

# THE DEVELOPMENT OF HEIGHT POTENTIAL AMONG THAI CHILDREN IN BANGKOK

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## ABSTRACT

This study aimed to 1) examine the level of height development potential among Thai children in the Bangkok metropolitan area and 2) investigate the factors influencing their height development. Data were collected using questionnaires administered to parents or guardians aged 35-59 years with children residing in Bangkok, totaling 400 respondents. The data were analyzed using descriptive statistics, including frequency, percentage, mean, standard deviation, and multiple regression analysis. The findings revealed that the height development potential of Thai children in Bangkok was high, particularly in terms of achieving an elegant physique, maintaining good physical and mental health, increased participation in sports, and enhanced future career opportunities. Furthermore, governmental policy, long-term genetic factors, fundamental physical activities, and family support were found to have a significant positive influence on the height development potential of Thai children in the Bangkok metropolitan area.

**Keywords:** Height Development Potential, Thai Children, Bangkok

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## INTRODUCTION

In 2023, the global number of newborns increased by approximately 75 million, resulting in the world population reaching 8 billion for the first time in 2024, or precisely 8,101,976,189 people. However, the birth rate for the year remains relatively low, with an increase of less than 1% (0.95%). It is projected that in 2024, the average global birth rate will be 4.3 births per second, while the average death rate will be 2 deaths per second. With such a slowing rate of population growth, it is anticipated that by the end of this decade, the rate of newborns will have expanded at the lowest level in recorded history. The average population growth over the ten-year period from 2020 to 2030 is expected to be less than 4% (Krungthep Thurakit, 2023). The latest survey on the situation of children and women in Thailand, conducted by the National Statistical Office in collaboration with UNICEF, indicates progress in several areas, such as adolescent fertility rates and the use of violent discipline at home, both of which show a declining trend. However, the survey also highlights concerning trends regarding child nutrition and secondary school enrollment. The Multiple Indicators Cluster Survey (MICS) in Thailand is conducted every three years, with this being the 6th international round (MICS 6) and the 4th conducted in Thailand. The survey collects data on children and women across various domains, including health, development, education, and child protection, from 40,660 households nationwide. The results indicate that 13% of children under five years of age in Thailand experience stunting, which is attributable to prolonged and continuous nutritional deficiencies.

In response to the issue of stunted growth among children in Thailand, government agencies have established policies and national strategic plans aimed at developing and enhancing human resource potential. Under the 20-year National Strategy (2018-2037) for human resource development, the key objective is to cultivate individuals who are capable, virtuous, and of high quality across all dimensions and life stages (National Strategy, 2018). Achieving this goal requires focusing on early childhood, particularly the first eight years of life, to foster the development of executive function in managing and regulating children's thoughts, emotions, and behaviors, which serves as the foundation for lifelong personal competence and moral character. Human potential development must begin from conception through to six years of age, or prior to entering grade six, as this period yields the highest return on investment in foundational growth. This is due to the rapid development of brain function and learning capacity during early childhood, and if children do not receive proper care and developmental support, optimal growth and cognitive development may be compromised (Early Childhood Development Plan, 2017-2021, 2017). Postnatal growth can be divided into four key stages, each of which is distinct and exerts a unique influence on linear growth. The first stage occurs during the prenatal period and is primarily dependent on maternal factors, including nutrition and placental function. The second stage encompasses the first two to three years of life, during which nutrition plays a dominant role, and growth hormone (GH) becomes increasingly significant from six months onward. The third stage corresponds to childhood, primarily regulated by growth hormone and thyroid hormones, although other hormones, including thyroxine, adrenal hormones, androgens, glucocorticoids, ghrelin, leptin, and insulin, contribute to growth via the GH-insulin-like growth factor I (IGF-I) axis. The final stage involves the rapid growth of puberty, largely governed by the synergistic effects of GH, IGF-I, and steroid hormones (Wei & Gregory, 2009). Overall, human growth is influenced by a combination of environmental, genetic, and hormonal factors. According to the early childhood development surveys conducted by the Department of Health, Ministry of Public Health, Thailand, using the Denver II developmental screening tool in 2010, 2014, and 2017, the proportion of Thai children with age-appropriate development was 73.4%, 72.0%, and 67.5%, respectively. These figures show a declining trend and fall short of the national target of at least

80% age-appropriate development (Jintana Patanapongthorn, 2018; Master Plan under the National Strategy, 2018).

Family support is a critical factor in the development of height potential in children with stunted growth, as families play a central role in managing nutrition, ensuring adequate rest, and providing physical and psychological guidance. This aligns with Wei and Gregory (2009), who emphasized that factors influencing child growth are closely related to nutrition. Similarly, Phat Mahachoklertwattana (2020) noted that stunted growth in Thai children results from a combination of factors, including nutrition, hormones, physical health, mental health, and the surrounding environment. In addition to these basic physical factors, stunted growth or growth hormone deficiency affects not only the child's physical appearance—manifesting as shorter stature—and psychological aspects, such as lower self-esteem, but also other bodily systems, including reduced muscle mass and increased fat accumulation, which can lead to childhood obesity. Thai cultural values further reinforce the perception that taller children have better opportunities in life, including greater athletic ability, improved personal appearance, and enhanced employability in adulthood (Sutthipong Watcharasinthu, 2020).

In addition, genetic factors play a significant role in child development, as growth potential is influenced by genetic inheritance, including both dominant and recessive traits resulting from gene interactions between the mother and father, and expressed in the child's phenotype from birth. Several key factors affect height potential. 1) genes are critical, as multiple height-related genes influence stature; children with tall parents and grandparents are likely to be taller, while certain gene abnormalities, such as mutations or enzyme deficiencies, may alter growth. 2) hormones, particularly growth hormone in childhood, stimulate bone elongation and overall height increase. 3) nutrition is essential for physical development, including bone growth. 4) specific nutrients, such as protein, are vital for the proliferation and elongation of cells at the ends of long bones, facilitating skeletal growth. 5) physical activity influences body size, with some sports favoring taller athletes, such as basketball, swimming, and volleyball, while others favor smaller statures, such as gymnastics and ballet. 6) adequate and restful sleep is closely associated with growth hormone secretion, making sufficient deep sleep essential for normal growth (Kusuma Chusilp, 2014).

Factors influencing children's height include genetics and nutrition. 1) Genetics directly affect a child's height; if both parents are tall, the child is likely to be tall, whereas if both parents are short, the child is likely to be short. When only one parent is tall, the child has a moderate chance of being tall, although in some cases, children of parents with average height may still exhibit growth abnormalities due to other factors. 2) Nutrition is also critical, beginning during the mother's pregnancy, as it significantly impacts fetal growth and the child's subsequent physical development.

In cases of insufficient nutrient intake, taking one calcium tablet (500 mg) daily after meals, starting from age 8, helps build bone mass early. Girls typically enter adolescence between 11.5 and 16 years, while boys do so between 13 and 20 years. Growth-stimulating physical activities, especially those involving consistent impact that stretch bones and joints, such as running, jumping rope, cycling, and swimming for 45-60 minutes daily, support overall body growth. Additionally, quality rest is essential; after exercise, adequate sleep allows tissue repair and development, with children requiring 8-10 hours per night. Proper sleep timing is crucial for the secretion of growth hormone, a key factor in physical development, as the human body is regulated by an internal biological clock (Wannasiri Wannasatit, 2022).

Furthermore, regular daily physical activity promotes the development of both large and small muscle groups, strengthens bones, and stimulates the secretion of growth hormone, which plays a critical role in bone elongation and height increase, particularly during the growth period (Sutthipong Watcharasinthu, 2020). This aligns with principles from sport science, an applied science that integrates various disciplines such as anatomy, exercise physiology, sports

psychology, sociology of sport, sports medicine, sports nutrition, sports technology, and sports management to optimize physical training, athletic performance, competition, and overall health management. A foundational understanding of anatomy, which examines the body's structural components—including bones, muscles, tendons, joints, heart, lungs, blood vessels, red blood cells, and neural cells—is essential for applying this knowledge effectively. This integration of anatomical knowledge with other sport science disciplines forms the basis of exercise physiology, which investigates the functioning of body systems before, during, and after physical activity, and examines how exercise impacts the nervous, muscular, circulatory, respiratory, and other physiological systems (Sports Authority of Thailand, 2022).

Given the significance of this issue, particularly in the example of China, which has achieved success by emphasizing children's height through government policy, family support, physical foundations, and long-term genetic enhancement, the researcher has recognized the problem of child stunting and low height. Children are the future of the nation and require comprehensive developmental support, especially in physical growth, cognitive development, and height. This represents a research gap. Therefore, the researcher is interested in studying "Height Development Potential of Thai Children in Bangkok" in order to provide data that can inform policy-making and promote effective strategies for enhancing the height development potential of Thai children in Bangkok and across Thailand in the future.

## **LITERATURE REVIEWS**

### **Concepts and Theories on the Height Development Potential of Children**

The development of height potential in Thai children is a critical issue encompassing physical, psychological, and social dimensions, as well as future life opportunities. Height growth is influenced by multiple factors, including genetics, nutrition, physical activity, overall health, and the social environment (World Health Organization, 2020). Proper height development not only contributes to a proportionate body structure but is also associated with positive personality traits, athletic potential, and increased career opportunities in the future. Among these factors, adequate nutrition is considered the most important determinant in promoting the height development of Thai children. Research by the Ministry of Public Health (2022) indicates that adequate intake of protein, vitamin D, calcium, and zinc stimulates growth hormone production and promotes bone mass development. In addition, Smith and Johnson (2021) report that chronic nutritional deficiencies during childhood result in below-average height, which can have long-term effects on children's self-confidence and personality. Height is also closely associated with an elegant personality, as studies have shown that children with appropriate height tend to have higher self-confidence, a positive self-image, and the ability to express themselves appropriately in social settings (Burdick, 2021). An elegant personality further enhances social skills and educational opportunities, as good personal presentation facilitates peer acceptance and positive social interactions. Moreover, height is a critical factor in athletic potential, particularly in sports such as basketball, volleyball, track and field, and swimming. Researchers from the Sports Association of Thailand (2023) found that above-average height provides competitive advantages in terms of mobility, reach, exertion, and strategic positioning, enabling children with optimal growth opportunities to enter sports more easily and access scholarships and future career prospects. Height is also associated with professional opportunities, as international studies indicate a correlation between stature, credibility, leadership, and access to desirable positions (Case & Paxson, 2008). While skills and abilities remain the most important factors for job performance, adequate height can enhance opportunities in certain professions, including security personnel, flight attendants, police, military, and sports-related careers. Furthermore, appropriate height reflects overall physical and mental well-being, as growth within the normal range indicates balanced nutrition, hormonal function, sleep, and physical activity (World Health Organization, 2020). Children

with proper height tend to be physically strong, have robust immunity, and exhibit healthy psychological development, underscoring the importance of comprehensive health promotion in supporting the long-term growth potential of Thai children.

In summary, the height development potential of Thai children is not solely related to physical stature, but also encompasses appearance, personality, opportunities in sports and careers, and long-term well-being. Therefore, the formulation of policies that promote proper nutrition, physical activity, and high-quality health systems is a key approach to developing the country's human resources.

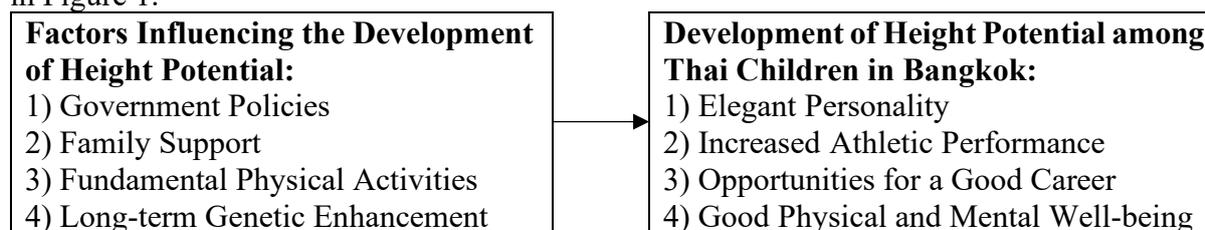
The development of children's height is a key indicator of physical growth, with significant implications for long-term health, quality of life, and future opportunities. Factors influencing height can be categorized into multiple dimensions, including government policy, family support, basic physical activity, and long-term genetic influences, which interact in complex ways (World Health Organization, 2020). A substantial body of literature emphasizes that promoting optimal height should adopt a holistic approach that encompasses social, familial, and biological dimensions. 1) Government policies play a crucial role in enhancing the nutritional status and overall health of Thai children, including school-based milk supplementation programs, malnutrition screening initiatives, and policies promoting physical activity according to recommended guidelines (Ministry of Public Health, 2022). Research by Singh and Kumar (2021) indicates that countries with robust nutritional policies tend to exhibit higher rates of child growth compared to those without well-established support systems. Such policies help reduce health disparities, create environments conducive to growth, and provide equitable access to quality nutrition for children across all social groups. 2) Family support is a fundamental factor in promoting children's height development, particularly through providing appropriate nutrition, establishing healthy sleep routines, encouraging regular physical activity, and fostering mental well-being within the household. Smith and Johnson (2021) indicate that families with nutritional knowledge and active involvement in their children's health care significantly enhance the likelihood of children reaching their full growth potential compared to those lacking such support. Psychological support, including encouragement and motivation, also indirectly contributes to the development of health-related discipline, which is a key foundation for physical growth. 3) Fundamental physical activities play a crucial role in stimulating growth hormone secretion and promoting bone mass development. Burdick (2021) emphasizes that basic activities such as running, climbing, and outdoor sports enhance bone density and increase the extensibility of growth plates. Furthermore, structured activities, including swimming, basketball, and gymnastics, contribute to muscle development and overall body balance, thereby supporting children's height development at an optimal rate and 4) Genetics is a key determinant of long-term height potential, accounting for approximately 60-80% of adult stature (WHO, 2020). However, research by Carter and Lee (2022) indicates that behavioral enhancement of genetic potential—such as ensuring proper nutrition during pregnancy, avoiding toxins, and fostering a healthy family environment—can enable children to achieve their full genetic height potential. While genetics provides the foundation, an appropriate environmental context remains crucial in shaping individual differences in growth and development.

In conclusion, the factors influencing the height development of Thai children encompass government policies, family support, lifestyle practices, and genetics. Height development is therefore not solely dependent on nutrition or physical activity, but requires a holistic support system involving the state, family, and society. Integrating these factors can lead to the comprehensive and sustainable development of Thai children.

Based on the literature review, the research hypotheses can be formulated as follows:

H1 From the literature review, it can be concluded that government policy, family support, basic physical activities, and long-term genetic enhancement influence the height development

potential of Thai children in Bangkok. Based on this, the conceptual framework is illustrated in Figure 1.



**Figure 1** Conceptual Framework

## RESEARCH METHODOLOGY

The population of this study consisted of parents or guardians aged between 35 and 59 years, who have children or grandchildren and reside in Bangkok, totaling 300,303 individuals (National Statistical Office, 2023). The sample size was determined to be 20 times the number of observed variables, which in this study was 20 variables (Grace, 2008). Therefore, an appropriate sample for this study was 400 participants. Stratified sampling was employed to select the sample.

The research instrument was a questionnaire, consisting of three parts. Part 1 addressed the personal factors of the respondents, using a multiple-choice format. Part 2 examined factors influencing height development potential, using a Likert-scale format with a 5-point rating system: the highest = 5, the high = 4, the moderate = 3, the low = 2, and the lowest = 1. Part 3 measured the height development potential of Thai children in Bangkok, also using a Likert-scale format with the same 5-point rating system: the highest = 5, the high = 4, the moderate = 3, the low = 2, and the lowest = 1.

Prior to data collection, the research instruments underwent systematic validation, including an Item-Objective Congruence (IOC) assessment and reliability testing using Cronbach's alpha. The IOC value was 0.839, and the Cronbach's alpha coefficient was 0.917, indicating that the research instruments were of adequate quality (Polit & Beck, 2006; Hair et al., 2012). To collect data, the questionnaires were distributed to parents or guardians aged 35-59 years with children residing in Bangkok. For data analysis, descriptive statistics including frequency, percentage, mean, and standard deviation were used, along with multiple regression analysis.

## RESEARCH RESULTS

1) The majority of respondents were female (65%), aged between 41 and 55 years (63.33%), held a bachelor's degree (69%), had an average monthly income ranging from 30,001 to 40,000 baht (56.67%), and were parents, accounting for 63.33% of the sample.

2) The height development potential of Thai children in Bangkok was found to be high in the following aspects: acquiring an elegant personality, having good physical and mental health, increasing athletic performance, and obtaining opportunities for a good career, as presented in Table 1.

**Table 1** Mean and standard deviation of height development potential of Thai children in Bangkok

Aspect	Description	$\bar{X}$	S.D.	Result
1	Elegant Personality	3.81	0.61	Much
2	Increased Athletic Performance	3.65	0.47	Much
3	Opportunities for a Good Career	3.52	0.42	Much
4	Good Physical and Mental Well-being	3.68	0.51	Much
<b>Total</b>		<b>3.67</b>	<b>0.42</b>	<b>Much</b>

3) Government policy had a Beta value of 0.232, family support had a Beta of 0.317, basic physical activity had a Beta of 0.142, and long-term genetic enhancement had a Beta of 0.231, indicating a positive influence on the height development potential of Thai children in Bangkok, with statistical significance at the 0.05 level (Sig. = 0.001, 0.000, 0.007, and 0.000, respectively), supporting the proposed hypotheses. The correlation coefficient (R) was 0.856, indicating a strong relationship between the set of independent variables and the dependent variable. The coefficient of determination ( $R^2$ ) was 0.641, showing that the independent variables collectively explained 64.1% of the variance in the height development potential of Thai children in Bangkok.

The equations can be expressed in the following order:

$$Y = 0.947 + 0.317X_2 + 0.232X_1 + 0.231X_4 + 0.142X_3$$

The regression analysis indicated that government policy, family support, basic physical activity, and long-term genetic enhancement collectively predict the height development potential of Thai children in Bangkok. Among these factors, government policy had the greatest predictive effect (Beta = 0.123), followed by long-term genetic enhancement (Beta = 0.121), basic physical activity (Beta = 0.092), and family support (Beta = 0.043). The details are presented in Table 2.

**Table 2** Multiple regression analysis of factors influencing the height development potential of Thai children in Bangkok

Factors	Unstandardized (b)	SE	Standardized (β)	t	Sig.
(Fixed value)	1.121	0.106		10.632	0.000
Government Policies	0.123	0.023	0.232	8.662*	0.001
Family Support	0.043	0.021	0.317	7.865*	0.000
Fundamental Physical Activities	0.092	0.042	0.142	2.402*	0.007
Long-term Genetic Enhancement	0.121	0.106	0.231	10.632*	0.000
R = 0.856, Adjusted R <sup>2</sup> = 0.641, R <sup>2</sup> = 0.730, SE = 0.142					

\* Statistical significance at the 0.05 level

## DISCUSSION & CONCLUSION

In the study on the height development potential of Thai children in Bangkok, the researcher discussed the key findings in accordance with the research objectives as follows:

1) The height development potential of Thai children in Bangkok was found to be high in the following aspects: acquiring an elegant personality, maintaining good physical and mental well-being, increasing athletic performance, and obtaining opportunities for a successful career. These findings align with trends in child nutrition and health development in large urban areas, where access to health services and nutrition knowledge is greater. Regarding an elegant personality, the study shows that proportionally tall children tend to have higher self-confidence, positive body image perception, and greater social expressiveness. This is consistent with Burdick (2021), who reported a positive relationship between children's height and physique with self-esteem and appropriate social interaction. In terms of physical and mental well-being, the findings reflect that children with proper height growth generally engage in healthy behaviors, such as balanced nutrition, regular physical activity, and adequate sleep. This aligns with the World Health Organization (2020), which indicated that children who achieve standard height growth tend to have better overall health than those experiencing stunting. Furthermore, the Ministry of Public Health (2022) reported that urban Thai children who receive continuous nutrition and exercise support are more likely to have body mass index and height within standard ranges compared to children in rural areas. Regarding athletic development, the study found that appropriate height provides children with greater

opportunities to participate in a variety of sports, particularly those where height confers an advantage, such as basketball, volleyball, and jumping events. This corresponds with the Thailand Sports Association (2023), which stated that height is a key biological factor that enhances physical performance and increases the potential for selection as youth athletes. Furthermore, Carter et al. (2022) found that promoting regular physical activity among school-aged children positively influences height, muscle development, and motor skills, thereby increasing their potential to develop into athletes in the future. Regarding career opportunities, the study indicated that parents and teachers in the sample perceived that appropriate height could enhance prospects for certain professions, such as safety-related occupations, military service, flight attendants, or jobs requiring frequent interaction with people. This aligns with the findings of Case and Paxson (2008), who reported that height is associated with perceived leadership, credibility, and earnings in the labor market. Singh and Kumar (2021) further confirmed that adult height is an accumulation of childhood nutrition and health status, which affects professional potential and occupational image. Therefore, the findings of the first research question suggest that the height development of Thai children in Bangkok is not merely a physical dimension but is closely linked with personality, well-being, sports participation, and career opportunities. This is consistent with both national and international literature, which emphasizes that height growth is a key long-term indicator of human capital.

2) Government policy, long-term genetic enhancement, basic physical activity, and family support influence the height development potential of Thai children in Bangkok. These factors reflect both structural and familial dimensions working together systematically. Regarding government policy, the study shows that school nutrition programs, provision of school lunches and milk, promotion of physical activity, and nutrition screening play a significant role in children's growth. This aligns with the report from the Ministry of Public Health (2022), which indicated that school-based supplementary (milk) programs significantly reduce stunting and short stature among primary school children. Research by Singh and Kumar (2021) conducted internationally similarly indicated that high-quality and continuous nutrition policies contribute to increasing the national average height of children. Regarding long-term genetic enhancement, studies have found that maternal health care during pregnancy, adequate nutrition before and after birth, and protection from exposure to toxins and certain medications significantly influence children's long-term height potential. This aligns with Carter and Lee (2022), who asserted that while genetics set the framework for height potential, nutritional and health environments during the first 1,000 days of life are crucial for realizing this potential. The World Health Organization (2020) also emphasized that maternal and early childhood nutrition is central to preventing stunting and undergrowth.

Concerning basic physical activity, studies confirmed that regular physical activity—such as outdoor play, school sports, and family exercise—promotes growth hormone secretion, increases bone mass density, and enhances muscle development. Burdick (2021) found that children engaging in moderate to high levels of physical activity had a significantly higher average annual height increase compared to those with low physical activity levels. Meanwhile, Smith and Johnson (2021) reported that the level of physical activity is associated with quality sleep, which is another factor influencing nocturnal secretion of growth hormones. Regarding family support, research indicates that families emphasizing the provision of nutritious food, health care, regular medical check-ups, and an environment conducive to physical activity play a crucial role in the long-term height development of children. Smith and Johnson (2021) found that parents' nutritional knowledge and health care attitudes were positively associated with the average height of children within the same household. Meanwhile, Lee et al. (2020), in a study of urban families, reported that family-oriented physical activity routines enhanced children's strength, physical fitness, and growth in height. Therefore, the findings of the second research question indicate that the height development potential of Thai children in Bangkok

is not influenced by a single factor; rather, it results from the integration of effective government policies, genetic and health care from early childhood, sufficient physical activity, and continuous family support. This is consistent with the human capital development framework, which emphasizes that investment in children should consider both policy structures and household lifestyles simultaneously.

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**Data Availability Statement:** The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

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