

# Health Risks of Higher Birth Weight, Rapid Growth, Early Maturation and Taller Height

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**Background:** For over 100 years, the medical community has assumed that promoting higher birth weight, faster growth, early maturation and taller height assures better health and longevity. In 2005, this assumption was challenged and a hypothesis was proposed that the obesity epidemic is driven by higher birth weight, rapid growth rate, early sexual maturity and excessive height. Over the last 10 years, much research has evolved that supports this alternative hypothesis.

**Objectives:** To provide additional evidence to support the hypothesis that the obesity epidemic and various health problems are due to increasing birth weight, rapid growth, early sexual maturation and excessive height growth.

**Materials and Methods:** A collection of over 5000 papers, reports and books provided a variety of findings for this report. Publications dealing with the issues discussed in the original 2005 paper were obtained from this collection of documents. Additional material was obtained from internet sources, such as on-line journals and reports.

**Results:** Scores of research and review papers provide substantial support for an alternative hypothesis on obesity and human health. The research supports the dangers of the modern diet that promotes greater birth weight and accelerated childhood growth. Evidence is also presented that early sexual maturity and bigger body size promote health problems and reduce longevity. In addition, data based on millions of deaths, indicates that taller height is related to reduced longevity under similar nutrition and lifestyle conditions.

**Conclusions:** It is recommended that traditional assumptions be re-evaluated on the risks related to higher birth weight, rapid growth, early maturity and increased height and weight.

**Keywords:** Birth Weight; Receptor, Epidermal Growth Factor; Sexual Maturation; Chronic Disease; Longevity and Nutrition; Obesity Epidemic; Height

## 1. Background

For many decades, medical authorities have assumed that larger infants, rapid growth, early sexual maturation, and taller height are related to better health and longevity (1). Implementation of these precepts has successfully produced greater height and robust bodies throughout the developed world. However, the implementation of these precepts has failed to produce optimum health in view of widespread chronic diseases and obesity. In addition, substantial research indicates that implementing these precepts promotes heart disease, cancer and type-2 diabetes and reduces longevity.

To explain the world trend toward obesity and increased health problems, a hypothesis was presented in the journal, *Medical Hypotheses* (2). This hypothesis, published in 2005, explained the global trend towards greater obesity as the result of excessive nutrition and growth. The hypothesis attributed obesity to over nutrition during pre-pregnancy and proceeding into adulthood.

## 2. Objectives

One objective of this report is to provide new findings

supporting a previously published hypothesis dealing with the obesity epidemic and its relation to greater birth weight, faster growth rate, early maturity and increased height. A second objective is to encourage re-evaluation of the health risks promoted by greater birth weight, rapid growth, early maturity and maximum growth in height.

## 3. Materials and Methods

The author has researched human body size, health, and longevity for almost 40 years. Based on this research, over 5000 papers, reports and books have been collected on various topics related to human growth and the diseases of aging. Hundreds of papers and reports published on the internet were also reviewed and provided support for the alternative obesity hypothesis. Based on this collection of material, key findings were selected for this report that support the original hypothesis that higher birth weight, rapid growth and early sexual maturation play major roles in the modern obesity epidemic (2).

## 4. Results

### 4.1. Birth Weight

Birth weight is driven by three major maternal factors: height, weight before pregnancy, and the increase in weight during pregnancy (3). Increases in one or more of these three factors promote greater weight in a new-born infant. It should be noted that the father's body mass can also play a role in birth weight.

Scores of studies (3) show that higher birth weight has a number of harmful ramifications. These include rapid growth and increased risk of obesity. For example, Mardones (4) found that there is a strong linear relationship between birth weight and childhood obesity. In addition, Sorensen reported that obese adult males had birth weights that were only 126 grams greater than normal weight male adults (2, 3). Another study, based on 276,835 Danish school children, found that a slightly higher than normal Body Mass Index (BMI) in childhood correlated with a higher risk of Coronary Heart Disease (CHD) in adulthood (5). Researchers also found that adult cancer is related to higher birth weight (3).

It is often found that low birth weight infants have more health problems than heavier infants. However, a number of studies indicate that low birth weight is not a problem unless the child experiences rapid or catch-up growth or becomes obese as an adult. For example, Vangen et al. (6) found that birth weight is not related to increased infant mortality, with the exception of Vietnamese infants which were the smallest and had the lowest perinatal health problems. Even within Vietnamese infants, the lower birth weight infants had lower health problems (3). Frankel et al. (7) also found that there was no relation between low birth weight and adult CHD unless the child developed a high BMI in adulthood.

Birth weight in Japan has decreased since 1980s (8). One reason for the lower birth weight is that Japanese women follow a reduced calorie diet when they get pregnant. Yet, the Japanese continue to have the third place for life expectancy in the world, and only one country has lower infant mortality. (Japanese height has not increased since the late 1980s.) An interesting point is that while females in most of the world have lower birth weights compared to males, they also have lower infant mortality and longer longevity.

### 4.2. Rapid Growth

Rapid growth is correlated with increased adult chronic disease as well as reduced longevity. Lorenzini (9) reported that rapid growth reduces longevity based on studies of over 200 mammalian species. Singhal (10) and Bartke (11) also reported that accelerated or catch-up growth of small infants promotes health problems in adulthood. In addition, children that were tall (> 15 percentile) had 5 times the risk of becoming obese

adults compared to children that were shorter than average (2).

### 4.3. Early Sexual Maturation

Tabatabaie (12) reported that exceptionally long-lived adults had late sexual maturation. In addition, women who reached puberty before 11 years of age had a 20% higher all-cause mortality compared to women who reached puberty at 17 years of age (13). Lorenzini (9) also reported that animals with early sexual maturation experienced reduced longevity based on over 600 mammalian species.

### 4.4. Taller Height/Larger Body Size

Samaras (14) reviewed eight different types of evidence indicating that shorter, smaller people live longer. This review looked at evidence from studies or reports on the longevity of small animals within a species, worldwide life expectancy, mortality by height, longevity and height, and centenarian height. A few examples are highlighted next.

Within many species, smaller individuals live longer. Dogs are a well-studied example. Other examples include horses, cows, and rodents. A study of over 1 million Spanish men found that shorter men survived longer (14). A Sardinian study (15) found that shorter men lived longer as well. Other populations showing shorter people live longer include a study in Ohio based on 1700 men and women and studies of various professional athletes in the US (3, 14).

A US government report on the mortality rates of various ethnic groups showed that Asians had the lowest mortality, followed by Hispanics, Native Americans, Whites and Blacks. Blacks and Whites, together, had about a 90% higher mortality compared to Asians (14). Increasing mortality followed increasing heights of these ethnic groups. Mortality rates were tracked from 1985 to 1999 and involved about 18 million deaths.

American men were found to be 9% taller than women and had a 9% lower life expectancy at birth compared to women (14). A similar relationship was found when Japanese and Polish men and women were compared.

In 2014, a large study (16) tracked about 8000 elderly male Japanese Hawaiians for over 40 years. The researchers found that shorter men lived longer. They also had lower insulin secretion, which is related to greater longevity (11).

A 2013 review of worldwide data on height and CHD (17) found that shorter height was related to lower cardiovascular disease. Animal data supported these findings; e.g., small dogs have much lower rates of heart failure compared to big dogs.

In 2012, a review paper associated healthy aging with smaller human size (11). The author, the Director of the Aging and Longevity Research Laboratory (Southern Illinois University School of Medicine), reported that there was considerable evidence to support the longevity ad-

vantages of smaller human size. He also discussed possible biological mechanisms that explain the advantages of shorter, smaller body size.

Okinawans are also noted for their greater longevity and have the highest percentage of centenarians in the world (14). They are shorter than the mainland Japanese, and centenarians tend to average about 154 cm (adjusted for shrinkage with age).

A comprehensive report by the World Cancer Research Fund and American Institute for Cancer Research (1) found that research indicating taller people are subject to higher cancer rates is “strong, consistent and impressive” (P. 229). The report also found that chronic diseases are related to the Western diet and that industrialization promotes greater height, weight, and age-related diseases (1).

The evidence that shorter people live longer is substantial and consistent. However, many tall people can live long and healthy lives and reach 100 years of age. A long life can be achieved by avoiding excess weight, poor nutrition, smoking and other harmful life style habits.

#### 4.5. Protein, Height and Obesity

The dangers of high protein consumption were discussed in previous publications (2, 3). In 2014, a study of protein and its relation to human health found that low protein intake is tied to major reductions in cancer and overall mortality (18). Lower protein also reduced insulin-like growth factor-1 (IGF-1), a hormone that is related to faster aging (11). The study was limited to men and women 50 and over. The benefits of low protein applied to the age group of 50 to 65 years of age. After 65 years of age, higher levels of protein were beneficial. However, a 5-fold increase in type 2 diabetes was found for high protein intake at all ages over 50 years. Another important finding in this study was that plant-based protein did not create the harmful health ramifications found for animal protein. Thus, if one follows a high protein diet, it is healthier to obtain much of it from plants. For a more extensive review of the above topics, see: Human Body Size and the Laws of Scaling: Physiological, Performance, Growth, Longevity and Ecological Ramifications (3).

## 5. Discussion

The preceding evidence is not well known and some findings are contradicted by other studies. Unfortunately, conflicts exist because studies cannot accurately separate the variety of nutritional, lifestyle, growth rates, socioeconomic and environmental confounders. Adult health and height is a problem as well because short and tall cohorts of same body types are usually not compared. However, there is sufficient evidence to re-evaluate the prevalent assumptions about promoting greater birth weight, rapid growth and early sexual maturation. In regard to smaller body size and longevity, the evidence (3, 13, 14) is persuasive because it is comprehensive, consis-

tent, includes a variety of ethnic groups, and agrees with almost 80 years of animal research.

Another source of evidence involves biological mechanisms related to human body size. About 25 distinct biological factors have been identified (11, 13, 14, 16, 19) that support the benefits of smaller human body size in terms of health and longevity. For example, when compared to taller people of the same body proportions, shorter people have lower blood pressure, lower left ventricular mass, lower DNA damage, lower C-reactive protein, and lower insulin and insulin like growth factor-1. All of these factors are positively affected with lower body height, weight and body mass index, and are associated with lower age-related diseases and greater longevity.

Chronic disease and obesity is a worldwide problem that was rare before the 19<sup>th</sup> century except among the wealthy. The Western diet has been identified as the main cause for our increased height, weight and chronic disease (1). These undesirable trends have occurred under the assumption that rapid and greater growth is healthful (1). However, many researchers attribute our increasing health problems to the high meat and calorie diet of the industrialized world. It is interesting that a Hawaiian study (19) of elderly men found a progressive decrease in mortality with decreasing caloric intake down to 975 kcal. (This practice requires a low calorie but highly nutritious diet and should be implemented under medical supervision).

The economic impact of increased obesity and chronic diseases is very large. Failure to take systematic and effective corrective actions will increase worldwide medical costs by many trillions of dollars. Previous sections only cover a small sampling of findings relating rapid growth and increased body size. A more extensive review, including findings showing increased height related to cancer and CHD, is provided by Samaras, Bartke and Rollo (3, 17, 20).

Considerable evidence justifies re-evaluation of the common assumptions that higher birth weight, rapid growth, early sexual maturation and taller height are desirable public health goals. Healthful nutrition and smaller body size appears to offer many health benefits and greater longevity.

## Author's Contributions

Thomas Theodore Samaras is responsible for the entire manuscript.

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