians preferred to treat short stature with testosterone, the era of clinical-grade cadaver growth hormone starting in 1958 experienced limited supply but theoretically bountiful resources. In order to campaign for more pituitary glands during this time period, promoters and practitioners played into cultural fears of short stature to convince would-be contributors to consider offering their glands to medicine and drew from a growing body of scholarship documenting the stigmatization of short stature in America. During the 1960s and 1970s, child psychology researchers confirmed the damaging effect short stature had on children's school performance and self-identity, sociologists honed in on the discrimination short adult men faced in the U.S., and journalists repackaged their findings as a type of common knowledge regarding the hardships of short-statured boys and men.

Child and adult psychologists, sociologists, and journalists continued to substantiate and articulate cultural concerns over stature through studies and terminology, and the category of short stature received scientific clarity when the federal government funded and spearheaded the creation of one set of growth charts for infants, toddlers, children, and teens. The 1977 National Center for Health Statistics (NCHS) growth charts served as public health instruments and diagnostic tools for physicians to monitor the individual growth of children for nearly thirty years. As new standards further defined shortness and slow growth in children and evidence proving the dreadfulness of short

[6] Ibid.

stature was mounting, HGH therapy seemed to be the only way to save small individuals from a life of "hellish dwarfism." This chapter sheds light on the synergy between the availability of effective HGH therapy, the creation of national standards of growth, sociologists' increased interest in heightism in America, and the upsurge of child psychologists' concern over short stature in childhood from the early 1960s to the early 1980s. It also examines how this mosaic of professional pursuits pertaining to stature provided the perfect tableau for the selling of growth hormone on the free market beginning in the early 1980s – a market which was drastically altered by the Creutzfeldt–Jakob disease (CJD) outbreak linked to cadaver human growth hormone therapy in 1984 and the FDA approval of Protropin, the first synthetic growth hormone product in 1985.

While recent books, including *Our Daily Meds* by Melody Peterson (2008), *The Medicalization of Society* by Peter Conrad (2007), *The Pursuit of Perfection* by David J. and Sheila Rothman (2003), and *Normal at Any Cost* by Susan Cohen and Christine Cosgrove (2009), address various elements of human growth hormone therapy during the cadaver growth hormone era, they undervalue how developments during this time influenced the contemporary HGH industry. They either focus on the making of the deadly version of HGH produced by the NPA, which led to the outbreak of CJD in young adults who had been treated by NPA's HGH, or concentrate on the short supply of the cadaver hormone, a problem which plagued HGH therapy in the U.S. from the late 1950s to the late 1970s.[7] However, if one looks at this period from the vantage point of the

[7] Susan Cohen and Christine Cosgrove, *Normal and Any Cost: Tall Girls, Short Boys, and the Medical Industry's Quest to Manipulate Height* (New York: Tarcher, 2009) and Melody Peterson, *Our Daily Meds: How the Pharmaceutical Companies Transformed Themselves into Slick Marketing Machines and Hooked the Nation on Prescription Drugs* (New York: Farrar, Straus and Giroux, 2008) and Peter Conrad, *The Medicalization of Society: On the Transformation of Human Conditions into Treatable Disorders* (Baltimore: Johns Hopkins Press,

1950s, a different picture is painted. By 1960, many medical experts assumed that while it was difficult to access, a cure had been found for growth hormone deficiency and, to some extent, short stature. Immediately, the quest to synthesize GH and a PR campaign persuading people to contribute to the supply began. Medical experts played into cultural notions of masculinity and stature to encourage people to reconsider their stance on posthumously keeping their organs. In short, those engaged in curing short children believed that modern medicine could and should end dwarfism.

The National Pituitary Agency

Although mainstream media and scientific journals reported on cases of successful HGH therapy during the late 1950s, pediatric endocrinologists and medical researchers struggled to provide patients with treatment and laboratories with enough product for research because human growth hormone was difficult to collect and required an expensive purification process. Consequently, few institutions had the funds, personnel, or facilities to purify growth hormone for clinical therapy or research.[8] Laboratory researchers and clinicians had to personally request HGH from those who had the means to prepare it and were required to collect the pituitary glands on their own.[9] While each phase of the process of producing clinical-grade or research-grade HGH

2007) and David J. and Sheila Rothman, *The Pursuit of Perfection: The Promise and Perils of Medical Enhancement* (New York: Pantheon, 2003).

[8] Letter from Raymond Mellenger to Elizabeth Force, Director of Medical Sciences National Academy of Sciences, July 30, 1973, Committee for Evaluation of National Pituitary Agency Files, National Research Council Division of Medical Sciences Records Group, 1946-1973, National Academies Archives, Washington, D.C. (hereafter cited as Committee for Evaluation of National Pituitary Agency Files).

[9] Letter from Ann Johnson M.D. University of Virginia School of Medicine Department of pediatrics to Dr. Elizabeth Force and Robert T Chatterson, June 26, 1973, Committee for Evaluation of National Pituitary Agency Files.

posed a host of problems, the collection of glands was the most unpredictable stage because "growth hormone was available only through individual arrangements" between practitioners and pathologists.[10] Dr. Solomon Kaplan of University of California, San Francisco, a pioneer pediatric endocrinologist and leader in the field, later remarked that the process was "haphazard" and often provided only "limited amounts of growth hormone to treat the vast number of patients available and in need of this beneficial treatment."[11] Instead of spending time working in the lab or treating patients, Kaplan was busy reminding pathologists of his request, sending them pre-paid mailing containers, and placing follow-up calls to make sure they were sending the pituitaries.[12]

Collection efforts were complicated even further once some researchers decided not to share their inventories and "private entrepreneurs" started vying for a portion of the human reserves.[13] According to experts in the field, Dr. Choh Hao Li had "always had a group of West Coast hospitals collecting fresh frozen glands for him" and gained a reputation for not sharing.[14] In 1960, Li established the first pituitary bank after receiving funding from various sources.[15] The bank's goal was to streamline the collection process and throughout the 1960s and 1970s it collected pituitaries from hospitals throughout the

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[10] Letter from Leonard Sussman to Elizabeth Force, July 11, 1973, Committee for Evaluation of National Pituitary Agency Files.

[11] Ibid.

[12] Ibid.

[13] Letter from Mosher to Elizabeth Force, 1973, Committee for Evaluation of National Pituitary Agency Files.

[14] A. Wilhelmi, his responses to questions for Panel I, Folder, Wilhelmi, Dr. A, Committee for Evaluation of National Pituitary Agency Files.

[15] "News Notes" *Science*, *New Series* 132, No. 3422 (July 29, 1960): 284.

Bay Area and "foreign sources," including hospitals in "Hong Kong, Manila, Mexico City, and Panama City."[16] The glands were used for basic research and clinical care. In particular Li was eager to replicate human growth hormone in the laboratory as the limited supply had thwarted effective therapy and research. His collecting efforts left other scientists and clinicians out of the loop. In the words of one pediatric endocrinologist, collecting human growth hormone became downright "chaotic" by the early 1960s.[17]

Concerns about the development of a black market and frustration over a lack of available hormone grew during the early years of effective HGH therapy. Medical experts most active in basic and clinical research involving pituitary hormones held meetings sponsored by the National Institute of Health [NIH] to swap techniques for extraction, share research results, and discuss the possibility of creating one nationwide agency. In 1962, they decided to join efforts to coordinate pituitary collection, extraction of hormone, and hormone use by investigators. Drs. Al Wilhelmi of Emory University, Robert Blizzard of Johns Hopkins University, Cho Hi Li of University of California, San Francisco, Maurice Raben of Tufts University, and Mr. Morris Graff from the National Institute of Arthritis, Metabolism, and Digestive Diseases [NIAMDD] created the National Pituitary Agency [NPA].[18] Receiving contract support from the NIAMDD and

[16] "Pituitary Bank Foundation Fifth Annual Meeting – Minutes," September 13, 1967, 3, Folder: Pituitary Bank, Choh Hao Li Papers.

[17] Letter from Dr. H. David Mosier to Elizabeth Force, July 27, 1973, Committee for Evaluation of National Pituitary Agency Files.

[18] They entertained a protocol for the collection, storage and shipment of human growth hormone proposed by Dr. Sanford Steelman of Merck and Co. Supposedly Merck was making "clinical grade" human growth hormone in high yield. Carton 8, Folder: National Pituitary Agency, Choh Hao Li Papers.

backing from the College of American Pathologists [CAP], the NPA standardized the collection, production, distribution, and use of human growth hormone in the U.S. and Canada from 1963 to 1985.[19] For over twenty years, human growth hormone treatment in the United States and Canada was highly limited because NPA-HGH could only be used for research purposes. Consequently, the National Pituitary Agency's cadaver growth hormone program inadvertently universalized the notion that GH availability was restricted and HGH treatment was exclusive.

Encouraging pathologists to extract pituitary glands was not an easy task. The NPA orchestrated an outreach campaign, which used a minimal financial reward and emphasized the clinical use of HGH on hypopituitary dwarfs to encourage pathologists to retrieve human pituitary glands at autopsies. Pathologists were paid $2 per gland by the NPA and were reminded about this minimal bounty and dire need for HGH in basic and clinical treatment through letters, phone calls, and exhibitions at CAP conferences.[20] Twice a year during the 1970s, the chair of the NPA wrote an appeal letter for the glands and emphasized how pathologists' efforts would help dwarfed children.[21] For example, the 1973 letter from NPA chair Dr. Salvatore Raiti remarked how the increased number

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[19] S. Douglas Frasier, "The Not-So-Good Old Days: Working with pituitary growth hormone in North America, 1956 to 1985," Supplement to *Journal of Pediatrics* 131, no. 1 part 2 (July 1997): 52.

[20] Letter from Salvatore Raiti to Elizabeth Force pertaining to specific questions pertaining to the evaluation, September 11, 1973, File: NPA Background, Committee for Evaluation of National Pituitary Agency Files.

[21] Ibid.

of glands translated into more children treated and thanked the pathologists for a job well done on behalf of "the hypopituitary dwarfs of the United States." [22]

Parents of growth-hormone-deficient children also helped in the collection of pituitary glands. During the first twenty-five years of cadaver human growth hormone therapy, it took up to 50 to 200 extracts from human pituitary glands to provide one child with one year of treatment, and parents of potential candidates scrambled to help clinical researchers, serving as their HGH providers, to secure enough supply for their children.[23] In 1965, these parents came together and created Growth Inc., which was later renamed the Human Growth Foundation (HGF).[24] Their goals were to provide a support system for families, educate the public on growth and development, keep current on the scholarship of human growth hormone therapy and the psychological impact of short stature on children, and help increase the supply. Members encouraged local hospitals, pathologists, and friends to donate pituitaries for the cause and participated in a hand-delivery service, which was national in scope. Delivery was facilitated by two of the founders of HGF, Fred and Gwen Mahler. They were parents of two of the first handful of children to receive HGH therapy in the U.S. and worked for TWA.[25] Fred was a pilot and Gwen had worked for the airline before she became a mother. The airline sanctioned the use of their planes in the rounding up and delivery of glands to the National Pituitary

[22] Salvatore Raiti, National Pituitary Agency letter "To All Pathologists" March 15, 1973, Committee for Evaluation of National Pituitary Agency Files.

[23] Betty Latty, "Rare Treatment Helps Dwarfed Children Grow," *Los Angeles Times*, June 5, 1970, 11.

[24] Susan Cohen and Christine Cosgrove, *Normal at Any Cost : Tall Girls, Short Boys, and the Medical Industry's Quest to Manipulate Height* (New York: Jeremy P. Tarcher/Penguin, 2009), 76.

[25] Latty.

Agency; as Human Growth Foundation chapters sprouted up across the country, additional members participated in the transportation of glands. Their efforts were invaluable to the process, as HGF members routinely collected batches of glands from morgues and then stored them in their personal refrigerators until they were able to ship them in special containers to the National Pituitary Agency.[26]

Once glands were accumulated, they were collected, processed, and distributed by one of four laboratories: Dr. A. Wilhemi's lab at Emory, Dr. Maurice Raben's lab at Tufts University and the New England Medical Center, Dr. B.B. Saxena's lab at Cornell University in New York City, or Dr. Lee's lab at a V.A. facility in the Bronx.[27] While Dr. Li's pituitary bank did distribute human growth hormone, it did not do so through the NPA. Not all of the labs working with the NPA extracted HGH from pituitary glands throughout the entire duration of the cadaver Human Growth Hormone program; Wilhelmi's lab at Emory was the most productive. It was common practice to pool glands and make batches of HGH, with little recording of the origins of the glands and final destination of the batches. The hormone was extracted from the pituitary glands and reconstituted into a powder. Hyland Laboratory in Costa Mesa, California, carried out vialing of HGH for clinical use. Mannitol was added to make it soluble and ready for injection.[28] Since there was no standard method, each procedure yielded different grades

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[26] Mariah Heath Mundy, "Undersized Boy Helps Others Like Him," *New York Times*, Aug 20 1972, 77.

[27] Report, "Operational Procedures in Brief," Committee for Evaluation of National Pituitary Agency Files.

[28] G. Donald Whedon, "Opening Address," in *Advances in Human Growth Hormone Research: A Symposium held at Baltimore, Maryland, October 9-12, 1973*, Salvatore Raiti ed. (Washington D.C.: DHEW publication (NIH), 1974), 15.

of HGH. Wilhelmi's procedure produced preparations with considerable physicochemical heterogeneity.[29] The variety of glands added to this problem as some were preserved in acetone, embalmed, or frozen with dry ice. While the use of fresh frozen glands would have yielded more growth hormone and physiochemical homogeneity, the National Pituitary Agency worried that a restriction placed on the type of glands gathered would "seriously complicate the collection process."[30]

With various processes and preserves in play, NPA-HGH varied in biological potency and number of antibodies. All NPA growth hormone preparations were antigenic and more than half of the patients treated with them for eighteen months or longer developed antibodies that bound to the HGH. While some of the pediatric endocrinologists who received clinical grade HGH from the NPA further processed the contents of their preparations in order to ensure potency, official accounts indicated that the number of patients who became resistant to NPA growth hormone was relatively small.[31] In fact, initial reports estimated that only 5% of NPA patients had developed such a high number of antibodies that the GH was neutralized.[32] Dr. Wilhelmi also responded to the controversy over the purity of his product by claiming that antibodies resulted in most human growth hormone recipients regardless of what preparation the GH had gone through. Technically, he was correct. Yet the most popular method in Europe,

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[29] Report, Part 3, "B. Quality of Products, A. Human Growth Hormone – Preparation, Structure, Standardization, Distribution," Committee for Evaluation of National Pituitary Agency Files.

[30] Ibid.

[31] S Douglas Frasier, "Clinical use of NPA Human Growth Hormone," Committee for Evaluation of National Pituitary Agency Files.

[32] Report, Part 3, "B. Quality of Products, A. Human Growth Hormone – Preparation, Structure, Standardization, Distribution," Committee for Evaluation of National Pituitary Agency Files.

the Roos method, did not yield the same high rate of antibodies as Wilhelmi's. Wilhelmi continued to use his method for nearly fifteen years, and his version of HGH was distributed throughout North America and the world. Finally, in December 1976, shortly before he retired, he changed to the Roos method, which included an important step in purification known as gel filtration, and the NPA as a whole moved away from embalmed glands since they yielded little to no viable HGH. [33]

Changes in procedure at the Emory lab and in the selection of glands were more important than anyone predicted. In 1978, two years after these alterations were adopted, Wayne V. Moore and Paula Leppert, pediatric endocrinologists at the University of Kansas Medical Center and past recipients of NPA-HGH, wrote an article in the *Journal of Clinical Endocrinology and Metabolism* claiming that NPA's HGH contained only about 30% (monomeric) effective growth hormone, which meant that 70% of the drug given to children probably did not help augment growth. While Moore and Leppert's report questioned the potency of the HGH given, it also raised the question of what else was lurking in the injections. In fact, the drug contained some amount of unidentified material, which in some batches turned out to be deadly. Contents from some of NPA's HGH included prions, which cause Creutzfeld-Jakob Disease (CJD). These prions are folded proteins located in the brain. They cause normal proteins nearby to misfold, and these odd-shaped proteins poke holes in the brain, which cause rapid mental deterioration. While the incubation period can last up until thirty years, CJD is always fatal. It was not until the late 1970s that medical experts and scientists began to understand how CJD was transmitted, and it was not until 1982 that the term prion was

[33] Cohen and Cosgrove, 94- 97.

given to these infectious proteins.[34] All cases of CJD caused by NPA-HGH have been linked to batches produced before 1977, the year before Wilhelmi made his procedure more stringent.[35]

For decades, government agencies, pharmaceutical companies, and pediatric endocrinologists distributed and administered cadaver HGH to children, unaware of the potential dangers. In fact, most of the HGH distributed by the National Pituitary Agency went to "investigative therapy."[36] Researchers had to apply for batches of HGH, even if they themselves were producing and distributing it through the NPA. The application included a description of the project and human subjects involved. It also allowed applicants to request which laboratory they would like their HGH to come from. Two subcommittees reviewed these applications and recommended those they found worthy to the director.[37] While projects varied in scope and content, many focused on treating growth hormone deficient children for their short stature.

Getting cleared for treatment was no easy task. While provocation tests for GH deficiency evolved during the 1960s, 1970s, and 1980s, they often required hospitalization, the repeated drawing of blood, a risky hypoglycemic state, and inconsistent results. Red flags in pediatric care pointing to a growth hormone deficiency have remained somewhat constant. If a child's growth curve flattened, the physician was advised to consider a series of diseases and disorders including GH deficiency. In 1963,

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[34] Centers for Disease Control and Prevention, "CJD, (Creutzfeldt-Jakob Disease, Classic),"August 16, 2012, http://www.cdc.gov/ncidod/dvrd/cjd/

[35] Cohen and Cosgrove, 80-82.

[36] Whedon, 17.

[37] Ibid.

a new chemical method emerged to determine GH levels in a child. Suspected children were placed into a hypoglycemic state and their HGH levels were tested.[38] This type of testing was risky. Children had to be hospitalized during the testing and were given L-arginine or L-dopa to reverse this state. Sometimes children would vomit or go into such extreme hypoglycemia that glucose was needed. In the end, the blood tests often yielded false positives as some children with normal growth hormone levels failed to respond to stimuli. Throughout the 1960s, 1970s and early 1980s other stimulants, such as estrogen, exercise, sleep, glucagon, and propanol were given to encourage a release of growth hormone, all with varied results.[39] Although a blood test result verifying a growth hormone deficiency brought a child one step closer to therapy, a determination of normal or sub-normal growth hormone levels did not necessarily exclude him. Pediatric endocrinologists were aware that the testing was not 100% reliable and the National Pituitary Agency extended the distribution of growth hormone beyond studies only focusing on growth hormone deficiency.

Whether an investigative study focused on growth hormone deficiency or not, height framed therapy and excluded some children who technically were candidates for investigative therapy. In the United States, children received HGH therapy by serving as human subjects, regularly receiving human growth hormone shots as long as there was a supply of the hormone. Some studies stretched out more than ten years, such as the

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[38] International Symposium on Growth Hormone, *Growth and Growth Hormone; Proceedings of the Second International Symposium on Growth Hormone, Milan, May 5-7, 1971* (Amsterdam: Excerpta Medica, 1972), 19.

[39] Solomon Kaplan, M.D., "Chapter 1: Growth and Growth Hormone: Disorders of the Anterior Pituitary, in *Clinical Pediatric and Adolescent Endocrinology*, Solomon Kaplan, ed. (Philadelphia: W.B. Saunders Company, 1982), 35 - 37.

National Collaborative Growth Hormone Treatment Project, and allowed for children to obtain HGH therapy for several years. While other clinical research endeavors were more short-lived, children had the opportunity to continue HGH therapy beyond the scope of the study. Once children completed "the research protocol they were eligible for continued GH treatment within the limitations of the available supply."[40] They received HGH from the NPA, free of charge, for eight months of each year following the study until they reached five feet.[41] The five-feet rule stayed in effect until the early 1980s.[42] Once the supply of cadaver human growth hormone reached a non-critical state, this termination measurement was recalibrated. Boys were allowed to receive NPA-HGH until they were five feet six, while girls was denied treatment once they reached five feet four.[43] While this type of gender-specific guideline restricting girls' access to HGH was new to the NPA-cHGH program, it speaks to a long-standing gendered approach to treating abnormal height in pediatrics.

Cultural notions of masculinity and femininity had played a role in pediatric endocrinology since its inception. Albert Q. Maisel wrote about the history of this field in 1965 and explained why "the correction of abnormal growth had been a goal of medical research" by stating: "[e]xtreme instances of abnormal growth patterns – dwarfism or gigantism – are fortunately rare. But many millions of us are handicapped throughout life by lesser deviations from the norm. The boy who fails to grow beyond

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[40] National Pituitary Agency, Report, Section A: HGH, December 31, 1972, Committee for Evaluation of National Pituitary Agency Files.

[41] G. Donald Whedon, 17.

[42] Frasier, 53.

[43] Ibid.

the height of five feet, for example, is inevitably barred from numerous occupations."[44] While HGH therapy was offered to growth hormone-deficient girls and boys, accounts of this medical regimen featured more boys than girls because they spoke to the cultural notion that being short was a social risk factor for men.

Conforming to social expectations of women, pediatric endocrinologists treated tall girls for height with estrogen beginning in earnest during the 1960s. They understood tallness to be a somatic reality that produced anxiety in girls more so than boys. Instead of being examined and tested for hormonal imbalance, most tall girls did not undergo a physical exam. Pediatric endocrinologists measured their skeletal ages, predicted their end heights, consulted parents, and administered estrogen to promote rapid epiphyseal fusion, which would stop growth prematurely. By the early 1980s, estrogen therapy for tall girls was considered very controversial in the field of pediatric endocrinology not because this dangerous hormonal regimen stemmed from a cultural understanding of femininity, which promoted shorter-than-male stature for women, but because results from the treatment were inconsistent and dosages seemed high.[45] It wasn't that stature was no longer a problem but, rather that the medicine to fix it for girls was.[46]

The Press and Cadaver Human Growth Hormone Therapy

Cultural notions of gender were infused in the press supporting cadaver human growth hormone therapy. Medical experts engaged in HGH treatment and research were

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[44] Albert Q. Maisel, *The Hormone Quest* (New York: Random House, 1965), 15.

[45] Richard E. Behrman, Victor C. Vaughan, and Senior Editor Waldo E. Nelson, *Nelson textbook of Pediatrics* (1979; Philadelphia: W.B. Saunders company, 1983), 43.

[46] Solomon Kaplan, M.D., "Chapter 1: Growth and Growth Hormone: Disorders of the Anterior Pituitary, in *Clinical Pediatric and Adolescent Endocrinology*, ed. Solomon Kaplan, M.D. (Philadelphia: W.B. Saunders Company, 1982), 35 - 37.

influential in the media coverage received by the cadaver human growth hormone program. Reports played into idealized notions of masculinity and its relationship to stature to build the public's compassion for the plight of short children and support for the medical efforts to treat short stature. In articles such as "We can end Dwarfism" during the 1960s and 1970s, reports on NPA-sponsored HGH therapy often included boys' personal stories as they best highlighted the hardships of being a short child, the pending doom of adulthood as a short person, and the promise and frustration that came with the sporadic supply of cadaver human growth hormone.

Articles with titles such as, "Hormone Means Life is Looking Up for Short People," "Children with Growth Ills 'Starve' for Hormone Shots," and "Helping the Little People," featured little boys and the harassment they faced as short boys and potentially as men.[47] In the 1978 *Chicago Tribune* article "Hormone Means Life is Looking Up for Short People," no one boy was singled out; instead, journalist Robert Steinbrook used the impersonal catch-all term "shorty." He pointed out that "at school he is bombarded with taunts of shrimp, small fry, midget, and dwarf." Instead of a happy life, as an adult he was destined to lead "a painful life as a loner, fraught with incredible anxieties about sex and success at work or school."[48] Steinbrook contrasted this harsh reality with the dream of growing taller, which medicine had made possible for children with growth-hormone deficiency. In a 1966 *Los Angeles Times* article, journalist Walter

[47] Robert Steinbrook, "Hormone Means Life is Looking up for Short People," *The Chicago Tribune: Tempo*, May 23, 1978, A1; "Children with Growth Ills 'Starve' for Hormone Shots," *The Chicago Tribune,* September 5, 1971, A5; and "Helping the Little People," *Time*, May 07, 1972.

[48] Robert Steinbrook, "Hormone Means Life is Looking up for Short People ," *The Chicago Tribune: Tempo*, May 23, 1978, A1.

Alvarez reported on the horrors of short stature and how "obviously, a lad who is only 4 feet tall is going to be terribly handicapped and unhappy for the rest of his life, and hence everything possible should be done to make him grow as he should."[49] Other articles referenced the hardships and treatment of specific boys. In the May 7, 1972, issue of *Time* magazine, the story of 14-year-old Erick Carstensen was featured in an article titled "Helping the Little People." Though just a child, Erick suffered discrimination from peers and adults because he was short. The article reported how this 14-year-old felt alienated by other students who excluded him from games and by teachers who mockingly called him "shorty" and harassed "him for his inability to keep up with his classmates in physical education."[50] These stories not only personalized the hardships of being short but also attributed the difficulty of being short to one gender: males.

Articles often measured the success of HGH therapy in vertical inches, which contributed to the conflation of growth hormone deficiency and height. Boys growing taller translated into happiness, improvement at school, and normalcy. In the *Time* magazine article, "Helping the Little People," Erick's medical regimen was framed by his vertical growth. It stated that he had "grown 2 ½ in. (to 4ft. 10 in.) since treatment was started, and the clinic doctors are confident that he will now reach a height of at least five feet."[51] Some articles allowed the patients and the parents of patients to speak on behalf of their progress. In journalist Carolyn Lewis' 1966 article, "Their Hope Grows by the Yardstick," a father of a boy undergoing HGH therapy commented on the benefits of his

[49] "Children with Growth Ills 'Starve' for Hormone Shots," *The Chicago Tribune*, September 5, 1971, A5.

[50] "Helping the Little People," *Time,* May 07, 1972.

[51] Ibid

son's treatment by observing that, "[h]is face just lights up whenever he learns he has grown an eighth of an inch."[52] Reports of vertical sprouter Virgil Anderson Jr. emphasized how his medically-induced height saved his life. Virgil grew eleven inches under the care of Dr. Willard Vanderlaan, head of the Division of Endocrinology at Scripps Clinic of La Jolla, located in San Diego, California. Before treatment, Virgil, was 4 feet 4 at age 15 and experienced "splitting headaches." He was taunted by his peers and adults and was called nicknames like shorty, and "was pretty unhappy with himself."[53] By age 22, his life had changed because he was bigger. At 5 feet 3, he was "a happy, productive man."[54] He worked as an operator of an aluminum shingle-manufacturing machine. Virgil owed his happiness and success to the HGH he received at Scripps Clinic and stated "I would never have been able to make anything of myself without Dr. VanderLaan's help."[55]

The gloom of HGH's sporadic supply loomed over these success stories. The limited supply of HGH was reported as a senseless tragedy since it could be rectified by people choosing to donate their pituitary glands upon their death. Those treated with HGH were referred to as the lucky ones because they had a treatable form of short stature and were able to overcome discrimination by no longer being an object of ridicule. As their stories promoted the medical correction of the body in the name of social acceptance and peace of mind, boys were typecast as having the most to lose if they remained short.

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[52] Carolyn Lewis, Their Hope Grows by the Yardstick, *The Washington Post,* July 1 1965, F5.

[53] Leo Bowler, "Virgil is Proud of 5 feet 3: Scripps Doctors Make Dwarf 11 Inches Taller," *Evening Tribune* San Diego, June 29, 1965, A23, mss 72, box 13 folder1, Special Collections, University of California, San Diego.

[54] Ibid.

[55] Lewis.

The Psychology of Dwarfism in Children

Research conducted by child psychologists imbued these human-interest stories. Initial findings from research in the field revealed that short-statured children tended to act immaturely, suffered from poor self-esteem, and struggled at school. Unlike Alfred Adler's psychoanalytical hunch that short children suffered from an inferiority complex, child psychology research tried to substantiate through data the prevalence of psychological hardships caused by being short. Child psychologists focused on children and adolescents and aimed to identify the cause and the extent of the problems that short children faced. They questioned the psychological seriousness of growth hormone deficiency (GHD) and examined the causal relationship between GHD, learning disabilities, and personality disorders. By the early 1980s, many experts believed that short stature impaired academic performance even though the child had normal intelligence, hindered interpersonal relationships because the child failed to act or was not treated age-appropriately, and caused personality disorders as short-statured children responded to the discrimination they faced in an unhealthy manner. In other words, the field of child psychology provided scientific credence to the notion that size mattered, even for children.

School performance garnered much attention from researchers. Studies throughout the 1960s, 1970s, and early 1980s explored the relationship between poor school performance and short stature. Several studies had found that short children with average intelligence quotients poorly performed at school. They often received poor marks and repeated grades.[56] In a 1964 study conducted by Ernesto Pollitt and John

[56] Ernesto Pollitt and John Money, "Studies in the Psychology of Dwarfism. I. Intelligence Quotient and School Achievement," *Journal of Pediatrics* 64, no. 3 (March 1964): 415-421.

Money of Johns Hopkins University, not one child in their study excelled in school. They interviewed teachers and parents about the study habits and personalities of these children for more insight, and their comments revealed deeper psychological problems at work. One teacher sized up a young student's personality by stating, "it seems that she is shy whenever asked any question: this may be because of her smallness."[57] Another teacher remarked on his second grade male student's study habits: "he tires very easily, his attention span is short, and his physical coordination makes his writing and drawing below average."[58] Pollitt and Money concluded that most of the children they studied were so busy searching for approval from peers and teachers that it interfered with their schoolwork.[59] Subsequent studies came to similar conclusions and made the connection between small stature, poor school performance, and the desire to fit in.[60]

Psychological studies also explored how short-statured children's physical appearance impaired interpersonal relationships and their ability to mature into adults. Studies showed that short children were often treated according to their perceived age rather than their chronological age and that these children often assumed the behavior attributed to the younger age. Their parents made matters worse as they babied these short girls and boys, which strained familial relationships and hindered the children's

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[57] Ibid, 420.

[58] Ibid, 419.

[59] Ibid.

[60] Ruth F. Gold, "Constitutional Growth Delay and Learning Problems," Journal of Learning Disabilities 11, no. 7 (August/September 1978): 36-38.

development because they were not given opportunities to demonstrate their maturity.[61] The evidence demonstrated that short stature and not growth hormone deficiency was to blame for these dysfunctional relationships.[62]

Studies revealed that small children and adolescents had different personalities than their normal statured counterparts. A 1977 article in the *European Journal of Pediatrics* reported on a study conducted by H.C. Steinhousen and N. Stahnke of Children's Hospital at the University of Hamburg, West Germany, which concluded that short children were "were less aggressive, excitable, less conscientious, more tender-minded, less shrewd, more controlled and less tense than their normal peers."[63] The focus of their study was not to substantiate these trends; rather, they aimed to tease out the endocrinological component from these personality traits. They compared psychological findings from children and adolescents with growth–hormone deficiency and multiple pituitary hormone deficiencies and those without any hormonal disorders. They concluded small stature was to blame, not a hormonal imbalance. Additional studies contributed to the laundry list of personal defects, which seemed at times contradictory, including the urge to isolate oneself and "a tendency toward conformity."[64] Again, short stature and not growth hormone deficiency was deemed to lie at the root of psychological disorders.

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[61] Clarissa S. Holmes, Jennifer A. Karlsson, and Robert G. Thompson, "Chapter 1: Longitudinal Evaluation of Behavior Patterns in Children with Short Stature," *Slow Grows the Child: Psychosocial Aspects of Growth Delay, Proceedings of a Symposium Sponsored by The Human Growth Foundation and Serono Symposia, USA*, ed, Brian Stabler and Louis E. Underwood (New Jersey: Lawrence Erblaum Associates, 1986), 7-11 (hereafter cited as *Slow Grows the Child*).

[62] Stabler, *Slow Grows the Child,* 11.

[63] Steinhausen and Stahnke, 268.

[64] Clarissa S. Holmes, *Slow Grows the Child*, 10.

Studies in the early 1980s took this line of analysis even further, stating that children suffering from constitutional short stature (CSS), i.e. short stature with no pathological origin, were more susceptible to psychological problems than GH-deficient children were. In a September 1982 *Journal of Pediatrics* article, Dr. Michael Gordon, the lead investigator and doctor from the departments of psychiatry and pediatrics at the State University Hospital at the Upstate Medical Center in New York, reported on the study of twenty boys and four girls with constitutional short stature. The findings suggested that children with CSS had significantly more behavior problems and less self-esteem than a matched control group with normal height and that these findings were in contrast to recent evaluations of children with growth hormone deficiency. Investigators postulated that children with CSS were more frustrated with being short because they did not know why they were short while the GH-deficient understood the cause of their short stature, received medical care at top-notch universities for it, and remained hopeful that they were going to grow taller.[65]

While having a positive outlook on treatment helped uplift the spirits of children receiving HGH, psychologists worried about the tendency for these patients and their parents to pin too much hope onto the idea that this medicine would facilitate robust vertical growth. Brian Stabler, a child psychologist who was a leading expert in growth disorders in children, observed that short children had a tendency to adapt to their small stature by taking on a "mascot" role. Since HGH therapy usually could only raise a child's height by a few inches, short children lost their identity as mascot but did not gain the total inches they desired and therefore developed what Stabler called an "invisible

[65] Jeffrey F. Popkin and Fred Sassoon, "Heightism and the Short Man: An Exploratory Study," MSW Thesis, University of California Los Angeles, 1977.

handicap."[66] Diane Rotnem, an assistant professor of social work at the Yale Child Center in New Haven, Connecticut, also documented the unexpected outcomes to HGH therapy. She noticed parents and short children had unrealistic expectations of treatment. In her research she found that children who had grown during HGH therapy but who felt they were still not tall enough became "angry, pessimistic, guilty, and negativistic, and felt unacceptable as they were."[67] Due to these findings, some psychologists questioned the usefulness of HGH therapy while others such as Stabler continued to champion the medical treatment as long as physicians helped ground their patients' expectations by framing HGH treatment as a long process to "catch up in height."[68]

As HGH-treated children reached adulthood, psychologists tracked the long-term success of their therapy. The main research question of several studies asked if HGH therapy had saved these children from an adult life of "hellish dwarfism." A team of researchers from Canada's University of Manitoba, Winnipeg, interviewed 116 growth hormone deficient (GHD) adults who had been treated for at least two years with HGH during childhood to see how well adjusted they were. The researchers assessed the subjects' level of education, employment, and marital status and began the study with the hypothesis that these adults were no different from any others. While the GHD subjects had reached a similar level of education as their siblings, fewer of them were employed or married when compared to the general population. The researchers concluded that

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[66] Deborah Franklin, "Growing up Short," *Science News* 125, no. 6 (Feb 11, 1984): 93

[67] Ibid.

[68] C. M Mitchell, et al. "Chapter 8: Psychosocial Impact of Long-Term Growth Hormone Therapy," *Slow Grows the Child*, 108.

while these individuals were deemed to have undergone successful HGH therapy because they grew in height, the overall outcome of their therapy was a failure.[69]

Other studies disputed these findings. Funded in part by the parent-run Human Growth Foundation, a study conducted at the State University of New York at Buffalo and Children's Hospital of Buffalo, New York, found that if treatment began early enough in childhood, and if patients did not suffer from multiple pituitary deficits, then the problems associated with short stature could be corrected.[70] Another study orchestrated by the University of Virginia School of Medicine and Johns Hopkins University School of Medicine, and also funded in part by HGF, claimed that HGH treatment "could be introduced in late childhood with positive psychological as well as physical benefits to many patients."[71] These studies not only revealed another perspective in the long-term benefits of HGH therapy but also demonstrated the influence the Human Growth Foundation in the study and treatment of growth disorders.

The Human Growth Foundation played a role not only in research conducted on the ill-effects of short stature but also in studies on the benefits of HGH therapy. HGF members dedicated themselves to the collection of pituitary glands, the multi-disciplinary study of growth disorders, and one another. Throughout the 1960s and 1970s the organization spread nationwide, and by 1982, more than 600 families were members,

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[69] Heather J. Dean, Terri L. McTaggart, David G. Fish, Henry G. Friesen, "Chapter 6: Long-Term Social Follow-up of Growth Hormone Deficient Adults Treated with Growth Hormone During Childhood," *Slow Grows the Child*, 73-82.

[70] Richard R. Clopper, Margaret H. MacGillivray, Tom Mazur, Mary L. Voorhess, Barbara J. Mills, Chapter 7: Post-treatment Follow-up of Growth Hormone Deficient Patients: Psychosocial Status," *Slow Grows the Child*, 95.

[71] C. M Mitchell, et al. "Chapter 8: Psychosocial Impact of Long-Term Growth Hormone Therapy, *Slow Grows the Child*, 108.

spanning seventeen chapters. They held national meetings, organized local get-togethers, hosted charity events, and provided social services for their children. HGF's activities spanned the spectrum from hosting Super Bowl Sunday parties to coordinating conferences.[72] In 1979, the Human Growth Foundation cosponsored a symposium in Galveston, Texas, with the University of Texas Medical Branch to examine the psychosocial aspects of short stature.[73] HGF parents believed that medical professionals needed to better understand the hardships their short-statured children endured and to do what they could to help improve the supply of HGH for their children.[74] HGF was uncritical of HGH therapy and HGF parents worked closely with the National Pituitary Agency in order to keep a steady stream of HGH injections available for their children. With the growing body of scholarship substantiating the hardships of short stature for children, HGF members seemed appropriate in their stance and did what they could to save their children from needless turmoil.

By the early 1980s child psychologists generally agreed about the perils of being small, and pediatric specialists had positioned themselves as able to help remedy short stature through medical intervention, saving those boys who were otherwise at risk of an unfulfilled adulthood. Deborah Young-Hyman of University of Maryland Medical School remarked in a publication focused on the psychological impact of short stature:

> The psychological literature concerning short-statured children is remarkable in that, with few exceptions, the conclusion is that shortness is a handicapping condition. This conclusion has led to an extensive effort by

[72] Virginia Mansfield, "Growing Up in a Tall World," *Washington Post*, Feb. 18, 1982, MD1.

[73] *Slow Grows the Child*, xi.

[74] "Symposium focuses on short stature," *The Galveston Daily News*, March 20 1979, 2-A.

> pediatric endocrinologists to seek effective forms of treatment, and has motivated mental health professionals to study these children.[75]

Combating a social risk factor, pediatric endocrinologists and endocrinologists framed the history of growth hormone therapy with the understanding that this hormone replacement therapy focused more on saving children from short stature than from GH deficiency. At the 62nd Annual Meeting of The Endocrinology Society in 1980, Henry G. Friesen, a professor of medicine in the Department of Physiology at University of Manitoba, Winnipeg, presented a paper titled "A Tale of Stature" that honored the efforts of Maurice Raben. Raben was a pioneer in HGH therapy who had reported on the first effective human HGH therapy in 1958. Friesben wanted members of the society to understand the scope of Raben's work beyond this milestone and calculated his influence in the field by stating "over 20 years he extracted over 1 ½ million U of GH which provided psychological and therapeutic benefit by adding 16,000 cm of height to all these short children. You must agree with me – that it is a giant contribution!"[76] Medical experts, pediatric endocrinologists, journalists, child psychologists, parents, and children measured the success of HGH therapy by the vertical growth gained. While the long-term gain of increased height in children remained in question, psychological research substantiated that short stature brought psychological trauma if left untreated.

Heightism: The Sociology of Stature

Child psychology was not the only field involved in studying stature; sociologists also explored the perils of being short, but instead of looking only at the individual, they

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[75] Deborah Young-Hyman, Chapter 3 "Effects of Short Stature on Social Competent," *Slow Grows the Child,* 27.

[76] Henry G. Friesen, "Raben Lecture 1980: A Tale of Stature," *Endocrine Reviews* 1, no 4 (1980): 309.

suggested public perception of stature was the source of the troubles. Heightism is the sociological term created to explain the social discrimination faced by short men and society's preference for height. Saul Feldman, a sociologist, coined the term in a paper he presented at the 1971 meeting of the American Sociological Association entitled "The Presentation of Shortness in Everyday Life – Height and Heightism in American Society: Toward A Sociology of Stature."[77] He argued that "American society is a society with a heightist premise: to be tall is to be good and to be short is to be stigmatized" and explored the nuances of this discrimination in language, male-female relationships, politics, economics, popular culture, and "degradation of self."[78] Drawing on the work of Alfred Adler and Erving Goffman, he exposed how men were most victimized by heightism in America. Feldman quoted an early articulation of the notion of hegemonic masculinity in order to make this point:

> Erving Goffman has noted that 'there is only one complete unblushing male in America: a young, married, white, urban, northern, heterosexual Protestant father of college education, fully employed, of good complexion, weight, and height, and a recent record in sports.' As Goffman intimates, those who lack even one of these characteristics may be considered deviant.[79]

Feldman's sociology of stature intended to demonstrate the potency of physical stature in America rather than to assess the mental state of short individuals or to champion HGH

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[77] Saul D. Feldman, "The Presentation of Shortness in Everyday Life -- Height and Heightism in American Society: Toward a Sociology of Stature." A paper presented at the 1971 meeting of the American Sociological Association, cover, box 17, folder 5, Records of the Sociology Department, Case Western Reserve University Archives, 3LZ, Cleveland, Ohio.

[78] Saul Feldman, "The Presentation of Shortness in Everyday Life – Height and Heightism in American Society. Toward a Sociology of Stature," *Lifestyles,* Saul D. Feldman and Gerald W. Thielbar ed. (Boston: Little, Brown, 1972), 437.

[79] Ibid.

therapy. Instead of blaming short people for not being able to overcome their deficits, Feldman pointed a finger at a society "directed toward overabundance and glorification of anything above average."[80]

Feldman's 1971 speech outlined his perception of the sociology of stature in America, and it became the template for subsequent work and commentary. He argued that Americans' disdain for shortness was pervasive and that it had seeped into our language often as a negative connotation. He cited examples: the term "short-sighted" for someone who lacked foresight; "short-tempered" applied to those with a quick tendency to get angry; "shortcoming" meaning a deficiency; "short-changed" when someone does not receive the entire amount he/she is due; and "the short end of the stick" for a situation in which someone receives the less-desirable outcome.[81] For Feldman, these sayings revealed a deep-seated discrimination against short people lurking in America. The field of psycholinguistics took the argument even further and suggested that these prevalent sayings actually helped cause heightism.[82] Either way, these terms served as evidence of a society critical of shortness.

Feldman's term harbored a hegemonic heterosexual standard, which cast the white middle-class male as the most common victim of heightism. He postulated that out of the four possible stature situations, to be either a tall woman or a short man was the most limiting and linked this assessment to mate selection.[83] While previous research in

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[80] Ibid., 442.

[81] Popkin and Sassoon, 2

[82] John S. Gillis, *Too Tall, Too Small* (Champaign, Institute for Personality and Ability Testing, inc., 1982), 10.

[83] Feldman, 438.

psychology and sociology had drawn similar conclusions, Feldman's attachment of a term to the harsh treatment gave his analysis an effective punch, and in doing so he was also able to reaffirm with certainty the daunting adulthood predicted for short statured boys predicted by child psychologists.[84]

Although Feldman presented his analysis as the sociology of stature, his work did not deal with the discrimination tall women faced; rather, he focused on the hardships of short men. He argued that "no matter what his race, creed or financial status, the American male under 5 feet 8 inches – the height of the average American man – is a victim of discrimination."[85] He called attention to how size mattered for men in many facets of American life, including politics. Feldman made a strong argument for the role of height in presidential elections. In his 1971 speech Feldman pointed out that the taller candidate had won in 17 of 19 presidential elections.[86] This observation drew media attention and began a tradition of journalists reporting on the height of candidates during presidential races. For example, in 1976, *Los Angeles Times* journalists Garrison Nelson and W. Ross Brewer suggested, in this case inaccurately, that height could be a factor in the presidential election in their article, "Watch Out, Jimmy – Ford and Reagan are Taller." Even though Jimmy Carter, the shorter candidate, won, sociologists continued to suggest that short stature compromised a candidate's chance for election.

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[84] Popkin and Sassoon, 17.

[85] Popkin and Sassoon, 23-24.

[86] Garrison Nelson and W. Ross Brewer, "Watch Out, Jimmy – Ford and Reagan are Taller," *Los Angeles Times*, July 11, 1976, B4.

The workplace, Hollywood, and sports all seemed to harbor discrimination against short men as well, according to Feldman. He noted that tall men were "hired sooner, promoted faster and paid more than short men"[87] and pointed to studies showing that tall men (six feet two and above) received a starting salary 12.4% higher than graduates from the same school who were less than six feet.[88] Even when short men were able to beat the odds and do well in business, their success was often understood in context to their stature. Feldman argued that "[a]ssumption of political or economic power for a tall individual is considered admirable, but let an individual of less than average stature, such as Andrew Carnegie or Fiorello H. LaGuardia, assume power and he is viewed as having a Napoleon complex."[89] Being short also hindered the careers and popularity of movie stars and athletes, Feldman observed. Feldman reported on how short actors were often cast as villains or "buffoons," while heroes were tall.[90] Feldman did not stop there. He pointed out how heightism was pervasive in sports and argued that Americans favored sports that glorified height, such as basketball, and when a shorter athlete was involved, as in horseracing, less attention was given to the athlete than in other sports. Feldman lambasted Americans' refusal to follow jockeys' careers as they did for baseball players. He pointed out that "a jockey's face has never appeared on a bubblegum card…but (jockeys) do appear across the nation as plastic lawn ornaments."[91]

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[87] Popkin and Sassoon, 5.

[88] Feldman, 439.

[89] Feldman, 440.

[90] Carol Kramer, "Minilib: Short Men Just Want Us to Look up to Them," *Chicago Tribune*, April 29 1975, B1.

[91] Popkin and Sassoon, 5.

Americans preferred tall men and our pastimes reflected that preference. As the sociological stats added up, being short was a problem for men and there seemed to be no relief from Americans' preference for tallness.

Feldman's analysis shed light on what some considered invisible discrimination based on stature and exposed the pending problems boys would face in adulthood if they remained short. Because short men had silently endured barrages of insults, limited employment options, and hardships in dating throughout their lives, many of them internalized the social discrimination they faced and experienced a "degradation of self" according to Feldman.[92] He postulated that they felt less in control, were hurt by the fact that others did not see them as manly, and blamed their bodies for not measuring up to other's expectations of how tall a man should be.

As short stature negatively impacted men's quality of life, self-confidence, and self-perception, the sociological discourse of heightism provided a medium and language for them to talk about it.[93] Short-statured male journalists started to contribute to the growing commentary on heightism and spoke out against the mal-treatment they faced in America. Instead of demanding a medical fix for their vertical realities or blaming themselves, they criticized cultural biases pertaining to height. During the 1970s and early 1980s, the loudest voice from this pool of victims was Ralph Keys'. He wrote about heightism in various magazines and in 1980 he published *Height of Your Life*, which brought together a decade of his observations and analyses. The tagline for the book read, "Short or tall…Who's really on top? The funny, fact-filled lowdown from

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[92] Feldman, 437.

[93] Popkin and Sassoon,13.

salaries to sex and beyond...," and in it Keyes used a socio-biological framework to discuss the discrimination he had faced ever since he was a little boy and expounded on Feldman's sociological interpretation of Americans' preference for height. He claimed that the discrimination short men faced did not come from being disabled or having an illness or disease; rather it was derived from a culture obsessed with superficial appearances and determined by human nature and therefore could not be rectified through a liberation movement. While child psychologists were unable to come to a consensus on the long-term gain of increased height in children due to HGH therapy, the first-hand experiences of men such as Keyes and findings from sociological studies documented the pervasiveness of heightism in America and the hardships of being short.

The heightist debate was compounded in 1977 when Randy Newman released his sixth album, *Little Criminals*. The first song made into a single from the album was "Short People." Meant to ridicule prejudice, the song's lyrics bashed short people and included such lines as "Short People got no reason to live," and "they got little noses and tiny little teeth…they wear platform shoes on their nasty little feet."[94] With controversial lyrics and a catchy tune, "Short People" shot up the charts and with it came opposition. By early 1978, some radio stations refused to play Newman's song, and short-statured people protested against the derogatory lyrics. This controversy made the song even more popular and, ironically, it was Randy Newman's first song to reach number one. Newman was adamant that the true intent of "Short People" was to mock discrimination through satire and pointed to other songs from his decade-long career, including "Davy, the Fat Boy" and "Yellow Man," as examples of his unique style of writing and cultural

[94] Randy Newman, "Short People," *Little Criminals*, 1977.

commentary.[95] But it didn't matter. The song continued to be misunderstood and people discussed the discrimination of stature they thought it documented. With titles such as, "Short People Song Sets Off a Tall Furor" and "Certain Song Makes the Short People Stand Tall in Rage," newspapers articles from the *Wall Street Journal*, *Los Angeles Times*, and *Chicago Tribune* wrote about the opposition to the song, Newman's intent, and its social impact. While the popularity of "Short People" provided an opportunity for people to discuss heightism, it also became its soundtrack. Carol Oppenheim reported in the *Chicago Tribune* that "taller youths are serenading the shorter ones with the song" at a junior high school in Manhattan as evidence of the cultural currency of "Short People."[96] Randy Newman could not override the potency of his prose, and his song provided bullies with yet another medium with which to taunt their schoolyard victims about short stature.

What recourse did these harassed short children have? Their stature had made them prime targets for ridicule, which now had lyrics to go along with it. While their parents could have intervened and demanded punishment of the taller children, the smaller children remained defenseless in a society where to be tall was to be good and to be short was to be stigmatized. According to the experts, their futures looked grim. If they remained shorter than their counterparts, they were destined to experience childhoods of continued trauma and adulthoods with limited opportunities, especially if they were male. Perhaps their parents would consider taking their bullied children to the pediatrician for some guidance or treatment in order to avoid such a disastrous fate.

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[95] Robert Hilburn, "Pop Music," *Los Angeles Times*, March 5, 1978, N72.

[96] Carol Oppenheimer, "'Short People' Song Sets Off a Tall Furor," *Chicago Tribune*, January 8, 1978, 3.

Medicine offered help for some short children with HGH therapy but it also compounded the social reality of others when the federal government created the first set of national growth charts for infants and children from 0-18. These medical charts contributed to the pathologization of stature that did not measure up to the norms created by selective measurements. The fourteen sex-specific growth charts were intended to serve as public health instruments and diagnostic tools for physicians to monitor the individual growth of children. They quickly became ubiquitous fixtures in doctors' offices across the nation and set the standard for children's growth around the globe when the Centers of Disease Control (CDC) and the World Health Organization (WHO) adopted them in their efforts to monitor children's health. In using these charts, the CDC and WHO endorsed the value of the measurements presented on the charts as normal/healthy and the medical practice of measuring children in pediatric care. Growth charts became the mechanism by which data about an individual could be compared to the population and interpreted in context to these presented norms. They ushered in a medical sensibility of short stature, which contributed to the stigmatization of short stature at a time when there was a budding interest in the sociological and psychological impact of short stature on quality of life, especially for males.

Federally Endorsed Growth Charts

The request for national growth charts came from both the public health sector and private medicine. In 1971, "a study group cosponsored by the American Academy of Pediatrics and the Maternal and Child Health Program, Public Health Service, and the Department of Health, Education, and Welfare (DHEW) recommended the development of national growth charts to be used for nutritional screening, public health assessments

of populations of children, and clinical standards of children and infants."[97] In 1974, the National Academy of Sciences called for new growth charts to evaluate the nutritional health of America's children and infants on a large scale. In 1975, a group sponsored by the National Institute of Child Health and Human Development made similar public health recommendations.[98] By 1976, the demand for new charts coupled with the supply of data from several growth survey initiatives fueled the development of a series of fourteen sex-specific growth charts consisting of smoothed growth curves of plotted percentile points based on distributions of body size (weight, height, and head circumference) attained at specific chronological ages by the National Center for Health Statistics [NCHS]. The charts for children from birth to three years originated from the Fels Research Institute's longitudinal study conducted from 1929 to 1975, and the set of charts for children 2-18 years of age were based on data collected from Health Examination Surveys sponsored by the NCHS from 1963 to 1974.[99]

Before the NCHS charts, there was no one standard set of charts used in public health and clinical medicine, though the growth charts most widely used by educators, public health officials, and physicians during the 1950s, 1960s, and early 1970s were the Stuart-Meredith charts from 1946. The Meredith portion of the charts was based on body measurements taken on white children living near Iowa City, Iowa, and the Stuart [a.k.a. Harvard charts] portion was based on body measurements taken on working class children in Boston, Massachusetts, from 1930 to 1943. Even though the Stuart-Meredith

[97] Peter V.V. Hamill, "NCHS Growth Curves for Children Birth-18 Years: United States," edited by National Center for Health Statistics, Vital Health Statistics, 165, no. 11 (1977): 1.

[98] Ibid.

[99] Ibid.

charts were a blend of two growth studies, they were considerably limited in scope due to their small and exclusive sample size and therefore did not represent the diversity of American children. In addition, the growth curves found on the Stuart-Meredith charts were reportedly based on mathematical approximations of curves smoothed by hand, a method that was outdated by the early 1970's.[100] Nevertheless, educators, public health workers, and physicians selected these charts as the best available tools in the surveillance of children.

In schools, educators were encouraged to record and assess the growth of a pupil using pamphlets that featured the Stuart-Meredith charts. Sponsored by a joint committee of the Department of Health and the AMA, these booklets were designed for recording the growth in height and weight of a single child. Recorders were instructed how to track a child's growth by keeping track of weight and height and comparing these measurements to norms represented as curves on the Stuart-Meredith charts. If abnormal growth was indicated, educators were instructed to refer the child to a physician.[101]

While pediatricians employed various tools in the surveillance of growth during the 1950s and 1960s, the Stuart-Meredith charts were included in the most popular pediatric textbook, the *Nelson Textbook of Pediatrics*, as diagnostic charts to assess stature. Although it featured the same charts as the educator's pamphlet, the Nelson textbook provided the pediatrician with additional insight into the making of these diagnostic tools by discussing the racial exclusivity of the charts' data and noting the

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[100] RJ Kuczmarski, CL Ogden, SS Guo, et al. "2000 CDC Growth Charts for the United States: Methods and Development," ed. National Center for Health Statistics, Vital Health Statistics, 262 (11) 2000, 2.

[101] Howard V. Meredith, Ph.D., "A 'Physical Growth Record" for Use in Elementary and High Schools," *American Journal of Public Health*, July 1949, 882.

importance of recent anthropological findings including an acknowledgment of studies on pygmies and stature, which problematized the perceived causal relationship between race and height by arguing that malnutrition and infectious disease could be the reason for racial differences in stature.[102] It also noted that the charts featured were "based on studies conducted by the Harvard School of Public Health of white children in Boston of predominantly north European stock" and left the practitioners to infer the appropriateness of the standards in their clinical setting.[103] While the *Physical Record* gave educators specific instructions for using the charts to assess the health of pupils, the Nelson textbook encouraged pediatricians to experiment with different measuring tools, including the Wetzel Grid and/or the Sheldon body composition scale (which combined stature and psychology) when assessing growth and to select a system that worked best for them.

The NCHS charts changed this flexibility in instruction and served as the standard in the surveillance of growth by pediatricians, educators, and public health workers in the U.S. and the world by the end of the 1970s.[104] Pediatricians found growth charts important in determining a patient's well-being because they were able to compare a patient's measurements with established curves and thereby identify abnormal growth, which might be an early warning sign of pathology. Meanwhile, public health officials in the U.S. used the charts to compare and contrast the health of children on a large scale, and the data collected was used as scientific evidence to champion for more

[102] Waldo E. Nelson, Victor C. Vaughan, and R. James McKay, *Nelson Textbook of Pediatrics* (Philadelphia, London, Toronto: W.B. Saunders, 1969).

[103] Ibid, 40.

[104] Kaplan, 37.

governmental financial support. Internationally, the World Health Organization adopted the NCHS data as the foundation for its growth charts in 1977. The WHO's versions of the NCHS charts would come to be known as the NCHS/WHO charts used by public health officials to interpret the data collected with the reference curves on the fixed weight and height charts. WHO officials believed that a universal standard helped in the fight against poverty; their goal was "to describe the worldwide distribution of child growth failure, permit intercountry and interregional comparisons, and facilitate the monitoring of global, regional and national trends and the charts helped standardize the data."[105] While these charts represented norms to be used in the surveillance of children's health, the charts included old data, relied upon very small sample sizes in some cases, and used data comprised of cross-sectional and longitudinal measurements that made for a distorted norm. Because of these deficiencies, not everyone agreed with the use of these charts in public health and private medicine.

In public health and private medicine, the 0-2 and adolescent charts drew the most controversy. The data for the 0-2 charts was extremely limited, as the data used came from the Fels Research Institute growth study. This growth study aimed to examine the development of a small sample of people throughout their lives in order to get a comprehensive understanding of growth at an individual level and not collect massive measurements, which would serve as healthy norms on charts. Consequently, the pool of subjects was small. Only featured 867 middle-class, formula-fed children from white families who lived near Dayton, Ohio from 1929 to 1975. The NCHS defended its use of

[105] World Health Organization, *A Growth Chart for International use in Maternal and Child Health care: Guidelines for Primary Health Care Personnel* (Geneva: World Health Organization, 1978).

the numbers from the Fels study by stating "there were no suitable alternative data for the first year of life."[106] Subsequently, this unique population served as the data for charts used throughout the world for over twenty years. Not all children lived up to the normal curves created by the measurements of Fels children. At a public health level this could be beneficial because it showed the need for better living conditions in impoverished areas, but the racial exclusivity of the subjects did not allow for practitioners and medical experts to rule out race-based explanations for measurements and growth trends. At a clinical level, these charts proved problematic because they skewed the clinician's assessment of a patient's health since the curves created reflected data from a very specific group and were treated as population-wide norms.

Medical experts also criticized the new adolescent charts, even though they were not based on data from the Fels Study but on more comprehensive NCHS surveys from the 1960s. British growth expert James M. Tanner was the most well-known critic of the use of the adolescent charts in private care. Co-developer of the standard five-stage clinical system for identifying normal pubertal development, Tanner claimed the NCHS charts failed to reflect the variability of growth during adolescence because the data was based on cross-sectional measurements and not the tracking of individuals' growth during a long period of time.[107] Consequently, the growth curves provided only compilation synthetic norms based on one-time measurements from various individuals and failed to represent average growth in children.

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[106] Hamill,2.

[107] Ibid.

Even with their flaws, these federally funded growth charts contributed to the normalization of average measurements of height and the stigmatization of short stature. Widely distributed through the efforts of Ross Laboratories, one of the largest manufactures of baby formula, these charts were common fixtures in pediatric offices throughout the country.[108] As Tanner stated, pediatricians used charts in clinical care to answer the question: "what is the probability that this particular child belongs to the motley army of normal children, of so many shapes and sizes; and what is the probability that he belongs to another battalion altogether, the company of the sick?"[109] In part due to this logic, during the late twentieth century these charts played an important role in medicalizing short stature. Growth charts had been used in growth hormone therapy since the 1960s as the initial diagnostic tool in determining the normalcy of a child's growth and height. Pediatric endocrinologists recommended that physicians plot the height and weight of a child on a growth chart and compare his or her development to the norms presented as curves on the chart. If a child's growth sharply declined, stopped altogether, or appeared abnormal, then further tests were conducted; and if a growth hormone deficiency was suspected, then the child would be referred to a pediatric endocrinologist, who often repeated these preliminary diagnostic tests in the quest to discover the cause of the failure to grow. A growth hormone provocation test would ultimately determine if the child was a candidate for cadaver-HGH therapy. If the child was found to be HGH deficient, he might become a possible subject for a clinical study and receive growth hormone as long as it was available. As the "company of the sick" became more identifiable through national growth charts and growth hormone testing, medical experts

[108] Ibid., 395.

[109] Tanner.

and the national pituitary agency tried to find additional reserves of HGH and funded efforts to synthesize the hormone.

Free Market Human Growth Hormone

Supply did increase during the mid-1970s with the introduction of commercial HGH into the U.S. market. The Food and Drug Administration (FDA) approved two cadaver human growth hormone products for the treatment of growth hormone deficiency during the late 1970s, Serono's Asellacrin (Asellacrin2 and Asellacrin 10) in 1976 and Kabi's Crescormon in 1979. The approval of Crescormon and Asellacrin, along with a change in the processing of pituitary glands that allowed more HGH to be yielded, eased the supply shortage but HGH therapy remained exclusive because of the price of commercial treatments.[110] One year's treatment cost between $9,000 and $20,000, and since the very beginning of commercial growth hormone therapy, there seemed to be complications with getting insurance to cover the cost.

Print advertisements for the drug reflected the exclusivity and expense of HGH therapy. Serono's ad campaign for Ascellacrin in the *Journal of Pediatrics* and the *Journal of Clinical Endocrinology and Metabolism* often depicted the intended upper-class consumer of HGH therapy – the prepubescent, white, affluent white boy wanting to be taller and full of growth potential. The three-page advertisement featured a portrait of a white boy with blond hair and a missing tooth, looking up. White, young, and not fully developed, the boy was full of linear promise, which could be fully realized with the help of Asellacrin, a drug intended to treat children with growth hormone deficiency by

[110] Franklin.

spurring linear growth.[111] Its use was framed to aid scientifically in a somewhat mysterious physiological process as described by the ad's tag line: "The Miracle of Growth: When growth depends on Somatropin replacement, you can depend on Serono." Advertisements for Asellacrin conflated notions of growth and height and provided a gendered and racialized perception of the perceived patient and in doing so Serono capitalized on the two decades of press materials created for cHGH therapy, findings from child psychologists about the hardships of short stature, and parental fears over heightism. Serono's marketing campaign for Asellacrin to pediatricians during the early 1980s used small white boys' bodies to tell not only that something was wrong, as Progressive Era photographers had done in their anti-child labor campaigns, but that potential growth was possible.

The young prepubescent boy also served as a mascot for Serono's screening services, Theoretical Growth Evaluation [TGE]. Serono offered pediatricians this computerized growth evaluation service as "A Second Opinion as Close as Your Mailbox."[112] TGE used the familiar rhetoric of growth and development and the growth chart genre to provide pediatricians with height predictions for their patients. Serono's evaluation service was different from the institutionalized CDC growth charts: it was personalized, used more measurements, and was technologically more advanced in its composition. Intended to bring potential consumers to cHGH therapy and Serono's product, TGE marketing stressed the need for early diagnosis, the availability of

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[111] Serono Pharmaceuticals' advertisement for Asellacrin, "The Miracle of Growth," *The Journal of Pediatrics* 98, no. 3 (March 1981): A46-48.

[112] Serono Pharmaceuticals advertisement for TGE, *The Journal of Pediatrics* 99, no. 6 (December 1981): A44-45.

treatment, and the promise of height. Running repeatedly in medical journals, Asellacrin and TGE advertisements made growth hormone therapy synonymous with treating short boys in the hopes of making them taller and appealed to physicians' middle-class white consumers.[113]

Serono's competitor in the HGH market was Kabi Pharmaceuticals. Kabi was owned by the Swedish government and dominated the global growth hormone market. Interestingly, Kabi's campaign for its HGH drug Crescormon did not address the intended user; instead the advertisements spoke more to the crisis of sporadic supply and the lack of agency pediatricians had to prescribe Crescormon. Running identical ads in the *Journal of Pediatrics* and the *Journal of Clinical Endocrinology and Metabolism*, Kabi's slogan for its Crescormon was "Now you can prescribe Somatropin."[114] While this advertising campaign was short-lived, Kabi continued to play a major role in America's HGH industry when it joined forces with Genentech, the pioneer company in recombinant DNA technology.

Genentech has been linked to the HGH industry since its inception. In 1976, one of the cofounders of the company, Dr. Herbert Boyer, and his lab collaborated with two Southern California scientists, Arthur Riggs and Keiichi Itakura, at the City of Hope National Medical Center near Los Angeles on DNA research. Their goal was to create a gene not found in nature but able to act like the one whose design it copied. After a year of experiments and research, their efforts gave birth to the biotech industry. Using somatostatin (a human protein known as the growth-hormone-inhibiting hormone

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[113] Ibid.

[114] Kabi Group Inc.'s advertisement for Crescormon, "Now you can prescribe somatropin: Cresormon," *Journal of Pediatrics* 199, no. 5 (November 1981): 14A.

because it inhibits the release of growth hormone and a thyroid-stimulating hormone) as their muse, these scientists transformed the microorganism *E. Coli* bacterium into a functional, replicating protein generator.[115]

Even though Genentech's somatostatin was not bound for market, it caught the attention of Kabi Pharmaceutical's Director of Research Hans Sievertsson. He visited San Francisco to meet the founders of Genentech, Dr. Herbert Boyer and venture capitalist Robert Swanson, in 1977. Supposedly, Kabi was experiencing a financial rough patch, and the possibility of genetically engineering human growth hormone seemed like a viable way to help the company climb out of its slump. Genentech had little else to offer this pharmaceutical giant besides its scientific expertise. Less than two years old, it had no laboratory or staff but could grant licenses based on its patents. Negotiations between the two firms continued until they came to a tentative agreement in the winter of 1977. An official agreement was finalized on August 1, 1978.[116] The contract gave Genentech two and a half years to genetically engineer a bacterium capable of producing human growth hormone. Kabi supported Genentech's efforts by providing its scientists with human pituitary material, collaborators, and one million dollars. In return, it received exclusive foreign marketing rights and shared rights with Genentech in the U.S.[117]

Fierce competition from scientists at the University of California, San Francisco, contributed to the pressure Genentech experienced to genetically engineer human growth hormone. The rivalry between the two had tangled roots; their relationship can arguably

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[115] Sally Smith Hughes, *Genentech: The Beginnings of Biotech* (Chicago: University of Chicago Press, 2011), 49-55.

[116] Hughes, 110.

[117] Ibid., 111.

be described as incestuous. Herbert Boyer had been a professor in microbiology and biochemistry at UCSF before and during his early days in business with Robert Swanson, and Boyer's lab at UCSF served as ground zero for Genentech's initial research endeavors. During the late 1970s, both entities were fully engaged in human growth hormone research and backed by pharmaceutical companies: Genentech was working with Kabi and UCSF received funding from Eli Lilly. While both claimed they had synthesized growth hormone by the summer of 1979, Genentech's marketing manager argued that they had produced HGH while UCSF's lab had created a less pure product.[118] Genentech filed for a patent on its human growth hormone Protropin that year and renegotiated its contact with Kabi in order to have sole control of the U.S. market.[119]

While the hard work of replicated HGH might have seemed over, the company had to endure a six-year FDA approval process. The FDA was somewhat hesitant to grant approval because Protropin was not an exact match to HGH.[120] As the FDA approval process continued, Genentech tried to keep pediatricians and pediatric endocrinologists interested in its pending product. In 1983, the company ran an advertisement calling attention to a new era in human growth hormone therapy. The ad was a three-page spread. The first page remarked, "Soon. Very soon..." and featured a large image, part of computer-generated looking sphere. The following two-page spread kept the words and image to a minimum. The sphere was more complete and on the top

[118] Ibid., 119.

[119] Ibid., 121.

[120] Ibid., 126.

of the sphere was an outline of a person. The tag line read, "The new era in human growth hormone. From Genentech Inc. The world leader in biotechnology."[121]

As buzz around Genentech's HGH product got louder, Serono did its best to stay relevant in the changing HGH industry. In 1984, it collaborated with the Human Growth Foundation in organizing an October symposium in Washington, D.C., on psychosocial aspects of growth delay and sponsored the publication of papers presented at the conference. While the conference did not directly promote HGH therapy, it did provide a venue for experts in the field of child psychology to share their findings about the impact of short stature in children. Also, several of the presenters reported on research partially funded by the pro-HGH therapy group HGF.[122]

In 1985, Serono launched a new ad campaign for Asellacrin in *The Journal of Clinical Endocrinology and Metabolism*, emphasizing its safety and effectiveness. It identified Asellacrin as "The natural human growth hormone" and claimed that the new subcutaneous injections were just as effective as inter-muscular injections and did not increase the risk of antibody injections. To depict how easy the new shots were to administer, the center of the advertisement featured a vignette of a mother kneeling down and injecting her son with HGH. Natural, effective, and easy-to use, Asellacrin seemed to meet all of the needs of the intended user. Serono was poised to compete against Genentech's unnatural hormone product.

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[121] Genentech Inc., Advertisement for Protropin, *Journal of Pediatrics* (January, 1984), 6A-9A.

[122] Serono Pharmaceuticals' advertisement for Asellacrin, "Series 2: Subcutaneous Injection: one in a series updating human growth hormone therapy Growth Hormone Deficiency. Asellacrin the natural human growth hormone," *Journal of Clinical Endocrinology and Metabolism* 60, no 6 (June 1985): 17-20A

Shortly after the campaign launched, it suddenly ended. In the spring of 1985, cHGH was connected to cases of Creutzfeldt–Jakob disease (CJD) in children. An incurable and fatal brain disease that was extremely rare in young adults, CJD was found in three patients and was linked to their growth hormone therapy. The FDA pulled commercial cHGH from the market, and the NPA halted its human growth hormone program. Journalists seized on the story and openly cast doubt on the treatment of short stature in the first place. The public had been wrongly assured of the safety of cadaver-based human growth hormone, with devastating results.[123]

This crisis made the FDA reconsider its stance on Genentech's HGH product; in October 1985 it approved Protropin. Eager to get its product to consumers, Genentech sent shipments of Protropin to hospital pharmacies. Later that year, the FDA designated Protropin as an "orphan drug" specifically designed to treat rare medical conditions, giving Genentech a seven year monopoly on the market and qualifying the company for generous tax credits.[124] Shortly thereafter, Genentech's elaborate advertising campaign for Protropin began.

Protropin's ad was outstanding. It was a five page spread printed on heavy grey stock with rich color graphics and big claims. While innovative in its technical approach, the content of the campaign bore resemblance to past human growth hormone advertisements as it included boys as its intended patients, emphasized the science behind its product, and addressed supply issues. The front page of the ad featured a portrait of a blue-eyed blond-haired young white boy transposed onto a landscape image of a large

[123] Salvatore Raiti, "Human Growth Hormone and Creutzfeldt-Jakob Disease," *Annals of Internal Medicine* 103, no. 2 (1985): 288-9.

[124] Hughes, 127.

evergreen tree, to symbolize growth. The caption read "Out of today's technology, tomorrow's growth." To the left of the word Protropin was an outline of a person serving as an arrow pointing up using the visual symbol of height to mean growth. While the boy served as the eye-catching, almost mascot-like image, inside the ad was a small picture of three white children, two boys and one girl, in an attempt to represent the diversity of potential patients. Responding to the decades of difficulties in accessing HGH supply, Genentech touted Protropin's provision of "virtual endless quantities…" "for every child who needs it – or will ever need it."[125] While Protropin was a scientific breakthrough in biotechnology, Genentech's advertising harkened back to previous marketing techniques used by Serono, overtly relying upon decades-long scholarship in child psychology and sociology, and playing on the fears and aspirations of a long-standing human growth hormone industry. After a yearlong marketing campaign, sales reached 43.6 million dollars.[126]

Conclusion

Genentech was not alone in the HGH market for long. The FDA approved Eli Lilly's Human Growth Hormone product Humatrope in 1987. Working with UCSF scientists, Lilly had conducted successful clinical trials of its product in late 1985 and was ready to file a new drug application with the FDA in 1986. It was speculated that Humatrope would be a fierce rival to Protropin since, unlike that drug, it was an exact duplicate of human growth hormone. Because of Protropin's orphan drug status,

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[125] Genentech, Inc. Protropin, "Out of Today's technology tomorrow's growth", *Journal of Pediatrics* 108, no. 1 (January 1986): 27A-31A .

[126] Wendy L. Wall, "Eli Lilly Gets Approval to Sell Growth Hormone," *Wall Street Journal* March 10, 1987, 18.

Genentech understood it had a monopoly on the HGH market and tried to stop Lilly from competing with Protropin by suing the FDA for its approval of Humatrope but the tactic backfired. Humatrope was approved on schedule and was also granted the prized orphan drug designation.[127]

The media contemplated the endless possibilities of synthetic human growth hormone, as new HGH pharmaceuticals entered the market during the mid-1980s. Some journalists suggested HGH might be ushering in a "Brave New World" where "cosmetic endocrinology" could enhance a child's quality of life and reported how parents had "already begun to besiege doctors to prescribe the hormone for kids who ultimately will be only slightly shorter than normal or even of average height."[128] Others wondered about the future of growth hormone therapy. After watching a broadcast of "The MacNeil-Lehrer Newshour" that discussed human growth hormone, journalist Russell Baker warned his readers about it. In his article titled, "Think Twice About Growth, Dads and Lads," Baker warned, "[w]ith the powerful growth hormone coming onto the scene, it's anybody's guess what the social effects will be. We are not talking about a few gracefully muscled 7-footers…but about hordes of 400-pound giants, people who have had themselves artificially enlarged in hopes of cleaning up financially in athletic careers."[129] Undoubtedly, boys were heavily featured in these bioethical discussions. Reporters related stories from pediatric endocrinologists about parents desiring HGH

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[127] Ibid.

[128] Gina Kolata and Alan L. Otten, "Synthetic Growth Hormone Raises Hopes of Many – and Ethical Concerns Over Use," *Wall Street Journal*, April 8, 1987, 33.

[129] Russell Baker, "Think Twice about Growth, Dads and Lads," *Chicago Tribune*, January 9, 1987, 19.

therapy for their sons. One specialist, Rebecca Kirkland, remarked that "[o]ne man said his son would be a better attorney if his son was taller." Other pediatric endocrinologists reported similar stories of parents demanding growth hormone therapy for their short sons.[130] In some articles, boys literally served as poster children for growth hormone therapy. The 1986 article "Growing Pains" included a large photo of Marcia Slaten giving her son Scott an injection of synthetic human growth hormone and a smaller image of Scott undergoing an X-ray examination of his hand to determine his growth rate during treatment.[131] Through imagery and anecdotal evidence, human growth hormone therapy in this era remained synonymous with treating young boys in the hopes of making them tall.

[130] Gina Kolata, "New Growth Industry in Human Growth Hormone?" *Science*, New Series 234, no. 4772 (October 3, 1986): 23.

[131] Andrew C. Revkin, "Growing Pains: A Synthetic Hormone is Cutting Short a Growth Disorder's Hold Over," *Los Angeles Times*, September 22, 1986, A6.

Epilogue – A Billion Dollar Industry

Today, human growth hormone fuels a billion dollar industry. There are over a dozen different growth hormone products from a handful of pharmaceutical companies competing for a share of the global market, which reached almost two billion dollars between 2006 and 2007.[1] A wide range of people beyond short-statured children seek out human growth hormone including those who want to stop the aging process, professional athletes looking for a performance advantage, and bodybuilders in search of increased muscle mass. There is a widely held belief that illicit distribution of HGH composes the lion's share of the market as non-FDA approved (or what is called off-label) human growth hormone therapy has been linked to increased energy, better skin, thicker hair, improved sleep patterns, and weight loss.[2] Readily available on websites and by physicians willing to prescribe it for off-label uses, HGH is seen as a magical cure for ailments from bad skin to a weak golf swing.

Many Americans became familiar with the illegal use of HGH by athletes in 2005 when Congress held hearings on steroid use in Major League Baseball. Beginning in March, the House Government Reform Committee called a series of elite players, including Mark McGwire and Roger Clemens to testify about doping in baseball. During the televised hearings, these baseball superstars were no longer the center of attention for their performance on the field; rather, their alleged drug use had brought them to Congress. Some of Major League Baseball's most revered players admitted to using them, others remained silent, and a few denied the allegations. Seeking answers, the

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[1] Leona Cuttler and J. B. Silvers "Growth Hormone and Health Policy." *Journal of Clinical Endocrinology and Metabolism* 95, no. 7 (2010): 3152.

[2] "Growth Hormone Illegal for Off-label Anti-aging Use, Study Warns," *ScienceDaily* (November 8, 2005) http://www.sciencedaily.com/releases/2005/11/051108084527.htm.

Committee and Major League Baseball's Commissioner appointed former Senator George Mitchell to lead an investigation of steroid use in this professional sport. In 2006, the Mitchell report was released; it named names and argued that everyone involved in baseball "shared to some extent responsibility for the steroids era."[3] Once the hearings began, Major League Baseball cracked down on players' drug use by implementing stricter mandatory drug testing and explicitly prohibiting specific performance enhancing drugs including HGH in 2005.[4]

While some observers considered the hearings successful, others questioned Congress' motive and insinuated that government officials had sought this opportunity to grandstand.[5] Committee members disagreed with this accusation. Rep. Henry A. Waxman, lead Democrat on the Committee, believed strongly in Congress' responsibility to investigate drug use in baseball because of a possible link between athletes taking performance-enhancing drugs and the rise in the use of steroids among children. Republicans shared his concerns. The chairman of the Committee, Republican Tom Davis, elaborated by stating "kids aren't just talking about their favorite teams' chances in the pennant race. They are talking about which pro players are on the juice."[6] Members of the Congressional Committee also referenced data from the 2003 Centers for

[3] George Mitchell, "Report to the Commissioner of Baseball of an Independent Investigation into the Illegal use of Steroids and Other Performance Enhancing Substances by Players in Major League Baseball. Summary and Recommendations" Office of the Commissioner of Baseball (New York: NY, 2007): SR-36.

[4] Ibid.

[5] Gail Gibson, "Congress set to probe use of steroids in baseball: Hearing opens tomorrow top names called to testify," *Baltimore Sun*, March 16, 2005, http://articles.baltimoresun.com/2005-03-16/news/0503160203_1_contempt-of-congress-subpoenas-steroids.

[6] Maria Newman, "Congress Opens Hearing on Steroid Use in Baseball," *New York Times Learning Network*, March 18, 2005, http://www.nytimes.com/learning/teachers/featured_articles/20050318friday.html.

Disease Control's "National Youth Risk Behavior Survey," which estimated that 6.1 percent of children, or 500,000 American teens, were using steroids. Committee members criticized baseball heroes for contributing to this alarming trend.[7]

Members of Congress recognized teen steroid use as a serious matter, because experts were suggesting a connection between the cessation of taking steroids and suicide.[8] Three young men – Efrain Marrero, Taylor Hooton, and Rob Garibaldi – were the subject of particular interest from the media as they took their own lives shortly after they stopped using steroids. The latter two stories caught the attention of committee members since the boys had been baseball players, and their parents were asked to testify during the hearings.[9] The parents saw a direct link between their children's deaths and the out-of-control atmosphere in Major League Baseball. The mother of Rob Garibaldi, Dr. Denise Garibaldi, testified to Congress that professional baseball killed her son. She argued, "there's no doubt in our minds that steroids killed our son. In his mind he did what baseball heroes like [Jose] Canseco had done."[10] While human growth hormone was not directly incriminated by these suicide stories, it was often lumped into the catch phrases "steroids" and "performing-enhancing drugs" and these terms were used throughout the hearings. Although the extent of doping in major league baseball was difficult for the Committee to determine, these personal stories evidenced a strong

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[7] Centers for Disease Control and Prevention, "Testimony on Steroid Use Among Females: Results of the Youth Risk Behavioral Surveillance System before Committee of Government Reform," June 15, 2005, http://www.hhs.gov/asl/testify/t050615a.html.

[8] Dan Jung, "Congressional Hearing on Steroids in Baseball," washingtonpost.com, March 16, 2005, http://www.washingtonpost.com/wp-dyn/articles/A41366-2005Mar16.html.

[9] Duff Wilson, "After a Young Athlete's Suicide, Steroids are Called the Culprit," *New York Times*, March 10, 2005, A1.

[10] Ibid.

causative link between professional baseball players' steroid use and the suicides of these American boys who strove to be as good as their heroes.

Even after these hearings, small boys with dreams of being taller remained the bread and butter of the legitimate human growth hormone industry. The gender disparity in growth hormone treatment was recently examined by a National Institutes of Health sponsored study. A 2008 *Journal of Clinical Endocrinology and Metabolism* article reported on its findings, which documented gender-based patterns in pediatric recombinant human growth hormone therapy in the U.S. and other countries. Dr. Adda Grimberg, a pediatrician at Children's Hospital of Philadelphia, led the project. By using an already existing database acquired by Pfizer to document the long-term outcomes and safety of its HGH product Genotropin, Grimberg and her team concluded that over the past twenty years the U.S. experienced an almost 2:1 male to female ratio in pediatric patients receiving human growth hormone therapy and that boys outnumbered girls even more so in cases without "a clear organ etiology."[11] The global results revealed similar gender ratios in Japan, Europe, Australia, and New Zealand, which led Grimberg to conclude that "factors other than biology are at play" when children were treated for short stature.[12] She alluded to patients' parents as possible culprits in the disparity of treatment between girls and boys and recommended that the gender divide in HGH care could be

[11] Adda Grimberg, E. Stewart, and M. P. Wajnrajch, "Gender of Pediatric Recombinant Human Growth Hormone Recipients in the United States and Globally," *Journal of Clinical Endocrinology and Metabolism* 93, no. 6 (June 2008) 2050-6.

[12] Ibid.

corrected by increased diligence in diagnosing and treating girls of growth stunting conditions and further consideration of the possible over-treatment of boys.[13]

Were parents really to blame? The history of human growth hormone therapy demonstrates they were not. Medical attempts to make up for men's shortcomings have deep roots in America. In the case of short stature, pharmaceutical companies have been able to capitalize on its longstanding stigmatization by society and its pathologization by medicine. During the first half of the twentieth century, the scientific turn in medicine had a technological bent, which made pharmaceutical fixes seen not only appropriate but also preferred. In the case of short stature, growth hormone became a viable weapon against bullying and a tactic to save young boys from unfulfilled adulthoods. As advances in medicine made it easier to alter an individual's height to be more culturally acceptable, less attention was given to changing society's stature bias.

Although pharmaceutical companies cannot be cast as the sole culprits in framing short stature as a disease, they have perpetuated and profited from the stereotypes of short men and have pumped millions of dollars into research solidifying short stature's stigmatization and pathologization. Pharmaceutical companies have plugged into longstanding medical traditions and protocols that endorsed the correction of short stature in small boys by funding pediatric and psychological research at universities, making inroads and funding existing volunteer organizations dedicated to promoting growth

[13] Grimberg, 2055. Important to note, the lead author of the article, Adda Grimberg received an honorarium and travel expenses from Pfizer to present preliminary data from this study at the 2006 Pfizer International Growth Study United States Investigators' Meeting in San Francisco and the two other authors of this report, Elizabeth Stewart and Michael P. Wajnrajch, were employees of this pharmaceutical giant.

hormone therapy and growth disorders awareness, and monopolizing parental concerns over stature.

The burgeoning field of child psychology enabled pharmaceutical companies to legitimize the prescribing of human growth hormone in order to make children taller. Forty years of research in the field had suggested "that short statured children experienced more interpersonal anxiety, have greater sensitivity to their interpersonal environment, are often socially immature and have poor relations with peers."[14] Some research has claimed that medically-induced height has helped children overcome these psychosocial disorders. Even when reports in the 1990s questioned HGH's ability to alter the final height of children, several child psychologists argued that the growth spurt it often did facilitate was therapeutic in itself.[15] These types of findings have created a synergy between child psychologists' research and pharmaceutical companies' financial endeavors. For example, a leader in research on the impact of stature in childhood, child psychologist Dr. Brian Stabler of the University of North Carolina has worked closely with human growth hormone manufacturers throughout his career; his research often supports the benefits of HGH therapy. Stabler's findings have pointed not just to the benefits of being taller but also to the hormone replacement quality of HGH therapy, even in cases where a deficiency was undetermined. His suggestion of a psychological disorder related to GH deficiency has caused him to recommend HGH therapy beyond

[14] Robert Delcampo, Teresa Chase, and Diana s. Delcampo, "Growth Disorders in Children: The Impact on the Family System," *Family Relations* 33, no. 1 (January 1984): 79.

[15] Barry Werth, "How Short is Too Short," *New York Times Magazine*, June 16, 1991, 29.

the growing stage-period for children.[16] In Stabler's world, more and not less of growth hormone needs to be prescribed.

Not all experts agree with Stabler. A 2005 study conducted by David E. Sandberg and Melissa Colsman from the Departments of Psychiatry and Pediatrics in the School of Medicine and Biomedical Sciences at the University of Buffalo found that most stereotypes about the perils of short stature, such as that short-statured people are treated poorly or hold lower status occupations and are paid less, were unsubstantiated. They also deduced that short-statured children were not psychologically plagued by these stereotypes and that an increase in height by human growth hormone therapy did not necessarily improve their quality of life.[17] However, this study and others seem to have less traction in our society when compared to the decades-long body of work on the ill effects of being short. This is in part due to the interpretation of short stature as a sign of pathology or a pathology in itself in the medical surveillance of healthy children; this understanding of small stature has endured since the early twentieth century and contributes to the medical correction of substandard height.

Aware of the power of the medical surveillance of children, pharmaceutical companies took over volunteer organizations and school growth surveys beginning in the 1980s in order to identify potential human growth hormone consumers. Genentech, Eli Lilly, and Caremark (a distributor of human growth hormone) used preexisting growth surveys for marketing purposes by pouring money into the Human Growth Foundation

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[16] Deborah Franklin, "Growing up Short," *Science News* 125, no. 6 (Feb. 11, 1984): 92. Stabler, B., P. T. Siegel, R. R. Clopper, C. E. Stoppani, P. G. Compton, and L. E. Underwood. "Behavior Change after Growth Hormone Treatment of Children with Short Stature." *Journal of Pediatrics* 133, no. 3 (1998): 366-73.

[17] David E. Sanberg and Melissa Colsman, "Assessment of Psychosocial Aspects of Short Stature," *Growth, Genetics & Hormones* 21 no. 2 (June 2005): 17-25.

(HGF) and its height screenings.[18] As a non-profit organization, HGF and its efforts often appear philanthropic rather than profit-driven, and companies engaged in the selling of human growth hormone have benefited from its volunteer health screenings and drives to educate the public about growth, growth disorders, and treatment. These companies understood that their consumer base would grow as more people became aware of growth problems and their solutions. Currently HGF and other voluntary, non-profit organizations focusing on growth disorders continue to receive corporate funding from the pharmaceutical industry as their volunteer efforts, websites, and support of medical research dovetail neatly with corporate attempts to advertise human growth hormone therapy.

Seen as a public good, growth surveys in schools were also tapped by pharmaceutical companies as prime opportunities to sell HGH directly to consumers. During the 1980s and 1990s, Genentech finagled its way into school screening programs in North Carolina and Georgia. In North Carolina, it funded screening programs for the Charlotte Mecklenburg School System orchestrated by Susan Parker, a pediatric nurse, Genentech consultant, and wife of a pediatric endocrinologist. Like school nurses during the early twentieth century, Susan measured children and charted their growth. If they had two disappointing measurements, Ms. Parker would then send to the child's parents a referral letter with an attached growth chart. The letter suggested that the parents seek additional medical counsel about their child's short stature. The program in Georgia worked in a similar fashion. Genentech gained access to a school screening program in Atlanta by working with the local Human Growth Foundation chapter in training physical

[18] Werth, 28.

education teachers how to measure children. Genentech supplied free charts and equipment to those conducting the surveys. As was the case in North Carolina, children who didn't measure up were sent home with a form letter recommending their parents contact the HGF or a pediatrician about their child's small stature. During the early 1990s, Genentech's work with schools caught the attention of the federal government. When Genentech's spokesperson James Weiss was questioned about his company's use of growth survey projects in schools, he argued that the screening effort was "a public health benefit to kids."[19] Although Weiss's assessment seems artificially altruistic school administrators had been championing health examination campaigns in schools as a public good since the early twentieth century and Genentech had simply extended the service to facilitate the treatment of short children with human growth hormone. Nevertheless, not everyone agreed with the appropriateness of Genentech's tactics.

Surveys like the ones in North Carolina and Georgia depended on growth charts to substantiate normal and abnormal height; without these charts, there would be no averages to assess a child's growth. The ability of charts to deem a child's height as abnormal and unhealthy has not gone unnoticed by pharmaceutical companies. During the past thirty years, they have used growth charts in marketing campaigns because of the diagnostic role they play in determining growth disorders, their assistance in prescribing human growth hormone, and their cultural currency. As the prescribing of HGH became less dependent on the diagnosing of growth hormone deficiency during the 1980s and 1990s, a child's measurements have gained importance. Since 2003, a child is officially

[19] Ralph T. King Jr., "Charity Tactic by Genentech Stirs Questions," *Wall Street Journal* August 10, 1994, B1.

a viable HGH consumer if his growth curve falls at or below the 2.1 percentile even if he produces adequate amounts of the hormone, according to the FDA. Since charts are composites of average measurements, there will always be a use for these charts in human growth hormone advertising as there will always be children who make up the low percentiles. Subsequently, short stature worthy of medical treatment is built into this diagnostic tool in perpetuity.

The fact that most parents mistakenly believe they know how to read and interpret their child's growth using growth charts contributes to these diagnostic tools' usefulness in the marketing of HGH. In 2007, a study was conducted to assess parental knowledge and understanding of growth charts. Of those surveyed, 79% of parents had seen a chart before, 98% of those had seen it in a doctor's or nurse's office, 64% of them thought it was important to be shown a growth chart to see how their child is growing, and 40% of them needed to see their child's growth chart as confirmation of their health care provider's interpretation. Yet, when given a multiple-choice quiz, 77% of parents surveyed incorrectly interpreted the charts.[20]

One source of misinterpretation had to do with the perception of percentiles. Since their invention by Francis Galton, percentiles have been used as the basis of most growth charts and standards. Although medical experts often refer to standard deviations when discussing height, physicians and growth studies experts favored using percentiles over standard deviations to explain growth and development to parents because they assumed percentiles were easier to understand. A well-known growth studies expert commented:

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[20] Elana Pearl Ben-Joseph, Steven A. Dowshen and Neil Izenberg, "Do Parents Understand Growth Charts? A National, Internet-Based Survey," *Pediatrics* 124 (2009): 1100.

> A parent who is told his child's height is at the 10th percentile understands readily: 10 per cent of normal healthy children are shorter than his child. But the equivalent statement that the child's height lies 1.28 standard deviations below the mean is incomprehensible, and has to be translated by a doctor equipped with both tables and understanding.[21]

However, parental comprehension of percentiles was more tenuous then expected. Of those parents surveyed in 2007, 96% had heard the term percentile but only slightly more than half (56%) could define it.[22]

In this context, the revamping of the federal growth charts by the NCHS and CDC in the early 2000s became a prime opportunity for Eli Lilly to directly advertise its growth hormone product for idiopathic short stature [ISS] to consumers. This was a tactic that the FDA strongly urged Eli Lilly not to take when it approved Lilly's growth hormone product in the treatment of ISS. The reconfiguring of the 1970s growth charts began in the early 1990s when the NCHS and CDC orchestrated a series of workshops to obtain expert input for creating the next generation of standards. Eight years later, the 2000 CDC growth charts with new standards were unveiled. The charts were hailed as more representative of America's children and included two new curves, the 3rd and 97th, which were intended to "facilitate plotting data for children at extremes of the distribution," an addition which must have pleased most human growth hormone manufacturers.[23] In 2003, Eli Lilly published and distributed its own version of these charts, which was identical to the official CDC version except for a bright red-lined curve

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[21] Tanner, 394.

[22] Ben-Joseph et al., 1100.

[23] RJ Kuczmarski, CL Ogden, SS Guo, et al. "2000 CDC Growth Charts for the United States: Methods and Development," ed. National Center for Health Statistics, Vital Health Statistics, 262, no. 11 (2000): 12.

for the 2.1 percentile to highlight at what point the FDA allowed for Eli Lilly's HGH product Humatrope to be prescribed for idiopathic short stature.[24] This red line not only drew attention to the FDA's approval but also to its proximity to the new third percentile. Lilly's red line and the 3rd percentile curve provided the borders of a danger zone of short stature, a zone that represented higher measurements in boys than in girls as the charts remained sex-specific.[25] Parents would see that their child failed to make it to a normal percentile and would perhaps consider ways to help their son or daughter.

Perceived as simplistic and easy to interpret, growth charts remained powerful marketing media used by pharmaceutical companies regardless of their origin. In 2011, Genentech's website for its growth hormone product Nutropin featured a growth chart tool. The website suggested, "the most widely used growth charts are created by measuring many boys and girls and breaking the range of their heights and weights into percentiles by age. To check your child's growth percentile, enter his or her sex, age, and height on the growth chart below and press "Show Growth Chart."[26] After inputting the data, a little black square representing the patient appeared on a height chart with a rainbow in the center. Each color of the rainbow pertained to certain percentile ranges with light blue corresponding to the highest percentile spectrum and red serving as the color for the 5th to 10th percentile range. There was no reference to the origin of the chart; the medium of the chart itself gave the assessment meaning. The little black square sat on the chart, its normalcy evaluated by a rainbow of standards.

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[25] John Lantos, Mark Siegler, Leona Cuttler, "Ethical Issues in Growth Hormone Therapy," *Journal of the American Medical Association* 261, no. 7 (February 17, 1989): 1020-24.

[26]Genentech Inc.'s Website for Nutropin, accessed October 20, 2011, http://www.nutropin.com/tools-resources/faqs/pghd.jsp.

The pathologization of short stature coupled with the perceived social stigmatization faced by short men made human growth hormone desirable to short boys and their parents. Even as organizations such as Little People of America and the National Association of Short Adults came out against HGH therapy and championed the end of discrimination based on height, personal testimonies from short male adults intended to document unfair treatment and inspire the halt of such behavior served as cautionary tales of being a short adult male. While personal commentaries by short men about heightism date back to the 1970s, this unexpected minority found a new voice in the mids-1990s. In 1995, the *Economist* ran an often-cited article titled: "Short Guys Finish Last: The World's Most Enduring Form of Discrimination" by journalist Jonathan Rauch. [27] Reminiscent of Ralph Keyes's popular discourse on heightism, Rauch argued, "studies confirm that short men are judged, and even judge themselves, negatively. Several surveys have found that short men feel less comfortable in social settings and are less happy with their bodies. Short men are paid less than taller men, they have a tougher time winning in electoral politics and in finding a heterosexual partner."[28] Rauch's article framed the discrimination faced by short-statured adult men as a consequence of socially constructed barriers and not as a result of being too short. Documentaries, books, articles, and web pages have continued the ongoing dialogue about the discrimination that short-statured male adults face and the failure of society to accept them as men. It is their testimony that continues to give credence to heightism in America and to serve as public service announcements for short boys.

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[27] Jonathan Rauch, "Short Guys Finish Last," *The Economist* (December 1995), http://www.jonathanrauch.com/jrauch_articles/height_discrimination_short_guys_finish_last/.

[28] Ibid.

The hardships of heightism did not seem exclusive to short men; short boys shared similar war stories, according to popular media. In 2006, *USA Today* published an article headlined, "The Debate is Growing: Is Being Short a Disability?"[29] In order to demonstrate the difficulties faced by children of short stature, journalist Rita Rubin began her article with a back-to-school to-do list from parents of a son with short stature. The Davies's list addressed the needs of their kindergartener and included items such as "get backpack" and "check height of school toilets." [30] They feared that the school restrooms facilities would mirror those in other public places and that their son Spencer, due to his height, would be unable to access the toilets without assistance. Their anxiety subsided after a bathroom check revealed the smaller-than-average facilities. Concerns over their son's short stature also stemmed from previous social circumstances when strangers commented on Spencer's height without provocation. Observing the social discrimination and physical challenges their son faced, the Davies had already sought medical attention when Spencer was two-and-a-half years old and decided to have him undergo human growth hormone therapy four years later even though clinical tests had not determined a reason for his short stature. At first the family's insurance would not cover the treatment because Spencer's idiopathic short stature (ISS) was not technically considered a disability requiring medical therapy; this decision was reversed after an outside review board ruled in favor of the Davies and of covering Spencer's human growth hormone therapy. Later in the article, the results of the therapy were considered by the reporter when she reported that after four and a half years of therapy, Spencer, at

[29] Rita Rubin, "The debate is growing: Is being short a disability?" *USA Today*, November 13, 2006, http://www.usatoday.com/news/health/2006-11-12-short-debate-cover_x.htm.

[30] Ibid.

age eleven, stood 4-foot-1, was "a straight A student and he's a top-ranked wrestler in Wisconsin."[31] The continuous social and physical struggles Spencer faced, the family struggle over coverage, and the journalist's selection of benchmarks used to document successful medical treatment speak to the understanding of both short stature and disability in American society.

Short stature is seen as a disability even in childhood. Though short stature is not often described as a disability, its medical treatment and people's visceral reactions to it stems from a culture obsessed with sameness, superficial appearances, and able-bodiedness at all ages.[32] Medicine has endorsed, reflected, and perpetuated these values by its approach to difference: to define abnormalities as pathologies to be fixed. At the root of this debate is the language of ability. Ability, like gender and race, operates in society as an axis of power with its implied premise and preference of normalcy and uniformity.[33] Any attempt to define difference within this enuciative modality perpetuates the cultural bias for sameness and similarity and provides an opportunity for pharmaceutical companies to offer medical fixes and elaborate on the somatic difference as pathological.[34]

The symbiotic relationship between human growth hormone therapy and the pathologization of short stature appears unlikely to end anytime soon. In 2012, Genentech's website for its human growth hormone product Nutropin includes an

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[31] Ibid.

[32] Henri-Jacques Stiker, *A History of Disability,* trans. William Sayers (Ann Arbor: University of Michigan, 1997), 1-14.

[33] Tobin Siebers, *Disability Theory* (Ann Arbor: University of Michigan, 2008), 7-11.

[34] Michel Foucault, *The Archaeology of Knowledge* (New York: Pantheon Books, 1972), 50-56.

educational pamphlet for the potential consumer. The tagline from Nutropin's advertising campaign "Growing Opportunity" appears throughout the booklet highlighting a boy's successful HGH therapy. The pamphlet's cover features a young man looking into the mirror at his former, younger, shorter self while being fitted by a tailor for a suit. The tailor is measuring the length of his suit coat to reinforce the notion that he has gained inches due to Nutropin. While his back is facing the viewer on the cover, the pamphlet's back cover features the boy looking straight ahead, smiling and straightening his tie. The label copy suggests Nutropin could be "helping you strive toward your growth potential," just like the well-dressed white young teenager. A mother's wish for her son to grow tall is also depicted in this campaign. A variation of the pamphlet's cover photo is on the Nutropin's Website. This image includes the boy's mother leaning on the mirror and smiling at the new, taller version of her son. This advertising campaign for Nutropin is not unique.[35] Throughout the twentieth and twenty-first centuries, educational pamphlets from pharmaceutical companies as well as federally produced growth charts, public health material, reports on psychosocial fears, and depictions of parental desires, have simultaneously substantiated the perceived hardships brought on by short stature and touted the promise of growth-promoting therapy. Since its inception, the human growth hormone industry has thrived on the manufactured heightened expectations of small boys who wish to be taller and the widely held belief that medicine can help them.

[35] Genentech, Inc.'s Website for Nutropin, "Human Growth Hormone Therapy for Children and Adults – Nutropin's website: Where are YOU in your Growth Hormone JOURNEY?" accessed August 20, 2012, http://www.nutropin.com/index.jsp.

Bibliography

Archives

Baby Books Collection, Louise M. Darling Biomedical Library at the University of California, Los Angeles.

Choh Hao Li Papers, 1937-1987, Archives and Special Collections, University of California, San Francisco Library & Center for Knowledge Management.

Committee for the Evaluation of the National Pituitary Agency, Central Files, National Academies of Sciences Archives, Washington, D.C.

Eugenics Record Office Records, American Philosophical Society American Philosophical Society, Philadelphia, Pennsylvania.

Herbert McLean Evans Papers, Archives and Special Collections, University of California, San Francisco Library & Center for Knowledge Management.

National Child Labor Committee Collection, Library of Congress Prints and Photographs Division, Washington, D.C.

Parke, Davis Research Laboratory Records, National Museum of American History's Archives Center, Washington, D.C.

Scripps Research Institute Archive, Mandeville Special Collections Library, University of California San Diego.

Primary Sources

News Sources and Periodicals

Anonymous. "16-Foot Men Held a Gland Possibility." *New York Times*, December 16, 1931, 36.

———. "All About Midgets Is Interesting Book on 'a Small World'." *Chicago Daily Tribune*, May 26, 1934, 12.

———. "Babies in Physical, Mental Tests at Hollywood." *Los Angeles Times*, April 17, 1925, 1.

———. "Can Japan Take It?" *Washington Post*, April 23, 1942, 14.

———. "Children's Day in Church." *New York Times*, August 4, 1918, 23.

———.“Children with Growth Ills ‘Starve’ for Hormone Shots.” *The Chicago Tribune,* September 5, 1971, A5.

———. "City to Observe Child Health Day May 1; Pupils to Take Part in Park Exercises." *New York Times*, April 29, 1928, 2.

———. "Comic 24 - No Title." *Los Angeles Times*, November 4, 1951, 31.

———. "Doctors Hear Gland Talk." *Los Angeles Times*, November 3, 1923, II1.

———. "Dr. Adler on Complexes." *Los Angeles Times*, February 17, 1929, 4.

———. "Dr. Engelbach Dies; Expert on Glands." *New York Times*, November 23, 1932, 22.

———. "Dwarf Girl, 11, Grows 3 Inches in 6 Months." *Los Angeles Times*, August 24, 1958, A.

———. “Faith Needed in This Age, Clerics Say.” *The Washington Post*, August 5, 1940, 11.

———. "Find Pituitary Hormone Aids Girl's Growth." *Chicago Daily Tribune*, August 24, 1958, 26.

———. "Glandular Grandeur." *New York Times*, December 17, 1931, 22.

———. "Growth Hormone Illegal for Off-Label Anti-Aging Use, Study Warns." *Science Daily,* November 8, 2005. http://www.sciencedaily.com/releases/2005/11/051108084527.htm

———.“Helping the Little People.” *Time*, May 7, 1972.

———. "How Children Should Grow: Grid Discards 'Average Size,' Charts Progress of Seven Body Types." *Life*, April 10, 1950, 79-82.

———. “List Anthropological Statistics, Made From Exposition at Chicago: Males Averaged 29 years and 68 inches in height.” *The Harvard Crimson,* March 28, 1934, http://www.thecrimson.com/article/1934/3/28/list-anthropological-statistics-made-from-exposition/.

———. "Marvelous Midget Beloved of Children." *Los Angeles Times*, September 12, 1920, III15.

———. “Medicine: Cornstalk.” *Time*, August 1, 1938, http://www.time.com/time/magazine/article/0,9171,771170,00.html.

———. "Medicine Gets New Place in Gland Control." *Chicago Daily Tribune*, April 22, 1932, 24.

———. "Midget Town Built First in Vienna Started Tiny Folk." *The Washington Post*, April 6. 1924, AA2.

———. “New Coney Dazzles Its Record Multitude." *New York Times*, May 15, 1904, 3.

———. "Pupils Prepare for May 1." *New York Times*, April 22, 1928, 33.

———. "Register for Baby Week." *Los Angeles Times*, March 28, 1926, 1.

———. "Says Hormones Add Inches to Children." *New York Times*, February 22, 1933, 24.

———. "Scientists Predicts Pituitary Treatment Will Overcome the 'Inferiority Complex." *New York Times*, August 2, 1937.

———. "Screen News Here and in Hollywood: ‘The Wizard of Oz’ in Demand Following the Box-Office Success of ‘Snow White’." *New York Times*, February 19, 1938, 19.

———. "Symposium Focuses on Short Stature." *The Galveston Daily News*, March 20, 1979, 2-A.

———. "The Amusements: Right This Way!" *New York Times*, April 30, 1939, 135.

———. "Tom Thumb in England." *Maine Farmer*, August 2, 1900, 7.

———. "To Save 100,000 Children." *New York Times*, January 25, 1918, 12.

———. "To Save 4,700 Babies Here." *New York Times*, July 29, 1918, 5.

Baker, Russell. "Think Twice About Growth, Dads and Lads." *Chicago Tribune*, January, 9 1987, 19.

Barton, William S. "Our Expanding Universe: A Department Interpreting the News in Science." *Los Angeles Times*, August 22, 1937, I15.

Bevans, Gladys Huntington. “Science is Giving Mothers and Babies More of a Chance.” *Chicago Daily Tribune*, June 2, 1928, 17.

Blakeslee, Alton L. "Hormones from Dead Persons’ Brains Are Making Dwarfed Children Grow." *The Washington Post*, March 29, 1958, 1.

Bowler, Leo. "Virgil Is Proud of 5 Feet 3: Scripps Doctors Make Dwarf 11 Inches Taller." *Evening Tribune*, 1965, A23.

Children's Bureau (U.S.). “President's Proclamation.” *The Child* 1, no. 11 (1937): 13.

Coughlin, Robert. “How to Survive Parenthood: Theories on How to Raise Children Have Come Full Circle as Parents Get ‘Neuroses-Neurosis’ Wondering What to do with and to the Kids.” *Life*, June 26, 1950, 112-126.

Cox, Stephen. “Kid Munchkins Reunite; Snubbed at a Walk of Fame Ceremony, Former Child Actors who Performed with the Adults Reminisce.” *Los Angeles Times*, December 3, 2008, E3.

Gibson, Gail. "Congress Set to Probe Use of Steroids in Baseball: Hearing Opens Tomorrow Top Names Called to Testify." *Baltimore Sun*, March 16, 2005. http://articles.baltimoresun.com/2005-03-16/news/0503160203_1_contempt-of-congress-subpoenas-steroids.

Greenacre, Allen. “We’re Getting Bigger Again.” *The American Weekly,* April 7,1947, 14.

Haskin, Frederic J. "Celebration to Set New Mark." *Los Angeles Times*, April 13, 1928, 18.

Herrick, Genevieve, Forbes. "Holds Plane of Life Is Fixed in First 5 Years." *Chicago Daily Tribune*, 1927, 33.

Robert Hilburn, “Pop Music.” *Los Angeles Times*, March 5, 1978, N72.

Jackson, Jay. "Comic 4 - No Title." *Chicago Defender*, August 19, 1944, 13.

Jung, Dan. “Congressional Hearing on Steroids in Baseball.” washingtonpost.com, March 16, 2005, http://www.washingtonpost.com/wp-dyn/articles/A41366-2005Mar16.html.

Kallen, H. M. “Psychology Without Compromise.” *The Dial*, March, 1925, 236.

King, Ralph T. "Charity Tactic by Genentech Stirs Questions." *Wall Street Journal*, August 10, 1994, 1.

Kolata, Gina, and Alan L. Otten. "Synthetic Growth Hormone Raises Hopes of Many – and Ethical Concerns over Use." *Wall Street Journal*, April 8, 1987, 33.

Kramer, Carol. "Minilib: Short Men Just Want Us to Look up to Them." *Chicago Tribune,* April 29, 1975, 1.

Latty, Betty. "Rare Treatment Helps Dwarfed Children Grow." *Los Angeles Times,* June 5, 1970, 11.

Lees, Hannah. "Side-Show Diagnosis." *Collier's*, June 5, 1937, 22, 35, and 38.

Lewis, Carolyn. “Their Hope Grows by the Yardstick.” *Washington Post,* July 1, 1965, F5.

Mansfield, Virginia. “Growing Up in a Tall World.” *Washington Post*, Feb. 18, 1982, MD1.

Mundy, Mariah Heath. "Undersized Boy Helps Others Like Him." *New York Times*, August 20, 1972, 77.

Nelson, Garrison and W. Ross Brewer. “Watch Out, Jimmy – Ford and Reagan are Taller.” *Los Angeles Times*, July 11, 1976, B4.

Newman, Maria. "Congress Opens Hearing on Steroid Use in Baseball." Review of July 3, 2012. *New York Times Learning Network*, March 18, 2005. http://www.nytimes.com/learning/teachers/featured_articles/20050318friday.html.

Oppenheimer, Carol. "'Short People' Song Sets Off a Tall Furor." *Chicago Tribune*, January 8, 1978, 3.

Rauch, Jonathan. “Short Guys Finish Last.” *The Economist* (December 1995), http://www.jonathanrauch.com/jrauch_articles/height_discrimination_short_guys_finish_last/.

Revkin, Andrew C. "Growing Pains: A Synthetic Hormone Is Cutting Short a Growth Disorder’s Hold Over." *Los Angeles Times*, September 22, 1986, 6.

Rubin, Rita. "The Debate Is Growing: Is Being Short a Disability?" *USA Today*, November 13, 2006. http://www.usatoday.com/news/health/2006-11-12-short-debate-cover_x.htm.

Sadler, Christine. “Officials War Raid Wardens Against ‘Napoleon’ Complexes.” *Washington Post*, January 27, 1942, 26.

Shearer, Lloyd. "We Can End Dwarfism!" *San Diego Union, Parade Magazine,* August 22, 1965, cover-6.

Staff Correspondent. "Chemist Discovers 'Growth Hormone'." *New York Times*, September 4, 1931, 1.

Steinbrook, Robert. “Hormone Means Life is Looking up for Short People.” *The Chicago*

Tribune: Tempo, May 23, 1978, A1.
Van Dellen, T. R. “How to Keep Well: Tallness and Shortness.” *Chicago Daily Tribune*, October 31, 1958, 10.

Wall, Wendy L. "Eli Lilly Gets Approval to Sell Growth Hormone." *Wall Street Journal*, March 10, 1987, 18.

Werth, Barry. "How Short Is Too Short? Marketing Human Growth Hormone." *New York Times Magazine*, June 16, 1991, 14-17, 28-29, 47.

Wilson, Duff. “After a Young Athlete’s Suicide, Steroids are Called the Culprit.” *New York Times*, March 10, 2005, A1.

Medical and Scientific Journals

Anonymous. "News Notes." *Science, New Series* 132, no. 3422 (July 29, 1960): 284.

Bayer, Leona M., and H. Gray. "Pituitary Dwarfs: Their Growth and Treatment: Observations on Twelve Cases for Periods of One to Eight Years." *California and Western Medicine* 47, no. 4 (October 1937): 228-33.

Ben-Joseph, Elana Pearl, Steven A. Dowshen, and Neil Izenberg. "Do Parents Understand Growth Charts? A National, Internet-Based Survey." *Pediatrics* 124, no. 4 (2009): 1100-1109.

Bowditch, Henry Pickering. "The Relation between Growth and Disease." *Transactions of the American Medical Association* 32 (1881): 371-77.

Brown-Séquard, Charles-Edouard. "The Effects Produced on Man by Subcutaneous Injections of a Liquid Obtained from the Testicles of Animal." *Lancet* (July 20, 1889): 103-07.

Cushing, Harvey. "Disorders of the Pituitary Gland: Retrospective and Prophetic." *The Journal of the American Medical Association* 76, no. 25 (1921): 1721-26.

Cutter, Leona, and J. B. Silvers. "Growth Hormone and Health Policy." *Journal of Clinical Endocrinology and Metabolism* 95, no. 7 (July 1, 2010): 3149-53.

Cutter, Leona, J. B. Silvers, Jagdip Sing, Ursula Marrero, Beth Finkelstein, Grace Tannin, and Duncan Neuhauser. "Short Stature and Growth Hormone Therapy: A National Study of Physician Recommendation Patterns." *Journal of American Medical Association* 276, no. 7 (1996): 531-37.

Cutter, Leona, and J. B. Silvers. "Growth Hormone and Health Policy." *Journal of Clinical Endocrinology and Metabolism* 95, no. 7 (2010): 3149-52.

Deamer, W. C. "Stimulation of Growth in Boys by Sublingual Testosterone Therapy." *American Journal of Diseases of Children* 75, no. 6 (June 1948): 850-9.

Delcampo, Robert, Teresa Chase, and Diana S. Delcampo. "Growth Disorders in Children: The Impact on the Family System." *Family Relations* 33, no. 1 (January 1984): 79-84.

Drummond, Jack Cecil, and Robert Keith Cannan. "Tethelin-the Alleged Growth-Controlling Substance of the Anterior Lobe of the Pituitary Gland." *Journal of Biochemistry* 16, no. 1 (1922): 53-9.

Engelbach, William. "The Growth Hormone: Report of a Case of Juvenile Hypopituitarism Treated with Evans' Growth Hormone." *Endocrinology* 16, no. 1 (January-February 1932): 1-19.

Engelbach, William, and Robert L. Schaefer. "Endocrine Dwarfism." *Journal of American Medical Association* 103, no. 7 (August 18, 1934): 464-68.

Franklin, Deborah. "Growing up Short." *Science News* 125, no. 6 (February 11, 1984): 92-94.

Friesen, Henry. "Raben Lecture 1980: A Tale of Stature." *Endocrine Reviews* 1, no. 4 (Fall 1980): 309-18.

Garn, Stanley Marion. "Physical Growth and Development." *American Journal of Physical Anthropology* 10, no. 2 (June 1952): 169-92.

Gold, Ruth F. "Constitutional Growth Delay and Learning Problems." *Journal of Learning Disabilities* 11, no. 7 (August/September 1978): 36-38.

Grimberg, A., E. Stewart, and M. P. Wajnrajch. "Gender of Pediatric Recombinant Human Growth Hormone Recipients in the United States and Globally." *Journal of Clinical Endocrinology and Metabolism* 93, no. 6 (June 2008): 2050-6.

Howell, William Saphir and Ralph H. Kunstadter. “Human Serum “Response to Gonadotropic Hormone (Pregnancy Urine Extract).” *Endocrinology* 24 (1939): 182-86.

Hyman, ed. Sol. "Tethelin Presented to the University of California by Doctor Robertson." *California State Journal of Medicine* XV, no. 6 (June 1917): 181.

Jacobsen, A. Wilmot, and Arthur J. Cramer. "Clinical Results of Anterior Pituitary Therapy in Children." *Journal of American Medical Association* 109, no. 2 (July, 10 1937): 101-08.

Kolata, Gina. "New Growth Industry in Human Growth Hormone?" *Science, New Series* 234, no. 4772 (October 3, 1986): 22-24.

Kornfeld, Werner. "The Anthropometric Approach to the Practice of the Pediatrician." *Child Development* 18, no. 3 (1947): 113-29.

Lantos, John, Mark Siegler, and Leona Cuttler. "Ethical Issues in Growth Hormone Therapy." *Journal of American Medical Association* 261, no. 7 (February 17, 1989): 1020-24.

Lewis, Roger A., Robert Klein, and Lawson Wilkins. "The Effect of Pituitary Growth Hormone in dwarfism with Osseous Retardation and Hypoglycemia and in a Cretin Treated with Thyroid." *Journal of Clinical Investigation* 29, no. 4 (1950): 460-464.

Li, C. H. "Pituitary Growth Hormone as a Metabolic Hormone." *Science* 123, no. 3198 (April 13, 1956): 617-8.

Li, C. H., and H. M. Evans. "The Isolation of Pituitary Growth Hormone." *Science* 99, no. 2566 (March 3, 1944): 183-84.

Li, C. H., and H. Papkoff. "Preparation and Properties of Growth Hormone from Human and Monkey Pituitary Glands." *Science* 124, no. 3235 (December 28, 1956): 1293-4.

Lisser, Hans. "Organotherapy, Present Achievements and Future Prospects." *Endocrinology* (January-February 1925): 1-20.

———. "The Endocrine Society the First Forty Years (1917-1957)." *Endocrinology* 80 (January 1967): 5-28.

Mansfield, Margery. "Understanding Adler." *Forum* 79 no. 4 (April 1928): XII.

Meredith, Howard V. "A "Physical Growth Record" For Us in Elementary and High Schools." *American Journal of Public Health Nations Health* 39, no. 7 (1949): 878-85.

Novak, Emil. "Glandular Physiology and Therapy: Anterior Pituitary and Anterior Pituitary-Like Substances." *Journal of American Medical Association* 104, no. 12 (March 23, 1935): 998-1002.

Pollitt, Ernesto, and John Money. "Studies in the Psychology of Dwarfism. I. Intelligence Quotient and School Achievement." *Journal of Pediatrics* 64, no. 3 (March 1964): 415-21.

Raben, M. S. "Treatment of a Pituitary Dwarf with Human Growth Hormone." *Journal of Clinical Endocrinology and Metabolism* 18, no. 8 (August 1958): 901-3.

Raiti, Salvatore. "Human Growth Hormone and Creutzfeldt-Jakob Disease." *Annals of Internal Medicine* 103, no. 2 (1985): 288-9.

Reilly, William A., Lawson H. Wilkins, and William C. Deamer. "American Academy of Pediatrics, Inc. Proceedings and Reports, Round Table Discussion, Endocrine Therapy in Childhood." *Pediatrics* 6, no. 6 (December 1950): 908-918.

"Review of Problem Children by Alfred Adler." *The British Medical Journal* 2, no. 3684 (August 15, 1931): 300.

Rohleder, Glenn D. "Accomplishments of the Child-Health Demonstration of Mansfield and Richland County, Ohio." *Educational Research Bulletin* 6, no. 16 (1927): 342-46.

Sanberg, David E., and Melissa Colsman. "Assessment of Psychosocial Aspects of Short Stature." *Growth, Genetics & Hormones* 21, no. 2 (June 2005): 17-25.

Shelton, E. Kost. "Pituitary Growth Factor: Some Clinical Considerations." *California and Western Medicine* 45, no. 1 (July 1936): 20-25.

Stabler, B., P. T. Siegel, R. R. Clopper, C. E. Stoppani, P. G. Compton, and L. E. Underwood. "Behavior Change after Growth Hormone Treatment of Children with Short Stature." *Pediatrics* 133, no. 3 (September 1998): 366-73.

Stendler, Celia B. "Sixty Years of Child Training Practices." *The Journal of Pediatrics* 36, no. 1 (1950): 122-36.

Stuart, Harold C., and Howard V. Meredith. "Use the Body Measurements in the School Health Program." *American Journal of Public Health and The Nation's Health* 36, no. 12 (1946): 1365-86.

Wilhelmi, A. E., Jacob B. Fishman, and Jane A. Russell. "A New Preparation of Crystalline Anterior Pituitary Growth Hormone." *Journal of Biological Chemistry* 176, no. 2 (November 1948): 735-745.

Books

Adler, Alfred. *The Science of Living*. Garden City: Garden City Publishing Company, 1929.

Anderseon, John E., and Florence L Goodenough. *How Normal Children Grow: Their Physical, Mental and Character Development*. New York: The Parents'

Publishing Association, 1930.
Armour Laboratories. *The Pituitary Gland: Clinical Application of Its Hormone Factors*. Chicago: Armour and Company, 1944, revised edition.

Aspinall, A, E. Anthony Smith, and David C. Douglas. *English Historical Documents 1783-1832*. New York: Routledge, 1959.

Baum, L. Frank. *The Wonderful Wizard of Oz.* New York: Knopf, 1900.

Behrman, Richard E., Victor C. Vaughan, and Senior Editor Waldo E. Nelson, *Nelson Textbook of Pediatrics*. Philadelphia: W.B. Saunders Company, 1983.

Billard Chalres Michel. *A Treatise on the Disease of Infants: Founded on Recent Clinical Observations and Investigations in Pathological Anatomy*. Translated by James Steward. Second American edition translated from the third French edition ed. New York: J & H.G. Langley, 1839.

Biography of Our Baby: From Birth to Seven Years. C. Junceau, c. 1941.

Bodin, Walter, and Burnet Hershey. *It's a Small World; All About Midgets*. New York: Coward-McCann, 1934.

Bowditch, Henry Pickering. *The Growth of Children*. Boston: Albert J. Wright, State Printer, 1877.

Chayer, Mary Ella. *School Nursing: A Contribution to Health Education*. New York: G.P. Putnam's Sons, 1938.

Cushing, Harvey. *The Pituitary Body and Its Disorders: Clinical States Produced by Disorders of the Hypophysis Cerebri*. Philadelphia & London: J.B. Lippincott Company, 1912.

Fonssagrives, J.B. *The Mother's Register Current Notes of the Health of Children (boys). The Mother Records for the Physician to Interpret*. Translated from French, New York: John Ross and Company, 1872.

Gesell, Arnold. *A Guide to the Study of the Pre-School Child*. New York: Harper & Brothers, 1940.

Gillis, John S. *Too Tall, Too Small*. Champaign, Institute for Personality and Ability Testing, inc., 1982.

Griffith, J.P. Crozer. *The Diseases of Infants and Children*. 1st ed., 2nd ed. revised and reset, and 3rd ed. Philadelphia: W.B. Saunders, 1919, 1938, and 1935 respectively.

Griscom, John H. *Sanitary Condition of the Laboring Population of New York City.* 1845.

Holt, Luther Emmet, et. al. *The Diseases of Infancy and Childhood: For the Use of Students and Practitioners of Medicine*. 1st ed., 4th ed., 6th ed., and 11th ed., New York: Appleton, 1897, 1908, 1913, and 1940 respectively.

Kant, Immanuel, and Lewis White Beck. *Critique of Practical Reason and Other Writing in Moral Philosophy*. Chicago: University of Chicago Press, 1949.

Kaplan, Solomon, ed. *Clinical Pediatric and Adolescent Endocrinology*. Philadelphia: W.B. Saunders Company, 1982.

MacDonald, Arthur. *Experimental Study of Children*. Washington D.C.: Government Printing Office, 1899.

———. *Man and Abnormal Man*. Washington D.C.: Government Printing Office, 1905.

Maisel, Albert Q. *The Hormone Quest*. New York: Random House, 1965.

Nelson, Waldo. *Textbook of Pediatrics: with the Collaboration of Eighty-One Contributors*. Philadelphia: Saunders, 1959.

Our Baby's Journal. Kansas City: Emery, Bird, Thayer Co, not after 1914.

Raiti, Salvatore, ed. *Advances in Human Growth Hormone Research: A Symposium held at Baltimore, Maryland, October 9-12, 1973.* Washington D.C.: DHEW publication (NIH), 1974.

Riis, Jacob. *How the Other Half Lives; Studies among the Tenements of New York*. New York: Sagamore Press, 1890.

Smith, Richard M., and Douglas A. Thom. *HEALTH, Physical, Mental, and Emotional*. Boston: Houghton Mifflin, 1936.

Spock, Benjamin. *The Common Sense Book of Baby and Child Care*. New York: Duell, Sloan and Pearce, 1957.

Stabler, Brian, and Louis E. Underwood. *Slow Grows the Child: Psychosocial Aspects of Growth Delay, Proceedings of a Symposium Sponsored by the Human Growth Foundation and Serono Symposia, USA*. New Jersey: Lawrence Erblaum Associates, 1986.

Talbot, Nathan B., Edna H. Sobel, Janet W. McArthur, and John D. Crawford. *Endocrinology: From Birth through Adolescence*. Cambridge: Harvard University Press, 1952.

Way, Lewis. *Alfred Adler: An Introduction to His Psychology*. New York: Pelican Books, 1956.

Wheelan, Albertine Randall. *Mother Stork's Baby Book*. New York: Dodge Publishing Company, c.1904.

Young, G.M., and W.D. Hancock. *English Historical Documents, 1833-1874*. Vol. XII, New York: Routledge, 1956.

Pamphlets, Thesis, Pharmaceutical Advertisements, Conference Papers, and Audio-Visual Material

Centers for Disease Control and Prevention. "Testimony on Steroid Use Among Females: Results of the Youth Risk Behavioral Surveillance System before Committee of Government Reform." June 15, 2005, http://www.hhs.gov/asl/testify/t050615a.html.

Children's Bureau (U.S.). *April and May Weighing and Measuring Test*. Children's Year Leaflet no. 2 part 2, Bureau Publication no. 38, Washington, D.C.: Labor Bureau,1918.

———. *Children's Year: A Brief Summary of Work Done and Suggestions for Follow-up Work*. Children's Year Follow Up Series no. 4, Bureau Publication no 67, Washington, D.C.: Labor Bureau, 1920.

———. *The Seven Years of the Maternity and Infancy Act.* Washington, D.C.: Labor Bureau,1931.

Feldman, Saul D. "The Presentation of Shortness in Everyday Life -- Height and Heightism in American Society: Toward a Sociology of Stature." A paper presented at the 1971 meeting of the American Sociological Association.

Feldman, Saul D. and Gerald W. Thielbar ed. *Lifestyles.* Boston: Little, Brown, 1972.

Fleming, Victor, Noel Langley, Florence Ryerson, Edgar Allan Woolf, Harold Rosson, Mervyn LeRoy, Judy Garland, et al. *The Wizard of Oz*. 1939; Turner Entertainment Co. 1999, DVD.

Genentech Inc. Advertisement for Protropin, *Journal of Pediatrics* (January, 1984): 6A-9A.

Genentech, Inc. Protropin. "Out of Today's technology tomorrow's growth." *Journal of Pediatrics* 108, no. 1 (January, 1986): 27A-31A.

Genentech Inc.'s Website for Nutropin. "The Nutropinville Kids." Accessed December

17, 2008, http://www.nutropin.com/pdf/13898_gene_ntrpnvlle_fa4.pdf.

———. "Human Growth Hormone Therapy for Children and Adults – Nutropin's website: Where are YOU in your Growth Hormone JOURNEY?" Accessed August 20, 2012, http://www.nutropin.com/index.jsp.

Hamill, Peter V.V. "NCHS Growth Curves for Children Birth-18 Years: United States." Edited by National Center for Health Statistics, Vital Health Statistics, 165, no. 11, 1977.

International Symposium on Growth Hormone. *Growth and Growth Hormone; Proceedings of the Second International Symposium on Growth Hormone, Milan, May 5-7, 1971*. Amsterdam: Excerpta Medica, 1972.

Joint Committee on Health Problems in Education and Thomas Denison Wood, *Health Service in the City Schools of the United States. Report of the Joint Committee on Health Problems in Education of the National Education Association and the American Medical Association.* No publishing information, 1922, Google Books.

Kabi Group Inc.'s advertisement for Crescormon. "Now you can prescribe somatropin: Cresormon." *Journal of Pediatrics* 199, no. 5 (November 1981): 14A.

Klein, Benjamin. "Modern Lilliputia: The Story of Midgets." No publishing information, 1933.

Krogman, Wilton Marion. "Principles of Human Growth." *Human Growth - Ciba Symposia* 5, no.1 (1943).

Kuczmarski, RJ, CL Ogden, SS Guo, et al. "2000 CDC Growth Charts for the United States: Methods and Development." Ed. National Center for Health Statistics, Vital Health Statistics, 262, no. 11 (2000).

Mitchell, George. "Report to the Commissioner of Baseball of an Independent Investigation into the Illegal use of Steroids and Other Performance Enhancing Substances by Players in Major League Baseball. Summary and Recommendations." Office of the Commissioner of Baseball, New York: NY, 2007.

National Child Labor Committee. "Child Labor and Social Progress: Proceedings of the Fourth Annual Meeting." Atlanta, Georgia, April 2-5 1908.

Newman, Randy. "Short People," *Little Criminals*, 1977.

Popkin, Jeffrey F. and Fred Sassoon. "Heightism and the Short Man: An Exploratory Study." MSW Thesis, School of Social Welfare, University of California Los Angeles, 1977.

Serono Pharmaceuticals' advertisement for Asellacrin. "The Miracle of Growth." *The Journal of Pediatrics* 98, no. 3 (March 1981): A46-48.

———. "Series 2: Subcutaneous Injection: one in a series updating human growth hormone therapy Growth Hormone Deficiency. Asellacrin the natural human growth hormone." *Journal of Clinical Endocrinology and Metabolism* 60, no 6 (June 1985): 17-20A

Serono Pharmaceuticals advertisement for TGE. *The Journal of Pediatrics* 99, no. 6 (December 1981): A44-45.

Souvenir booklet. "A Century of Progress: Chicago World's Fair Souvenir, 1833-1933." Chicago: The Arena Company, 1933.

Walt Disney Films. *Snow White and the Seven Dwarfs*. 1937; Burbank, California: Walt Disney Enterprises, 2009, DVD.

World Health Organization. *A Growth Chart for International use in Maternal and Child Health care: Guidelines for Primary Health Care Personnel*. Geneva: World Health Organization, 1978.

Secondary Sources

Adelson, Betty M. *Dwarfism: Medical and Psychosocial Aspects of Profound Short Stature*. Baltimore: Johns Hopkins University Press, 2007.

Albrizio, Angelo. "Biometry and Anthropometry: From Galton to Constitutional Medicine." *Journal of Anthropological Sciences* 85 (2007): 101-23.

Apple, Rima D. *Perfect Motherhood: Science and Childrearing in America* New Brunswick: Rutgers University Press, 2006.

Barker-Benfield, Ben. "The Spermatic Economy: A Nineteenth Century View of Sexuality." *Feminist Studies* 1, no. 1 (1972): 45-74.

Berrett, Jesse. "Feeding the Organization Man: Diet and Masculinity in Postwar America." *Journal of Social History* 30, no. 4 (1997): 805-25.

Bliss, Michael. *Harvey Cushing: A Life in Surgery*. Oxford, 2005.

Bogdan, Robert. *Freak Show: Presenting Human Oddities for Amusement and Profit*. Chicago: University of Chicago Press, 1988.

Borell, Merriley. "Brown-Séquard's Organotherapy and Its Appearance in America at the End of the Nineteenth Century." *Bulletin of the History of Medicine* 30, no. 3 (Fall 1976): 309-20.

Bremner, Robert Hamlett. *Children and Youth in America: A Documentary History*. Vol. Vol. 1, 1600-1865, Cambridge, Mass: Harvard University Press, 1975.

Campbell, Neil A., and Jane B. Reece. *Biology*. 7 ed. San Francisco: Pearson, 2006.

Canguilhem, Georges. *The Normal and the Pathological*. New York: Zone Books, 1989.

Centers for Disease Control and Prevention, "CJD, (Creutzfeldt-Jakob Disease, Classic)."Accessed August 16, 2012. http://www.cdc.gov/ncidod/dvrd/cjd/.

Cohen, Susan, and Christine Cosgrove. *Normal at Any Cost: Tall Girls, Short Boys, and the Medical Industry's Quest to Manipulate Height*. New York: Jeremy P. Tarcher/Penguin, 2009.

Cole, Douglas. *The Early Years, 1858-1906*. Seattle: University of Washington, 1999.

Cone, Thomas E. *History of American Pediatrics*. Boston: Little Brown and Company, 1979.

Connell, R.W. *Masculinities*. Berkeley: University of California Press, 1995.

Conrad, Peter. *The Medicalization of Society : On the Transformation of Human Conditions into Treatable Disorders*. Baltimore: Johns Hopkins University Press, 2007.

Corner, George W. "Herbert Mclean Evans, 1882-1971." edited by National Academy of Sciences. Washington D.C.: National Academy of Sciences, 1974.

Craig, Lee A. *To Sow One Acre More: Childbearing and Farm Productivity in the Antebellum North*. Baltimore: Johns Hopkins University Press, 1993.

Deleuze, Gilles, and Félix Guattari. *Anti-Oedipus: Capitalism and Schizophrenia*. Minneapolis: University of Minnesota Press, 1983.

Dreger, Alice Domurat. *Hermaphrodites and the Medical Invention of Sex*. Cambridge, Mass.: Harvard University Press, 1998.

Fisher, Delbert A. "A Short History of Pediatric Endocrinology in North America." *Pediatric Research* 55, no. 4 (2004): 716-26.

Foucault, Michel. *The Archaeology of Knowledge*. World of Man. 1st American ed. New York: Pantheon Books, 1972.

Frasier, S. Douglas. "The Not-So-Good Old Days: Working with Pituitary Growth Hormone in North America, 1956 to 1985." Supplement to *The Journal of Pediatrics* 131, no. 1 (July 1997): S1-S4.

Freedman, Russell. *Kids at Work: Lewis Hine and the Crusade against Child Labor*. New York: Clarion Books, 1994.

Gilbert, James B. "Anthropometrics in the U.S. Bureau of Education: The Case of Arthur Macdonald's 'Laboratory'" *History of Education Quarterly* 17, no. 2 (Summer 1977): 169-95.

Gratton, Brian and Jon Roger Moen. "Immigration, Culture, and Child Labor in the United States, 1880 - 1920." *Journal of Interdisciplinary History* 34, no. 3 (Winter 2004): 355-391.

Hall, Diana Long, and Thomas F. Glick. "Endocrinology: A Brief Introduction." *Journal of the History of Biology* 9, no. 2 (1976): 229-33.

Halpern, Sydney A. *American Pediatrics: The Social Dynamics of Professionalism, 1880 - 1980*. Berkeley: University of California, 1988.

Hirschbein, Laura Davidow. "The Glandular Solution: Sex, Masculinity, and Aging in the 1920s." *Journal of the History of Sexuality* 9, no. 3 (July 1, 2000): 277-304.

Hughes, Sally Smith. *Genentech: The Beginnings of Biotech*. Chicago: University of Chicago Press, 2011.

Kaplan, Daile, ed. *Photo Story: Selected Letters and Photographs of Lewis W. Hine*. Washington D.C.: Smithsonian Institution Press, 1992.

Kevles, Daniel. *In the Name of Eugenics: Genetics and the Uses of Human Heredity*. New York: Knopf, 1985.

King, Charles R. *Children's Health in America: A History*. New York: Twayne Publishers, 1993.

Kudlick, Catherine J. "Disability History: Why We Need Another 'Other'." *The American Historical Review* 108, no. 3 (June 2003): 763-93.

Li, Alison. "A.M. Hanson and the Isolation of the Parathyroid Hormone, or Endocrines and Enterprise." *Journal of the History of Medicine and Allied Sciences* 47, no. 4 (1992): 405-38.

———. *J.B. Collip and the Development of Medical Research in Canada: Extracts and Enterprise*. McGill-Queen's University Press, 2003.

Markel, editors - Alexandra Minna Stern and Howard. *Formative Years: Children's Health in the United States, 1880-2000*. Ann Arbor: The University of Michigan Press, 2002.

Marks, Harry. "Cortisone, 1949: A Year in the Political Life of a Drug." *Bulletin of the History of Medicine* 66, no. 3 (1992): 419-39.

Nordlund, Christer. "Endocrinology and Expectations in 1930s America: Louis Berman's Ideas on New Creations in Human Beings." *Redorbit* October 10 (2007) http://www.redorbit.com/news/science/908843/endocrinology_and_expectations_in_1930s_america_louis_bermans_ideas_on/.

Pearce, J. M. "Pituitary Tumours and Acromegaly (Pierre Marie's Disease)." *Journal of Neurology, Neurosurgery and Psychiatry* 73, no. 4 (Oct 2002): 394.

Pernick, Martin S. *The Black Stork: Eugenics and the Death Of "Defective" Babies in American Medicine and Motion Pictures since 1915*. New York: Oxford University Press, 1996.

Peterson, Melody. *Our Daily Meds: How the Pharmaceutical Companies Transformed Themselves into Slick Marketing Machines and Hooked the Nation on Prescription Drugs*. New York: Farrar, Straus and Giroux, 2008.

Prescott, Heather Munro. ""I Was a Teenage Dwarf": The Social Construction Of "Normal" Adolescent Growth and Development in the United States." In *Formative Years: Children's Health in the United States, 1880-2000*, edited by Alexandra Minna Stern and Howard Markel, 153-82. Ann Arbor: University of Michigan Press, 2002.

Quirke, Vivian. "Making British Cortisone: Glaxo and the Development of Corticosteroids in Britain in the 1950s-1960s." *Studies in History and Philosophy of Science Part C: Studies in History and Philosophy of Biological and Biomedical Sciences* 36, no. 4 (2005): 645-74.

Rasmussen, N. "Steroids in Arms: Science, Government, Industry, and the Hormones of the Adrenal Cortex in the United States, 1930-1950." *Medical History* 46, no. 3 (Jul 2002): 299-324.

Rosen, George. "Political Order and Human Health in Jeffersonian Thought." *Bulletin of the History of Medicine* 22, no. 1 (1952): 32-44.

———. "Benjamin Rush on Health and the American Revolution." *American Journal of Public Health* 66, no. 4 (1976): 397-98.

Rosenblum, Naomi. "Biographical Notes." In *America & Lewis Hine: Photographs 1904-1940: [Exhibition]*, edited by Alan Trachtenberg, 16 - 25. New York: Aperture, Inc., 1977.

Rothman, David J., and Sheila M. Rothman. *The Pursuit of Perfection: The Promise and Perils of Medical Enhancement*. Vintage, 2003.

Sampsell-Willmann, Kate. *Lewis Hine as Social Critic*. Jackson: University Press of Mississippi, 2009.

Siebers, Tobin. *Disability Theory*. Corporealities. Ann Arbor: University of Michigan Press, 2008.

———. *Disability Theory*. Ann Arbor: University of Michigan, 2008.

Smith-Rosenberg, Carroll, and Charles Rosenberg. "The Female Animal: Medical and Biological Views of Woman and Her Role in Nineteenth-Century America." *The Journal of American History* 60, no. 2 (1973): 332-56.

Smuts, Alice Boardman. *Science in the Service of Children, 1893-1935*. New Haven and London: Yale University Press, 2006.

Spencer, Frank. *History of Physical Anthropology: An Encyclopedia*. Vol. 1,1997.

Stern, Alexandra Minna, and Howard Markel. *Formative Years: Children's Health in the United States, 1880-2000.* Ann Arbor: University of Michigan Press, 2002.

Stiker, Henri-Jacques. *A History of Disability*. Translated by William Sayers. Ann Arbor: University of Michigan, 1997.

Tanner, J. M. *A History of the Study of Human Growth*. Cambridge Cambridgeshire; New York: Cambridge University Press, 1981.

Trattner, Walter I. *Crusade for the Children: A History of the National Child Labor Committee and Child Labor Reform in America*. Chicago: Quadrangle 1970.

Watkins, Elizabeth Siegel. *The Estrogen Elixir: A History of Hormone Replacement Therapy in America*. Baltimore: Johns Hopkins University Press, 2007.

———. "The Medicalization of Male Menopause in America." *Social History of Medicine* 20, no. 2 (2007): 369-88.

Weissbach, Lee Shai. "Child Labor Legislation in Nineteenth-Century France." *The Journal of Economic History* 37, no. 1 (1977): 268-71.

Whaples, Robert. “Child Labor in the United States.” *EH.Net Encyclopedia* edited by Robert Whaples, October 7, 2005, http://eh.net/encyclopedia/article/whaples.childlabor.

Wood, Ann Douglas. ""The Fashionable Disease": Women's Complaints and Their Treatment in Nineteenth-Century America." *Journal of Interdisciplinary History* 4, no. 1 (1973): 25-52.

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