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HOW SHORT IS TOO SHORT ACCORDING TO PARENTS OF PRIMARY CARE PATIENTS

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Abstract

Objective—Height is a physical trait on a continuum. The threshold between normal and abnormal is arbitrarily set, potentially influencing medical decision-making. We sought to examine parents' perceptions of adult heights and associated demographic factors.

Methods—Parents of pediatric primary care patients of various heights completed a one-time survey. Parents answered, "How short is too short?" for adult males and females. Results were summarized as median [interquartile range]. Factors significantly associated with height threshold by simple linear regression were included in a multivariable mixed effects analysis of covariance model.

Results—1820 surveys were completed (83% response rate; 1587 female, 231 male). Median threshold height deemed too short for adult females was 56 inches [48, 59] among male respondents and 57 inches [50, 60] among female (p<.05). Median threshold height for adult males was 61 inches among males [60, 64] and females [59, 66] (p<.05). The median of male minus female heights per respondent (delta heights) was 5 [2, 7] inches. Factors found to be significant main effects in a parsimonious model were sex of adult considered, height of respondent, sex of respondent, respondent race, primary care practice, income and having concerns about their child's height.

Conclusion—Taller acceptable height thresholds were perceived by respondents who were taller, wealthier, white, female, from non-urban practices or who had a personal concern about

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their child's height. Male heights were expected to be taller than female. Such traits may influence who is concerned and more likely to seek medical treatment for their children.

Keywords

Perceptions; Height; Parents; Decision-Making

Introduction

Height is a physical trait on a continuum; the threshold between normal and abnormal is arbitrarily set. Short stature is classified by the Centers for Disease Control and Prevention (CDC) as height less than 5th percentile for age (1) and by the World Health Organization (WHO) as less than 3rd percentile (2). In 2003 United States Food and Drug Administration (FDA) approved growth hormone (GH) treatment for children with idiopathic short stature (ISS), stipulated as height more than 2.25 standard deviations (SD) below the mean (1.2nd percentile) for age and gender (3), while the United Kingdom healthcare system advocates a threshold of -2.65 SD (0.4 percentile) on height screening for initiating referral and evaluation (4, 5).

Although the evaluation and treatment of children with short stature are guided by standards, evidence is lacking in support of the best referral strategies, and controversies persist with relation to criteria, medical necessity, cost effectiveness and outcomes (5). Therefore, families and providers play an integral role in deciding who receives GH treatment. Parental concern about a child's physical health, quality of life and psychological well-being can influence the medical decision-making process, irrespective of objective measures of the child's growth (6 - 9). Family concern increased both referrals by primary care providers (PCP) to specialists (10) and the prescribing of GH by endocrinologists (11 - 13).

The influence of demographic factors was demonstrated in a national study of randomly selected U.S. pediatricians, wherein PCP were more likely to refer boys than girls and PCP who were older, shorter, or female were also more likely to refer short children, even if all physiological parameters were held constant (10). Demographic backgrounds may reflect different attitudes and experiences regarding the impact of short stature and different access to specialists, thereby potentially influencing preferences regarding treatment. Thus, in order to better understand the decision-making process related to the evaluation and treatment of short stature, this study sought to examine parents' perceptions of adult heights and the associated demographic factors.

Materials & Methods

The study was granted exemption by the institutional review board of the Children's Hospital of Philadelphia (CHOP). Parents of randomly selected children of any height, aged 9-14 yrs, from 9 primary care pediatric offices participated in 13 open focus groups (total of 40 African American and 31 white parents) and 10 nominal group technique sessions (24 African American, 39 white parents). Based on parents' comments in these groups, questions designed to explore parental beliefs about short stature, its evaluation and treatment were incorporated into a one-time survey. Initial iterations of the survey were given to parents of

patients of all ages from the diabetes clinic at CHOP, until all ambiguities in content, instructions or question wording were clarified. Surveys were tested randomly and anonymously, and feedback from parents was used to develop the final version of the survey.

The one-time survey, available in English or Spanish, was collected during the summer of 2012 from parents of children evaluated at four primary care pediatric offices (two urban and two non-urban) affiliated with a tertiary care pediatric hospital. Parents were approached while awaiting their children's outpatient visits. Recruitment was blind to the height and age of their children, and all surveys were anonymous. Parents completed the surveys independently and in writing. Spanish language surveys had been translated by a member of the research team who was a native Spanish speaker, and then back-translated and tested for accuracy and consistency with the English version by two additional native Spanish speakers.

In addition to questions about their demographic background, parents were asked about their experiences with height, including their own height. Parents were also asked if they have been personally concerned that at least one of their children was too short and if so, they were asked to complete follow-up questions about their response to those concerns. Since parents of children of all heights were recruited to participate in this survey, these questions captured the number of parents who may have had personal experience having their child evaluated or treated for short stature. In order to better understand beliefs about height, parents were asked, "*How short is too short for an adult male?*" and "*How short is too short for an adult female?*" Respondents wrote in an open-ended response in feet and inches.

Survey data were managed using REDCap (Research Electronic Data Capture, Vanderbilt University, Nashville, TN) tools hosted at CHOP (14). Probabilistic samples of randomly selected surveys (10% of the 1820 surveys) were manually reviewed to test fidelity of the data entry. Responses to the how short questions were converted into inches by calculator for data analyses. Results were summarized as median [interquartile range] to avoid skewing of calculations of the means by extreme outlier values. Factors significantly associated with height threshold by simple linear regression were included in a multivariable mixed effects analysis of covariance model using stepwise procedures to achieve parsimony. All analyses were performed using JMP software (SAS Institute, Inc, Cary, NC).

Results

Of the 2185 parents approached (87% female), 1820 surveys were completed (83% response rate), from both non-urban (51%) and urban practices (49%). Table 1 demonstrates the demographic characteristics of the parents who completed the survey. Survey respondents were predominantly female (87%), and 7% of surveys were completed in Spanish. Forty-seven percent of respondents classified themselves as African American (of all patients seen at the participating primary care practices during the preceding summer, 45% were African American and 41% were white). Forty-three percent indicated that they currently had full-time, paid employment, working 35 or more hours per week. Of the respondents, 28.5% were college graduates, 21% had a master's or doctorate degree and 20% graduated high

school. Approximately 13% of respondents indicated that they have been concerned that at least one of their children was too short and of those respondents, 17 (7%; about 1% of total survey respondents) indicated that they had a child who had been treated with GH.

When parents were asked, “*How short is too short for an adult female?*” responses ranged from 0 inches to 74 inches. Parents gave the range of 0 inches to 84 inches when asked “*How short is too short for an adult male?*” 1539 respondents entered a height for males and 1530 entered a height for females; 1527 entered a height for both. Thirteen percent of respondents did not answer either question, and three percent volunteered a free text response instead of giving a specific height in feet and inches. Table 1 compares the demographic characteristics of survey respondents who entered free text responses to those of the total study population. Most free text responses, from respondents of either sex, argued against a height threshold, with comments including, “nobody is too short”, or “I don’t feel as though people are too short.” Some saw it as an inappropriate way of judging people, writing, “It doesn’t matter how short or tall they are,” and “N/A, I don’t measure people like this.” Some objections were religiously based (eg. “God made them who are (sic) they are-- therefore, there is no too short or too tall.”), while others were more focused on health outcomes (eg., “not sure, the height which may negatively impact their health.”).

Respondents reported different height thresholds for adult males versus females. Median threshold height for an adult male (Figure 1A) was 61 inches among both male [60, 64] and female [59, 66] respondents ($p < .05$). The median threshold height deemed too short for an adult female (Figure 1B) was 56 inches [48, 59] among male and 57 inches [50, 60] among female ($p < .05$) respondents. The median of the male minus female heights per respondent (delta heights; Figure 2) was 5 [2, 7] inches.

In addition to the sex of the adult being considered, demographic traits of the respondents themselves related to height perceptions (Table 2). Higher threshold heights for adult males were associated with respondents who were taller, personally concerned about their child’s height, had a child treated with GH, and were white, English-speaking, of higher educational background and income level, and had private insurance coverage and pediatric care from non-urban practices. Higher threshold heights for adult females were associated with respondents who were taller, white, English-speaking, with higher incomes, private or federal insurance and have personal concerns about their child’s height. Male respondents had a median height of 69 inches [68, 72] and female respondents, 64.5 inches [63, 66]. For every inch increase in height among respondents, their perceived male height threshold increased by 0.20 inches and female threshold by 0.21 inches.

Investigator guided stepwise elimination modeling explored various explanatory variables to arrive at a parsimonious model (Table 3). Factors found to be significant main effects were sex of adult considered, height of respondent, sex of respondent, race of respondent, primary care practice, income, and having concerns about their own child’s height. In multivariable modeling, for every inch increase in height among respondents, their perceived height threshold increased by 0.29 inches. Insurance, education and employment, factors thought to be highly associated with primary care practice, were found to neither improve the model nor be a suitable replacement for primary care practice. Race of respondent and survey

language were highly associated variables that were redundant on modeling; since race provided more granularity than language in discriminating among populations, race was retained in the final parsimonious model.

Discussion

In summary, we found that the threshold for how short is too short as perceived by parents of primary care patients was associated with certain demographic traits. Notably, 3% of respondents volunteered a free text response in lieu of a specific height, arguing against the concept of a minimally acceptable height threshold. Overall, higher height thresholds were given when considering male heights. The difference between male and female heights for each respondent (delta height) had a median of five inches, potentially reflecting beliefs about a greater importance of height in men or reflecting societal experience (the average male is a little more than five inches taller than the average female) (15). Likewise, taller respondents had taller height thresholds, possibly reflecting their own experiences or a tendency to use oneself as a benchmark when considering people's heights.

Differences in height-related perceptions and people's experiences in society may influence who is more likely to be concerned about height and thus consider seeking medical care for their child. Parents of short children seeking care from a pediatric endocrinology center in a mid-sized ethnically diverse U.S. city were found to differ from the surrounding population, with those seeking care mostly white (91%) and of relatively higher socioeconomic status and higher educational background, but of heights similar to the general U.S. population (13). The same survey found that the parents seeking specialist care for their children believed that short men suffer in terms of self-esteem, and face hurdles in order to succeed compared with tall men, although short women were not believed to face these same problems (13). Interestingly, the group in our study with the highest median threshold height (65 inches) was parents of children who had received GH in considering adult male height.

Multiple studies have documented the desirability of tallness for males, associating height with reproductive success (16 - 18), physical strength (19), dominance (20), attractiveness and dating preferences (21 - 23), workplace success and higher income (24 - 26), as well as choice and evaluation of political leaders (27). Pressures for male tallness have been persistent over at least the last century, with height-related economic and social advantages for men evident in a study from 1915 (28). Associations between height and perceived ability among males have also been observed before adulthood; in a nationally representative sample of kindergarten boys and their teachers, at the start of kindergarten, teachers underrated the academic performance of boys who were shorter than the perceived height norm (29).

In response to these societal beliefs and the associated pressure for tall stature in men, boys and their families may be more likely to have concerns about height and therefore request referrals or seek specialist care, especially during puberty when height becomes more of a factor and the child's future and psychosocial development may be more of a concern for parents (30). Research has shown a sex bias in referrals to specialists, with boys more likely

than girls to present for evaluation of short stature (31). GH registries indicate boys receive GH therapy by a ratio of approximately 2:1 versus girls in the U.S. and Japan (32).

In our study, parents of primary care patients reported a median acceptable threshold height for an adult male of 61 inches (or -3.0 SD), and 56 (male respondents) or 57 (female respondents) inches for an adult female (-3.3 SD and just above -3.0 SD respectively). A previous study found that the median height of patients coming to an endocrine clinic for short stature evaluation was -2.4 SD for girls and -1.9 SD for boys, and the greater height deficit in girls was relative to both the general population and their mid-parental target heights (31). The taller height z-score of patients seeking endocrine care for short stature in comparison to the median acceptable threshold height reported by parents of primary care patients cautions against generalizing research results about height-related attitudes across the two populations. Of note, the therapeutic threshold for treating ISS with GH as stipulated by the FDA (-2.25 SD) is more aligned with the heights of patients seeking endocrine care than with the perceived height thresholds of respondents of this survey. This may reflect a difference between the beliefs of people seeking endocrine care (and who served as the subject population for the FDA studies) and those in the general pediatric care community. Patients seeking endocrine care set the experiences of the pediatric endocrine community, which informed care policy and this subpopulation. There may be a selection bias, in that parents with higher perceived acceptable height thresholds are more likely to seek specialist care and GH treatment for their children. Alternatively, individuals may tolerate a lower height threshold as normal in a hypothetical survey, but when considering their own child they may desire a height more closely approaching the mean.

One limitation to the current study is the female predominance of survey respondents. However, males comprised 13% of all parents approached and 13% of all completed surveys. Thus, the gender ratio reflects the greater number of children accompanied by mothers than fathers to their pediatrician's clinic, and not a gender-based response bias. Our study sample represents the population of parents who come to their children's pediatrics visits, rather than the general community. It is this former population, however, that is likely to be more involved in medical decision making for their children. Surveys were designed for independent parental completion, providing only responses to the questions as parents interpreted them and not any further explanation as to the heights that were listed as "too short." We did not ask survey respondents to explain their beliefs about "how short is too short", so it is unclear how they chose their answers and why. While some parents felt it was important enough to explicitly renounce the concept of a minimally acceptable height threshold, other parents entered biologically implausible responses, such as 0 inches or 74 and 84 inches for women and men, respectively. Whether such parents misunderstood the question or were opposed to height thresholds was not ascertained. Parents were also asked to complete the surveys in their children's PCP office, potentially leading to some response bias, i.e. desire to give socially appropriate responses.

In conclusion, our study showed that demographic groups differ in their perceived thresholds of how short is too short and that some parents objected to the concept of a lower acceptable height threshold. Female respondents gave higher height thresholds, as did respondents who were taller, white, wealthier and from non-urban primary care practices.

Respondents who indicated that they had been concerned that at least one of their children was too short also gave higher height thresholds. The demographic groups with higher height threshold responses on our survey were consistent with data related to disparities in the evaluation and treatment of short stature, where disproportionately high numbers of white children from upper income and more educated families seek evaluation (13).

Clinicians may want to consider demographic group differences in height perceptions when evaluating and treating patients, including discussing with parents what is appropriate child and adolescent growth. Recognition of racial differences in body ideals led to more culturally sensitive approaches to improved weight management counseling in the face of the obesity epidemic (33). Further research is similarly needed into what causes the differences in height perceptions found in this study and how clinicians can best address these differences. In any case, it is important that clinicians engage in conversations with their patients and their families regarding their concerns about body image.

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Abbreviations

CDC	Centers for Disease Control and Prevention
CHOP	Children's Hospital of Philadelphia
FDA	U.S. Food and Drug Administration
GH	Growth hormone
ISS	Idiopathic short stature
PCP	Primary care providers
REDCap	Research Electronic Data Capture
SD	Standard deviations
WHO	World Health Organization

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FIG 1.

Distributions of height responses for how short is too short for male (A) and female adults (B). Above each histogram is an outlier box plot; the boxes, demarcating the interquartile range and median, surround the middle half of the data points. The gray brackets above the box plots indicate the shortest half (the shortest interval containing half the data).

FIG 2.

Distribution of delta heights for how short is too short. Delta height equals male height response minus female height response for each respondent. Above each histogram is an outlier box plot; the boxes, demarcating the interquartile range and median, surround the middle half of the data points. The gray bracket above the box plot indicates the shortest half (the shortest interval containing half the data).

Table 1

Demographics of survey respondents of height (inches) or text replies to “How short is too short?”

Traits categorized ¹	All respondents		Volunteered free text responses	
	Number	Percentage	Number	Percentage
Total	1820	-	48	3
Sex				
Female	1587	87	41	85
Male	231	13	7	15
Race				
American Indian/Alaska Native	22	1	0	0
Asian	100	6	0	0
Native Hawaiian or Other Pacific Islander	5	.03	0	0
Black or African American	856	47	17	35
White or Caucasian	733	41	26	54
Hispanic or Latino	138	8	3	6
Other	34	2	2	4
Chosen survey language				
English	893	93	46	96
Spanish	68	7	2	4
Primary care practice				
Non-urban	932	51	26	54
Urban	888	49	22	46
Highest level of education completed				
Partial high school	116	6	5	10
High school graduate	361	20	4	8
Trade school graduate	154	9	1	2
Partial college	275	15	6	13
College graduate	514	29	15	31
Masters or Doctorate degree	385	21	16	33
Current employment status				
Full time (≥ 35 hours/week)	762	43	21	44
Part time	370	21	4	8
Unemployed	221	13	6	13
Homemaker	244	14	11	23
Student	63	4	0	0
Retired	15	1	1	2
Disabled	45	3	1	2
Other	34	2	1	2
2011 Total household annual income				

Traits categorized ¹	All respondents		Volunteered free text responses	
	Number	Percentage	Number	Percentage
Less than \$25,000	526	30	7	15
\$25,000 - \$49,999	374	21	10	21
\$50,000 - \$74,999	225	13	7	15
\$75,000 - \$99,999	162	9	5	10
\$100,000 - \$149,000	212	12	5	10
\$150,000 or more	249	14	11	23
Insurance				
Private	1053	60	32	67
Government	593	34	12	25
Self-Pay	124	7	4	8

¹ Not all categories total 1820 because of missing data.

Table 2

Univariate analyses of parental response (height in inches) to question, “How short is too short?”

Subject characteristics	Too short for males		Too short for females	
	Median [IQR]	P value	Median [IQR]	P value
Sex of respondent		.03632		.03555
Male	61 [60,64]		56 [48,59]	
Female	61 [59,66]		57 [50,60]	
Height (in) of respondent	.1963712 *	.0003	.2138321 *	<.0001
Race of respondent		.0001		.0001
Asian	60 [58,63]		56 [48,60]	
Black or African American	60 [57,64]		56 [48,60]	
White or Caucasian	62 [60,65]		58 [54,59]	
Hispanic or Latino	60 [48,60]		54 [48,60]	
Other	60 [57,64]		56 [48,59]	
Chosen survey language		.0001		.0012
English	61 [59,64]		57 [50,59]	
Spanish	56 [47,60]		51 [40,60]	
Primary care practice		.0001		.0001
Non-urban 1	62 [60,64]		56 [50,59]	
Non-urban 2	63 [60,65]		58 [56,60]	
Urban 1	61 [59,64]		58 [50,60]	
Urban 2	60 [56,63]		56 [48,59]	
Highest level of education completed		.0005		.3143
Partial high school	60 [53,62]		56 [48,60]	
High school graduate	60 [57,64]		56 [48,60]	
Trade school graduate	60 [58,63]		57 [48,59]	
Partial college	61 [60,64]		57 [49,60]	
College graduate	62 [60,64]		57 [53,60]	
Masters or Doctorate degree	62 [60,65]		58 [53,59]	
Current employment status		.6609		.2202
Full time (35 hours/week)	61 [60,64]		57 [50,59]	
Part time	62 [60,64]		57 [52,60]	
Unemployed	60 [57,64]		56 [48,59]	
Homemaker	62 [60,65]		57 [50,60]	
Student	60 [56,64]		55 [48,60]	
Retired	61 [58,63]		57 [45,59]	
Disabled	60 [57,64]		59 [53,60]	
Other	60 [57,63]		57 [52,58]	
2011 Total household annual income		.0001		.0001

Subject characteristics	Too short for males		Too short for females	
	Median [IQR]	P value	Median [IQR]	P value
Less than \$25,000	60 [56,64]		56 [48,60]	
\$25,000 - \$49,999	61 [59,64]		57 [50,60]	
\$50,000 - \$74,999	60 [59,64]		56 [48,59]	
\$75,000 - \$99,999	60 [59,64]		56 [50,59]	
\$100,000 - \$149,000	62 [60,65]		58 [54,60]	
\$150,000 or more	63 [60,65]		58 [55,60]	
Insurance		.0003		.0174
Private	62 [60,64]		57 [53,59]	
Government	60 [57,64]		57 [48,60]	
Self-Pay	60 [51,64]		53 [48,59]	
Respondent concerned that at least one of their children was too short.		.0001		.0002
No 1788 (86.8%)	60 [59,64]		57 [49,59]	
Yes 236 (13.2%)	63 [60,65]		58 [55,60]	
Of the 236 (13.2%) respondents who were concerned that at least one of their children was too short, those admitting that they ...				
Have a child treated with GH		.0165		.2676
No 219 (92%)	63 [60,65]		58 [55,60]	
Yes 17 (7%)	65 [61,66]		58 [54,62]	

* Simple regression coefficient = the magnitude of change in the height of the respondent and their perceived height threshold.

Table 3

Multivariable modeling for responses to “How short is too short?” for male and female adults (n= 2898) height responses)

Factor	Factor Level	Least Squares (LS) Mean for Height (inches)	Standard Error of the LS Mean	P value
Sex of adult	Female	53.81	0.56	<.0001
	Male	59.08	0.56	
Height (in) of respondent	Partial regression coefficient * : 0.2941781			<.0001
Sex of respondent	Female	57.61	0.53	.0002
	Male	55.27	0.73	
Race of respondent	Asian	56.84	0.92	.0058
	Black or African American	57.02	0.54	
	White or Caucasian	57.67	0.64	
	Hispanic or Latino	54.16	0.95	
	Other	56.52	0.99	
Primary care practice	Non-urban 1	55.81	0.68	.0113
	Non-urban 2	57.20	0.83	
	Urban 1	57.12	0.72	
	Urban 2	55.64	0.51	
2011 Total household income	Less than \$25,000	56.44	0.56	.0044
	\$25,000-\$49,999	56.89	0.56	
	\$50,000 - \$74,999	55.37	0.64	
	\$75,000 - \$99,999	56.05	0.71	
	\$100,000 - \$149,999	57.43	0.66	
	\$150,000 or more	58.16	0.66	
Respondent concerned that at least one of their children was too short	No	55.20	0.53	<.0001
	Yes	57.68	0.70	

* Partial regression coefficient =magnitude of change in perceived height threshold per one-inch change in height of respondent