Performance of Eleven Simplified Methods for the Identification of Elevated Blood Pressure in Children and Adolescents

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Abstract—The identification of elevated blood pressure (BP) in children and adolescents relies on complex percentile tables. The present study compares the performance of 11 simplified methods for assessing elevated or high BP in children and adolescents using individual-level data from 7 countries. Data on BP were available for a total of 58 899 children and adolescents aged 6 to 17 years from 7 national surveys in China, India, Iran, Korea, Poland, Tunisia, and the United States. Performance of the simplified methods for screening elevated or high BP was assessed with receiver operating characteristic curve (area under the curve), sensitivity, specificity, positive predictive value, and negative predictive value. When pooling individual data from the 7 countries, all 11 simplified methods performed well in screening high BP, with high area under the curve values (0.84–0.98), high sensitivity (0.69–1.00), high specificity (0.87–1.00), and high negative predictive values (≥0.98). However, positive predictive value was low for most simplified methods, but reached ≈0.90 for each of the 3 methods, including sex- and age-specific BP references (at the 95th percentile of height), the formula for BP references (at the 95th percentile of height), and the simplified method relying on a child's absolute height. These findings were found independently of sex, age, and geographical location. Similar results were found for simplified methods for screening elevated BP. In conclusion, all 11 simplified methods performed well for identifying high or elevated BP in children and adolescents, but 3 methods performed best and may be most useful for screening purposes. **(*Hypertension*. 2016;68:614-620. DOI: 10.1161/HYPERTENSIONAHA.116.07659.)** ● **Online Data Supplement**

Key Words: adolescents ■ children ■ epidemiology ■ high blood pressure ■ hypertension ■ methodology

Elevated blood pressure (BP) in pediatric populations is an important public health problem worldwide. Elevated BP is associated with increased risk of target organ damage in children and adolescents.[1] Furthermore, elevated BP in childhood tracks into adulthood,[2] which increases long-term risk of subclinical atherosclerosis and premature death at adulthood.[3–5] Thus, early identification of individuals with elevated BP and adoption of effective measures to lower their BP levels may be an important strategy to reduce risk of cardiovascular diseases and mortality in adulthood.

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The US National Heart, Lung and Blood Institute and the European Society of Hypertension recommend that children aged ≥3 years should have their BP measured either at every medical encounter or annual health examination.[6,7] However, hypertension screening is generally performed less regularly in clinical practice,[8] and hypertension is frequently underdiagnosed in children whose BP is measured.[9] This may arise because physicians think that there is no sufficient evidence for benefits of hypertension screening in children,[10] although this thought has been questioned by several researchers.[11,12] In addition, it is cumbersome to assess raised BP in children according to sex, age, and height.[6] In 2004, the Fourth Report of the US National High Blood Pressure Education Program Working Group on High Blood Pressure in Children and Adolescents (later referred as the Fourth Report) recommended that pediatric hypertension be defined as systolic/diastolic BP (SBP/DBP) above the 95th percentile by sex, age, and height measured on 3 different occasions.[6] The Fourth Report is now widely used in the United States and many European countries. However, there are 476 sex-, age-, and height-specific cutoffs to assess the 95th percentile of SBP and DBP among children aged 1 to 17 years for both sexes, which makes definition of raised BP in children cumbersome and time-consuming for clinicians, although this may be less a problem when electronic medical files are used.[9]

Alternatively, several simple and more user-friendly tools for screening elevated BP in children and adolescents have been suggested to be used in clinical practice.[13] These simplified methods include the use of simple mathematical formulas,[14,15] simplified tables by age and sex with or without height,[16–18] and BP to height ratio (BPHR).[19,20]

It is, therefore, useful to compare the performance of these simplified methods to know whether these user-friendly methods to assess elevated BP among children and adolescents may be useful for routine screening. To our knowledge, 3 cross-sectional studies[21–23] and 1 cohort study[24] have attempted to compare the performance of several simplified methods. However, these 3 previous cross-sectional studies had several limitations. First, participants came from a local area or a hospital, and the results might not be representative of the general population. Second, interpretation of some results should be reassessed. For example, in 2 validation studies,[22,23] the authors mentioned that the simplified table by Kaelber and Pickett[16] (which provides 64 BP cutoffs by age and sex) performed best, followed by the BPHR (which provides 4 cutoffs for SBP/DBP in boys/girls).[19] However, the positive predictive values (PPV) of both methods were lower (Kaelber and Pickett, 16.1%; BPHR, 44.2%) than the simplified methods by Chiolero et al[18] (88.3%) and by Somu et al[14] (86.4%). Another study[24] using a cohort design assessed the performance of only 2 selected methods[16,17] and did not include other available simplified methods.

In the present study, we compare the performance of 11 simplified methods for screening elevated or high BP among 58 899 children and adolescents aged 6 to 17 years based on data from 7 national studies from China, India, Iran, Korea, Poland, Tunisia, and the United States.

Methods

Study Population

This study is based on individual data from a total of 58 899 children and adolescents aged 6 to 17 years who had complete data on sex, age, height, weight, and BP from 7 large national cross-sectional surveys in China, India, Iran, Korea, Poland, Tunisia, and the United States (Table S1 in the online-only Data Supplement). These surveys have been described in detail elsewhere.[25–32] Briefly, data from India, Poland, and Tunisia were from single cross-sectional surveys, whereas data from China, Iran, Korea, and the United States included samples pooled from several cross-sectional surveys (eg, US National Health and Nutrition Examination Survey [NHANES] and Korea National Health and Nutrition Examination Survey [KNHANES]). All participants were healthy and did not have genetic diseases or acute or serious chronic diseases. In each survey, all participants and their parents provided a written informed consent (the participants in Tunisia provided a verbal informed consent). All surveys had been approved by their respective Institutional Ethics Review Board.

Measurements

BP values were obtained with certified mercury sphygmomanometers by trained examiners after the standard protocol recommended by the American Heart Association in all 7 countries.[33] In brief, BP was obtained on the right arm of seated children resting for at least 5 minutes using an appropriately sized cuff. The feet of children were resting on a platform during BP measurement. SBP was measured by the onset of the first Korotkoff sound (ie, appearance of tones) and DBP was recorded by the fifth Korotkoff sound (ie, total disappearance of tones). Children with DBP equal to zero mm Hg were excluded in all data sets. BP was measured ≤3 at several minute intervals between readings on one visit. For 5 countries (China, India, Korea, Poland, and the United States), participants had 3 BP readings, and the mean of the last 2 readings was used for our analysis; for the other 2 countries (Iran and Tunisia), 2 readings were available, and the averaged BP value was used for our analysis. Weight and height were measured for each individual in light clothing without shoes. Body mass index was calculated as weight in kilograms divided by the square of height in meters. Overweight and obesity were defined using age- and sex-specific body mass index percentiles as recommended by the International Obesity Task Force.[34]

Definition of Raised BP

High BP defined as SBP/DBP ≥95th percentile by sex, age, and height according to the Fourth Report[6] was considered as the gold standard for comparison with the 11 simplified methods for 95th percentile values (Tables 1–5). Table 1 shows the 95th percentile BP values for the 5th, 50th, and 95th percentiles of a child's height based on the Fourth Report, consistent with the simplified table by Kaelber and Pickett.[16] Table 2 shows the simplified 95th percentile BP values for the 5th, 50th, and 95th percentiles of height by age group based on the Fourth Report, consistent with the simplified table by Mitchell et al.[17] Table 3 shows formulas that estimate the 95th percentile BP values at the 5th, 50th, and 95th percentiles of height based on the Fourth Report, consistent with formulas developed by Somu et al[14] and Badeli et al.[15] Table 4 shows the cutoffs of BPHR established by Xi et al.[20] Table 5 shows the 95th percentile BP values for absolute height categories based on the Fourth Report established by Chiolero et al.[18]

Elevated BP defined as SBP/DBP ≥90th percentile by sex, age, and height (or ≥120/80 mm Hg) according to the Fourth Report[6] was considered as the gold standard for comparison with the 11 simplified methods for 90th BP values (Table S2).

Statistical Analysis

Analyses were performed using SAS 9.2 (SAS Institute, Cary, NC). For NHANES and KNHANES data, sampling weights were considered to account for complex survey design (primary sampling unites and strata) at the country level; for other national data, the weights

Table 1. Simplified Table Displaying the 95th Percentile Values of Blood Pressure (mm Hg) Based on the Fourth Report at the 5th, 50th, and 95th Percentiles of a Child's Height by Sex and Age, Consistent With the Simplified Table by Kaelber and Pickett[16]

	Boys						Girls					
	SBP, mm Hg			DBP, mm Hg			SBP, mm Hg			DBP, mm Hg		
Age, y	P_5(H)	P_{50}(H)	P_{95}(H)	P_5(H)	P_{50}(H)	P_{95}(H)	P_5(H)	P_{50}(H)	P_{95}(H)	P_5(H)	P_{50}(H)	P_{95}(H)
3	104	109	113	63	65	67	104	107	110	65	67	69
4	106	111	115	66	69	71	105	108	112	68	70	72
5	108	112	116	69	72	74	107	110	113	70	72	74
6	109	114	117	72	74	76	108	111	115	72	74	76
7	110	115	119	74	76	78	110	113	116	73	75	77
8	111	116	120	75	78	80	112	115	118	75	76	78
9	113	118	121	76	79	81	114	117	120	76	77	79
10	115	119	123	77	80	82	116	119	122	77	78	80
11	117	121	125	78	80	82	118	121	124	78	79	81
12	119	123	127	78	81	83	119	123	126	79	80	82
13	121	126	130	79	81	83	121	124	128	80	81	83
14	124	128	132	80	82	84	123	126	129	81	82	84
15	126	131	135	81	83	85	124	127	131	82	83	85
16	129	134	137	82	84	87	125	128	132	82	84	86
17	131	136	140	84	87	89	125	129	132	82	84	86

P_5(H), P_{50}(H), and P_{95}(H) indicate 5th, 50th, and 95th percentiles of a child's height. DBP indicates diastolic blood pressure; and SBP, systolic blood pressure.

were not available. We performed receiver operator characteristic curve analysis to examine the performance of each of the considered 11 simplified methods for their discriminatory power of elevated or high BP (yes versus no) when compared with the Fourth Report as the gold standard. The area under the curve (AUC), sensitivity, specificity, PPV, and negative predictive value (NPV) were calculated.

Results

Characteristics of participants in the 7 national surveys are shown in Table S1. A total of 58 899 children and adolescents aged 6 to 17 years were included in the present study, with 9129 subjects (boys, 52.7%; age range, 6–17 years) in China; 7114 (boys, 56.0%; age range, 6–17 years) in India; 16 613 (boys, 51.0%; age range, 6–17 years) in Iran; 6846 (boys, 52.8%; age range, 10–17 years) in Korea; 5721 (boys, 49.4%; age range, 6–17 years) in Poland; 1777 (boys, 46.1%; age range, 15–17 years) in Tunisia; and 11 699 (boys, 49.2%; age range, 8–17 years) in the United States. As shown in Table S3, the prevalence of high BP (using 95th percentile of the Fourth Report) in boys/girls ranged from 2.7%/2.1% in Korea to 11.8%/13.9% in India, respectively; the prevalence of obesity (using the International Obesity Task Force criteria) in boys/girls ranged from 1.7%/0.9% in China to 15.4%/16.3% in the United States, respectively.

In the analysis pooling individual-level data from the 7 countries, all 11 simplified methods performed well in screening high BP, with high AUC values (0.84–0.98), high sensitivity (0.69–1.00), high specificity (0.87–1.00), and high NPV values (≥0.98; Table 6). In contrast, the PPV was lower for most methods. However, 3 simplified methods achieved fairly good PPV (boys/girls): the method using sex- and age-specific BP references at the 95th percentile of height (0.94/0.94),

Table 2. Simplified Table Displaying the 95th Percentile Values of Blood Pressure (mm Hg) at the 5th, 50th, and 95th Percentiles of a Child's Height by Age Group, Based on the Fourth Report, Consistent With the Simplified Table by Mitchell et al[17]

	SBP, mm Hg			DBP, mm Hg		
Age, y	P_5(H)	P_{50}(H)	P_{95}(H)	P_5(H)	P_{50}(H)	P_{95}(H)
3–5	104	107	110	63	65	67
6–8	108	111	115	72	74	76
9–11	113	117	120	76	77	79
12–14	119	123	126	78	80	82
15–17						
Boys	126	131	135	81	83	85
Girls	124	127	131	82	83	85

P_5(H), P_{50}(H), and P_{95}(H) indicate 5th, 50th, and 95th percentiles of a child's height. DBP indicates diastolic blood pressure; and SBP, systolic blood pressure.

Table 3. Formulas to Estimate the 95th Percentile Blood Pressure Values (mm Hg) at the 5th, 50th, and 95th Percentiles of Height Based on the Fourth Report, Consistent With Formulas Developed by Somu et al[14] and Badeli et al[15]

	Age, y	P_5(H)	P_{50}(H)	P_{95}(H)
SBP, mm Hg	3–17	96+2×age	100+2×age	103+2×age
DBP, mm Hg	3–5	58+2×age	60+2×age	63+2×age
	6–17	66+age	68+age	70+age

P_5(H), P_{50}(H), and P_{95}(H) indicate 5th, 50th, and 95th percentiles of a child's height. DBP indicates diastolic blood pressure; and SBP, systolic blood pressure.

Table 4. Simplified Table Displaying the Blood Pressure to Height Ratio Corresponding to the 95th Percentile Blood Pressure Values, Based on the Fourth Report (Xi et al[20] and Lu et al[19])

Age, y	Systolic BPHR	Diastolic BPHR
6–11	0.84	0.55
12–17	0.78	0.50

BPHR indicates blood pressure to height ratio.

the method based on the formula at the 95th percentile of height (0.84/0.96), and the method based on absolute height (0.84/0.92) compared with PPV of 0.32 to 0.69 in boys and 0.40 to 0.81 in girls for the other simplified methods. In addition, 3 methods each above also performed similarly well according to age group and type of high BP (Table S4).

Performance for the identification of high BP for all 11 simplified methods was similar in each of the 7 countries (Table S5). All simplified methods in all countries had high AUC, high sensitivity, high specificity, and high NPV (Table S5). In contrast, PPV was substantially lower for most simplified methods, but markedly and consistently higher in all countries for 3 simplified methods (sex- and age-specific BP references at the 95th percentile of height, formula at the 95th percentile of height, and the method based on a child's absolute height; Figure).

The 11 simplified methods also performed well for identification of elevated BP, with high AUC, high sensitivity, high specificity, and high NPV (Table S6). Based on PPV values, 3 simplified methods, including the sex- and age-specific 90th percentile BP values at the 95th percentile of height (boys, 0.99; girls, 0.99), the formula for 90th BP references at the 95th percentile of height (boys, 0.99; girls, 1.00), and the height-specific BP references (boys, 0.98; girls, 0.98), performed best among all 11 simple methods.

Discussion

We compared the performance of 11 simplified methods for assessing elevated or high BP in 58 899 children and adolescents aged 6 to 17 years from 7 countries in 3 continents. All methods had good performance to identify children and adolescents with elevated or high BP based on high AUC, sensitivity, specificity, and NPV. However, PPV differed largely across simplified methods. Three simplified methods achieved good PPV (≈90%): the method specific for sex and age (at the 95th height percentile), the method based on mathematical formula (at the 95th height percentile), and the method based on a child's absolute height, meaning that ≈90% of children identified to have raised BP with the test would actually have high BP. However, it should be noted that the method based on a child's absolute height might be the most useful in clinical practice because the 2 other methods (one based on sex- and age-specific values and the other one based on formulas) perform well only among tall children.

Table 5. Simplified Table Displaying the 95th Percentile Blood Pressure Values According to a Child's Absolute Height, Based on the Fourth Report (Chiolero et al[18])

Height Categories, cm	Height Range, cm	SBP, mm Hg	DBP, mm Hg
80	<85	104	61
90	85–94	107	65
100	95–104	110	68
110	105–114	112	72
120	115–124	114	76
130	125–134	117	78
140	135–144	120	80
150	145–154	123	81
160	155–164	128	83
170	165–174	131	85
180	≥175	136	87

DBP indicates diastolic blood pressure; and SBP, systolic blood pressure.

It is well known that height is strongly associated with BP independently of age and sex.[6,35,36] In 2013, Chiolero et al[18] established BP cutoffs for screening high BP in children and adolescents derived from the Fourth Report taking only a child's absolute height into consideration, along with 11 incremental 10-cm absolute height categories between 80 and 180 cm. Hence, the simplified table has 22 SBP/DBP height-specific cutoffs versus 476 BP age-, sex-, and height-specific cutoffs in the original Fourth Report. These BP cutoffs based on a child's absolute height were assessed in 2 surveys in Switzerland and Seychelles, and PPV and NPV values were found to be 92% and 97% in Switzerland and 91% and 98% in the Seychelles, respectively.[18] These results are consistent with our findings in 7 other populations.

In 2003, Somu et al developed a formula to identify high BP in children and adolescents based on linear regression analysis of the 95th percentile BP values at the 50th percentile of height for both sexes.[14] Because this formula was based on the corresponding BP values extracted from the 1996 US BP criteria,[37] we recalculated it using the BP cutoff values from the Fourth Report. It was coincident that our recalculated 95th BP percentile values were nearly identical to the original formula of Somu et al.[14] In the present study, we also developed similar formulas at the 95th percentile of a child's height, which performed equally well with the simplified height-specific BP references.

Lu et al[19] proposed the use of BPHR in 2011, with 4 cutoff ratios to define elevated SBP, respectively, DBP, in boys and girls. The authors concluded that BPHR was an accurate and simple index for screening elevated BP in adolescents aged 13 to 17 years.[19] However, the PPV of this method was <50%, similar to our findings. In other words, >50% of children identified as having elevated or high BP based on this simplified method would actually not have elevated or high BP based on the cutoffs of the Fourth Report (ie, a large false-positive yield), which may result in unnecessary confirmatory tests (to rule out truly elevated or high BP) and psychological stress for children and their parents related to false-positive labeling.

The BP cutoffs used to define hypertension in male adolescents aged 17 years were close to the 140/90 mm Hg cutoff used in adults, ranging from 136/87 mm Hg at the 50th percentile of height to 140/89 mm Hg at the 95th percentile of

Table 6. Performance of the 11 Simplified Methods for the Identification of High Blood Pressure in Children and Adolescents From the Pooling Data

Simplified Method	Boys					Girls				
	AUC (95% CI)	Sensitivity	Specificity	PPV	NPV	AUC (95% CI)	Sensitivity	Specificity	PPV	NPV
Method A										
P_5(H)	0.95 (0.95–0.95)	1.00	0.91	0.40	1.00	0.97 (0.97–0.97)	1.00	0.94	0.54	1.00
P_{50}(H)	0.94 (0.93–0.94)	0.90	0.97	0.69	0.99	0.98 (0.97–0.98)	0.97	0.98	0.75	1.00
P_{95}(H)	0.85 (0.84–0.87)	0.71	1.00	0.94	0.98	0.87 (0.86–0.88)	0.74	1.00	0.94	0.98
Method B										
P_5(H)	0.93 (0.93–0.94)	1.00	0.87	0.32	1.00	0.95 (0.95–0.96)	1.00	0.91	0.41	1.00
P_{50}(H)	0.95 (0.95–0.96)	0.97	0.93	0.47	1.00	0.97 (0.96–0.97)	0.99	0.95	0.58	1.00
P_{95}(H)	0.93 (0.92–0.94)	0.89	0.97	0.67	0.99	0.93 (0.92–0.94)	0.86	0.99	0.81	0.99
Method C										
P_5(H)	0.95 (0.95–0.95)	1.00	0.91	0.40	1.00	0.97 (0.96–0.97)	0.99	0.94	0.51	1.00
P_{50}(H)	0.95 (0.95–0.96)	0.95	0.96	0.62	1.00	0.96 (0.95–0.96)	0.93	0.98	0.77	1.00
P_{95}(H)	0.89 (0.88–0.91)	0.80	0.99	0.84	0.99	0.84 (0.83–0.86)	0.69	1.00	0.96	0.98
Method D	0.92 (0.91–0.93)	0.92	0.92	0.42	0.99	0.93 (0.93–0.94)	0.96	0.91	0.40	1.00
Method E	0.95 (0.94–0.95)	0.90	0.99	0.84	0.99	0.94 (0.93–0.95)	0.89	0.99	0.92	0.99

P_5(H), P_{50}(H), and P_{95}(H) indicate 5th, 50th, and 95th percentiles of a child's height. AUC indicates area under the curve; CI, confidence interval; NPV, negative predictive value; and PPV, positive predictive value.

height. However, the BP cutoffs used to diagnose hypertension in female adolescents aged 17 years (≈130/85 mm Hg) were substantially lower than the 140/90 mm Hg cutoff in adults. BP levels are typically higher in male than in female adolescents aged 17 years in many surveys. The exact reasons for this sex difference in BP are unknown, but differences in sex hormones and in body build (eg, total muscular versus fat mass) between boys and girls at late adolescence may play a role. However, it should be recalled that BP cutoffs in the Fourth Report were established based on BP distributions using statistical methods rather than linking BP values in childhood to target organ damage or cardiovascular diseases in childhood or adulthood. Thus, it cannot be definitely assessed whether BP cutoffs to define hypertension in male and female adolescents aged 17 years should be close to that in adults or not.

The strengths of this study include the large sample size of our pooled data set (n=58 899), the population-based nature of all national samples, the high quality of measured data (eg, use of calibrated BP devices and trained investigators), the comprehensive age range of most data sets (6–17 years), and the diverse underlying populations (7 countries from 3 continents). These characteristics strengthen the generalizability of our findings and their potential applicability by clinicians in all countries. However, several limitations should also be noted. First, we did not validate the 11 simplified methods in children younger than 6 years. Second, BP was measured at only one visit in all surveys. Further studies should assess the performance of the simplified methods based on BP readings taken on at least 3 occasions or in different settings (eg, home BP). In addition, it would be useful if these simplified tools could be evaluated based on the presence of target organ damage.

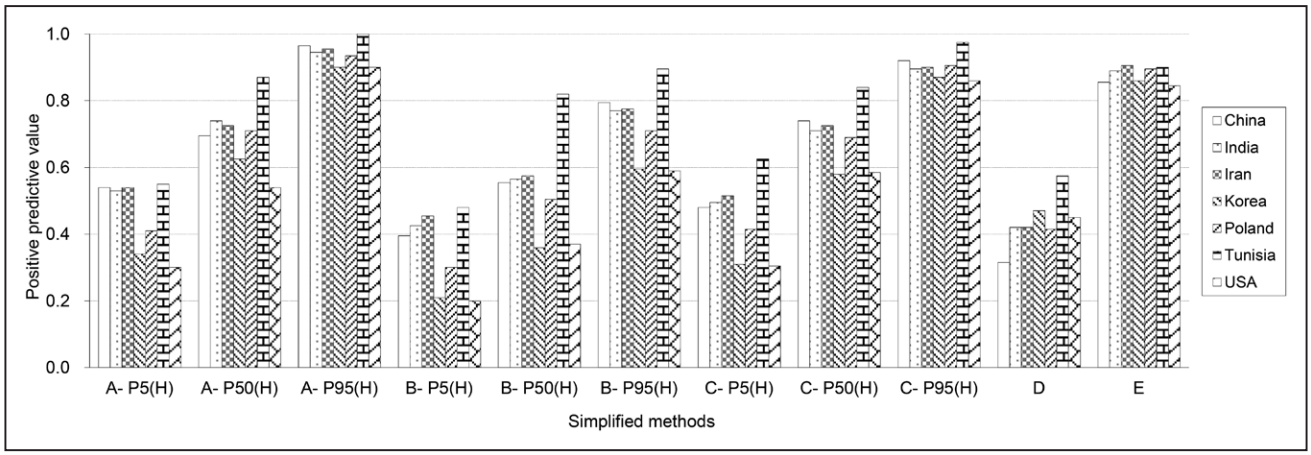

Figure. Positive predictive value of the 11 simplified methods for identifying high blood pressure (BP) in children and adolescents from 7 countries. P5(H), P50(H), and P95(H) indicate 5th, 50th, and 95th percentiles of a child's height.

Perspectives

The present study shows that all simplified methods to assess elevated or high BP in children and adolescents performed well when the purpose was to exclude the presence of elevated or high BP in the children screened, but only 3 simplified methods had sufficiently high PPV to identify children with high BP. In addition, simplified methods, which are expected to be more user-friendly than the original tables of the Fourth Report, may be suitable for routine screening, but definite diagnosis of elevated or high BP needs to be confirmed using the standard criteria of the Fourth Report. Further studies should examine the performance of simplified methods in other settings and populations, particularly methods based on a child's absolute height, to further document their external validity.

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Disclosures

None.

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Novelty and Significance

What Is New?

- We compared the performance of 11 simplified methods for screening elevated or high blood pressure among 58 899 children and adolescents aged 6 to 17 years based on data from 7 national studies from China, India, Iran, Korea, Poland, Tunisia, and the United States.

What Is Relevant?

- Three simplified methods performed best: one as the simplified tables by sex and age (at the 95th percentile of height), one using a formula (at the 95th percentile of height), and one based on a child's absolute height. Simplified methods may be useful for screening purpose.

Summary

This study shows that commonly used simplified methods to assess high blood pressure in children and adolescents performed well when the purpose was to exclude the presence of high blood pressure, but only 3 simplified methods had sufficiently high positive predictive value to accurately identify children with high blood pressure.

Performance of Eleven Simplified Methods for the Identification of Elevated Blood Pressure in Children and Adolescents

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Performance of eleven simplified methods for the identification of elevated blood pressure in children and adolescents

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Supplemental Files

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Table S1 Description of the Seven Population-based Surveys of Blood Pressure among Children and Adolescents Aged 6-17 Years

Country	Survey year	Description	No. of participants	Age range, y	Boys, %	Weight, kg	Height, cm	BMI, kg/m^2	SBP, mmHg	DBP, mmHg
China	1997-2011	Data pooled from six cycles of the China Health and Nutrition Survey	9129	6-17	52.7	38.4 (12.9)	145.2 (16.4)	17.7 (2.9)	98.7 (12.7)	65.0 (9.4)
			2392	6-9	52.7	25.5 (5.7)	126.1 (8.7)	15.9 (2.5)	91.6 (11.3)	60.4 (9.2)
			4744	10-14	52.0	38.9 (10.0)	147.5 (11.5)	17.6 (2.7)	98.8 (11.8)	65.0 (8.8)
			1993	15-17	54.6	52.5 (8.9)	162.6 (8.6)	19.8 (2.4)	107.2 (10.9)	70.3 (8.2)
India	2010-2012	National Growth Survey	7114	6-17	56.0	40.8 (15.4)	145.7 (16.8)	18.5 (4.0)	105.8 (12.6)	70.6 (8.9)
			2318	6-9	56.4	26.3 (7.4)	126.8 (8.9)	16.1 (3.0)	97.3 (11.2)	66.1 (8.6)
			3483	10-14	56.2	44.4 (11.7)	151.5 (10.2)	19.1 (3.7)	108.3 (10.9)	71.9 (8.3)
			1313	15-17	54.5	56.8 (12.8)	163.7 (9.0)	21.1 (4.0)	114.2 (10.1)	75.4 (7.1)
Iran	2009-2012	Data pooled from two cycles of the CASPIAN survey	16613	6-17	51.0	42.2 (15.6)	147.9 (16.8)	18.6 (3.9)	101.2 (12.9)	64.7 (10.8)
			4130	6-9	52.8	26.0 (6.1)	127.1 (8.4)	15.9 (2.5)	95.1 (12.0)	61.2 (10.6)
			7965	10-14	49.7	42.4 (12.3)	149.5 (11.3)	18.6 (3.7)	101.1 (12.1)	64.5 (10.5)
			4518	15-17	51.5	56.6 (12.4)	164.1 (9.5)	20.9 (3.7)	107.1 (12.1)	68.2 (10.4)

Korea	2005-2013	Data pooled from four cycles of the Korea National Health and Nutrition Examination Survey	6846	10-17	52.8	51.6 (13.4)	158.7 (11.5)	20.2 (3.5)	104.6 (10.1)	64.9 (9.0)
			4682	10-14	53.1	47.7 (12.2)	154.7 (10.5)	19.7 (3.5)	103.6 (9.8)	63.5 (8.9)
			2164	15-17	52.4	60.0 (11.9)	167.3 (8.2)	21.3 (3.4)	106.9 (10.4)	68.0 (8.5)
Poland	2002-2005	National Survey of Children and Adolescents	5721	6-17	49.4	44.5 (15.8)	151.4 (17.7)	18.8 (3.4)	108.4 (11.2)	66.5 (8.0)
			1573	6-9	49.1	28.4 (6.5)	130.1 (7.6)	16.6 (2.5)	101.8 (9.1)	63.3 (7.6)
			2586	10-14	50.0	44.7 (11.9)	153.2 (11.1)	18.8 (3.3)	109.1 (10.3)	66.9 (7.7)
			1562	15-17	48.7	60.4 (10.9)	169.8 (8.7)	20.9 (3.0)	113.9 (11.1)	69.1 (7.8)
Tunisia	2005	National Survey of Adolescents	1777	15-17	46.1	57.0 (9.8)	164.7 (8.9)	21.0 (3.1)	111.5 (10.0)	66.3 (8.1)
USA	1999-2012	Data pooled from six cycles of the U.S. National Health and Nutrition Examination Survey	11699	8-17	49.2	55.8 (19.4)	156.9 (14.4)	22.1 (5.4)	106.3 (10.2)	59.0 (10.9)
			1757	8-9	48.0	34.9 (10.1)	135.2 (7.2)	18.8 (4.1)	100.2 (8.8)	54.4 (10.8)
			5951	10-14	48.0	53.6 (16.5)	155.8 (10.6)	21.7 (5.1)	105.5 (9.5)	58.4 (10.7)

	3991	15-17	51.4	68.2 (17.4)	167.9 (9.4)	24.1 (5.4)	110.3 (10.1)	61.9 (10.4)

Continuous variables are expressed as mean and standard deviation (SD)

SBP: systolic blood pressure; DBP: diastolic blood pressure.

Table S2 Simplified methods for the identification of pre-high blood pressure in children and adolescents

A. Simplified table displaying the 90th percentile values of blood pressure (mmHg) based on the Fourth Report at the 5th, 50th and 95th percentiles of a child's height by sex and age [1]

Age, y	Boys						Girls					
	SBP, mm Hg			DBP, mm Hg			SBP, mm Hg			DBP, mm Hg		
	P_5(H)	P_{50}(H)	P_{95}(H)	P_5(H)	P_{50}(H)	P_{95}(H)	P_5(H)	P_{50}(H)	P_{95}(H)	P_5(H)	P_{50}(H)	P_{95}(H)
3	100	105	109	59	61	63	100	103	106	61	63	65
4	102	107	111	62	65	67	101	104	108	64	66	68
5	104	108	112	65	68	70	103	106	109	66	68	70
6	105	110	113	68	70	72	104	108	111	68	70	72
7	106	111	115	70	72	74	106	109	113	69	71	73
8	107	112	116	71	73	76	108	111	114	71	72	74
9	109	114	118	72	75	77	110	113	116	72	73	75
10	111	115	119	73	75	78	112	115	118	73	74	76
11	113	117	120	74	76	78	114	117	120	74	75	77
12	115	120	120	74	76	79	116	119	120	75	76	78
13	117	120	120	75	77	79	117	120	120	76	77	79
14	120	120	120	75	78	80	119	120	120	77	78	80
15	120	120	120	76	79	80	120	120	120	78	79	80
16	120	120	120	78	80	80	120	120	120	78	80	80
17	120	120	120	80	80	80	120	120	120	78	80	80

P_5(H), P_{50}(H), P_{95}(H): 5th, 50th and 95th percentiles of a child's height

B. Simplified table displaying the 90th percentile values of blood pressure (mmHg) at 5th, 50th and 95th percentiles of a child's height by age, based on the Fourth Report [2]

Age, y	SBP, mmHg			DBP, mmHg		
	P_5(H)	P_{50}(H)	P_{95}(H)	P_5(H)	P_{50}(H)	P_{95}(H)
3-5	100	103	106	60	60	65
6-8	105	108	111	70	70	75
9-11	110	113	116	75	75	75
12-14	115	120	120	75	80	80
15-17	120	120	120	80	80	80

P5(H), P50(H), P95(H): 5th, 50th and 95th percentiles of a child's height

C. Formulas to estimate the 90th percentile blood pressure values (mmHg) at the 5th, 50th and 95th percentiles of height based on the Fourth Report [3]

BP, mmHg	Age, y	P_5(H)
SBP	3-13	95+1.6*age
	14-17	120
DBP	3-13	57+1.5*age
	14-17	80
	Age, y	P_{50}(H)
SBP	3-11	101+1.4*age
	12-17	120
DBP	3-11	60+1.4*age
	12-17	80
	Age, y	P_{95}(H)
SBP	3-9	103+1.6*age
	10-17	120
DBP	3-9	61+1.6*age
	10-17	80

P_5(H), P_{50}(H), P_{95}(H): 5th, 50th and 95th percentiles of a child's height

D. Simplified table displaying the blood pressure to height ratio (BPHR) corresponding to the 90th percentile blood pressure values, based on the Fourth Report [4]

Age, y	Systolic BPHR	Diastolic BPHR
6-11	0.81	0.52
12-17	0.70	0.46

E. Simplified table displaying the 90th percentile blood pressure values according to a child's absolute height, based on the Fourth Report [5]

Height categories (cm)	Height range (cm)	SBP, mmHg	DBP, mmHg
80	<85	99	57
90	85–94	103	61
100	95–104	106	64
110	105–114	108	68
120	115–124	110	71
130	125–134	113	74
140	135–144	116	76
150	145–154	120	80
160	155–164	120	80
170	165–174	120	80
180	≥175	120	80

Table S3. Prevalence of elevated blood pressure and overweight/obesity in seven countries

Country	Elevated BP, %				BMI categories, %	
	High BP	High SBP	High DBP	High normal BP	Overweight	Obesity
China						
Boys	4.7	2.0	3.6	12.1	7.9	1.7
Girls	4.9	1.9	3.9	8.4	5.7	0.9
India						
Boys	11.8	4.7	9.9	20.8	15.6	4.6
Girls	13.9	6.1	11.2	19.4	15.6	3.5
Iran						
Boys	7.8	3.2	6.3	17.0	14.3	3.2
Girls	8.2	3.0	6.5	13.4	13.4	2.9
Korea						
Boys	2.7	1.5	1.6	12.7	23.9	5.2
Girls	2.1	1.2	1.4	5.7	14.1	1.6
Poland						
Boys	6.3	5.0	2.6	18.7	12.5	3.8
Girls	6.7	5.0	3.1	13.6	11.5	1.8
Tunisia						
Boys	3.5	2.0	1.8	36.0	11.1	0.6
Girls	5.9	4.7	1.8	27.0	12.6	2.4
USA						
Boys	2.7	2.2	0.5	13.6	21.7	15.4
Girls	2.2	1.7	0.6	6.2	21.6	16.3

BP, blood pressure; SBP, systolic blood pressure; DBP, diastolic blood pressure; BMI, body mass index

Table S4 Performance of the two simplified methods for the identification of high blood pressure in the pooled population by sex, age group, and type of high blood pressure

Simplified method	Boys					Girls				
	AUC (95%CI)	Sen	Spe	PPV	NPV	AUC (95%CI)	Sen	Spe	PPV	NPV
Method A- P_{95}(H)										
Age group (years)										
6-11	0.87 (0.85-0.88)	0.74	1.00	0.91	0.98	0.89 (0.88-0.91)	0.80	0.99	0.92	0.98
12-17	0.84 (0.83-0.86)	0.69	1.00	0.97	0.98	0.84 (0.82-0.86)	0.69	1.00	0.98	0.98
Type of high BP										
High SBP	0.84 (0.82-0.85)	0.67	1.00	0.93	0.99	0.84 (0.82-0.86)	0.68	1.00	0.94	0.99
High DBP	0.86 (0.85-0.88)	0.73	1.00	0.95	0.99	0.89 (0.87-0.90)	0.77	1.00	0.95	0.99
Method C- P_{95}(H)										
Age group (years)										
6-11	0.92 (0.91-0.94)	0.86	0.98	0.75	0.99	0.88 (0.86-0.90)	0.94	0.98	0.94	0.98
12-17	0.87 (0.86-0.89)	0.75	1.00	0.93	0.98	0.80 (0.78-0.82)	0.98	0.98	0.98	0.98
Type of high BP										
High SBP	0.85 (0.84-0.87)	0.71	1.00	0.88	0.99	0.76 (0.74-0.78)	0.62	1.00	0.97	0.99
High DBP	0.91 (0.90-0.92)	0.83	0.99	0.81	0.99	0.88 (0.87-0.90)	0.77	1.00	0.95	0.99
Method E										
Age group (years)										
6-11	0.96 (0.95-0.07)	0.95	0.98	0.80	1.00	0.94 (0.93-0.95)	0.89	1.00	0.96	0.99
12-17	0.93 (0.92-0.94)	0.87	0.99	0.90	0.99	0.94 (0.93-0.95)	0.89	0.99	0.87	0.99
Type of high BP										
High SBP	0.95 (0.93-0.96)	0.90	0.99	0.80	1.00	0.93 (0.91-0.94)	0.86	0.99	0.86	1.00
High DBP	0.95 (0.94-0.96)	0.90	0.99	0.85	1.00	0.95 (0.94-0.96)	0.90	1.00	0.93	1.00

AUC, area under the curve; CI, confidence interval; Sen, sensitivity; Spe, specificity; PPV, positive predictive value; NPV, negative predictive value

Table S5 Performance of the 11 simplified methods for the identification of high blood pressure in children and adolescents from seven countries

Simplified method	Boys					Girls				
	AUC (95%CI)	Sen	Spe	PPV	NPV	AUC (95%CI)	Sen	Spe	PPV	NPV
China										
Method A- P_5(H)	0.96 (0.95-0.97)	0.98	0.94	0.45	1.00	0.98 (0.98-0.99)	1.00	0.97	0.63	1.00
Method A- P_{50}(H)	0.92 (0.89-0.94)	0.85	0.98	0.68	0.99	0.98 (0.96-0.99)	0.96	0.98	0.71	1.00
Method A- P_{95}(H)	0.76 (0.72-0.80)	0.52	1.00	0.96	0.98	0.84 (0.80-0.88)	0.68	1.00	0.97	0.98
Method B- P_5(H)	0.95 (0.94-0.96)	1.00	0.90	0.34	1.00	0.97 (0.96-0.97)	1.00	0.94	0.45	1.00
Method B- P_{50}(H)	0.95 (0.93-0.96)	0.94	0.96	0.51	1.00	0.97 (0.96-0.98)	0.98	0.97	0.60	1.00
Method B- P_{95}(H)	0.91 (0.88-0.94)	0.84	0.98	0.71	0.99	0.92 (0.89-0.95)	0.84	0.99	0.88	0.99
Method C- P_5(H)	0.96 (0.95-0.97)	0.98	0.93	0.42	1.00	0.98 (0.97-0.98)	0.99	0.96	0.54	1.00
Method C- P_{50}(H)	0.94 (0.92-0.96)	0.91	0.98	0.65	1.00	0.96 (0.94-0.98)	0.93	0.99	0.83	1.00
Method C- P_{95}(H)	0.84 (0.80-0.87)	0.68	0.99	0.87	0.98	0.82 (0.78-0.86)	0.64	1.00	0.97	0.98
Method D	0.93 (0.91-0.95)	0.95	0.91	0.34	1.00	0.93 (0.91-0.94)	0.97	0.88	0.29	1.00
Method E	0.94 (0.91-0.96)	0.89	0.99	0.83	0.99	0.93 (0.90-0.96)	0.87	0.99	0.88	0.99
India										
Method A- P_5(H)	0.92 (0.92-0.93)	1.00	0.85	0.47	1.00	0.94 (0.94-0.95)	1.00	0.89	0.59	1.00
Method A- P_{50}(H)	0.94 (0.93-0.96)	0.94	0.95	0.72	0.99	0.97 (0.97-0.98)	0.99	0.95	0.76	1.00
Method A- P_{95}(H)	0.88 (0.86-0.90)	0.77	0.99	0.93	0.97	0.90 (0.88-0.92)	0.81	0.99	0.96	0.97
Method B- P_5(H)	0.90 (0.89-0.91)	1.00	0.79	0.39	1.00	0.91 (0.90-0.92)	1.00	0.81	0.46	1.00
Method B- P_{50}(H)	0.93 (0.92-0.94)	0.98	0.88	0.53	1.00	0.94 (0.94-0.95)	1.00	0.89	0.60	1.00

Method B- P_{95}(H)	0.94 (0.92-0.95)	0.93	0.95	0.70	0.99	0.94 (0.92-0.96)	0.91	0.97	0.84	0.98
Method C- P_{5}(H)	0.92 (0.91-0.93)	1.00	0.84	0.45	1.00	0.93 (0.92-0.94)	1.00	0.86	0.54	1.00
Method C- P_{50}(H)	0.95 (0.94-0.96)	0.97	0.93	0.64	1.00	0.97 (0.96-0.98)	0.97	0.96	0.78	1.00
Method C- P_{95}(H)	0.91 (0.89-0.93)	0.84	0.98	0.82	0.98	0.87 (0.85-0.90)	0.75	1.00	0.97	0.96
Method D	0.90 (0.88-0.91)	0.96	0.84	0.45	0.99	0.86 (0.85-0.88)	0.96	0.76	0.39	0.99
Method E	0.92 (0.91-0.94)	0.87	0.98	0.85	0.98	0.93 (0.91-0.94)	0.86	0.99	0.93	0.98
Iran										
Method A- P_{5}(H)	0.95 (0.94-0.95)	0.99	0.91	0.48	1.00	0.97 (0.96-0.97)	1.00	0.94	0.60	1.00
Method A- P_{50}(H)	0.91 (0.90-0.93)	0.85	0.97	0.71	0.99	0.97 (0.96-0.98)	0.97	0.97	0.74	1.00
Method A- P_{95}(H)	0.84 (0.82-0.86)	0.69	1.00	0.96	0.97	0.87 (0.85-0.89)	0.75	1.00	0.95	0.98
Method B- P_{5}(H)	0.94 (0.93-0.95)	1.00	0.88	0.42	1.00	0.95 (0.95-0.96)	1.00	0.91	0.49	1.00
Method B- $_{P50}$(H)	0.95 (0.94-0.96)	0.96	0.93	0.54	1.00	0.96 (0.96-0.97)	0.98	0.94	0.61	1.00
Method B- P_{95}(H)	0.91 (0.90-0.93)	0.86	0.97	0.72	0.99	0.93 (0.91-0.94)	0.88	0.98	0.83	0.99
Method C- P_{5}(H)	0.95 (0.94-0.95)	1.00	0.90	0.47	1.00	0.96 (0.96-0.97)	0.99	0.93	0.56	1.00
Method C- P_{50}(H)	0.94 (0.93-0.95)	0.92	0.96	0.67	0.99	0.96 (0.95-0.97)	0.95	0.98	0.78	1.00
Method C- P_{95}(H)	0.88 (0.86-0.90)	0.77	0.99	0.85	0.98	0.87 (0.84-0.89)	0.73	1.00	0.95	0.98
Method D	0.92 (0.91-0.93)	0.95	0.89	0.42	1.00	0.93 (0.92-0.94)	0.98	0.88	0.42	1.00
Method E	0.97 (0.96-0.98)	0.94	0.99	0.89	0.99	0.97 (0.96-0.98)	0.95	0.99	0.92	1.00
Korea										
Method A- P_{5}(H)	0.96 (0.95-0.97)	1.00	0.92	0.26	1.00	0.98 (0.98-0.99)	1.00	0.97	0.42	1.00
Method A- P_{50}(H)	0.97 (0.95-0.99)	0.96	0.98	0.57	1.00	0.98 (0.96-1.00)	0.97	0.99	0.68	1.00

Method A- P_{95}(H)	0.88 (0.83-0.93)	0.76	1.00	0.91	0.99	0.85 (0.78-0.91)	0.70	1.00	0.89	0.99
Method B- P_{5}(H)	0.94 (0.93-0.95)	1.00	0.87	0.18	1.00	0.97 (0.96-0.97)	1.00	0.93	0.24	1.00
Method B- P_{50}(H)	0.97 (0.96-0.98)	1.00	0.94	0.31	1.00	0.98 (0.98-0.99)	1.00	0.97	0.41	1.00
Method B- P_{95}(H)	0.97 (0.95-0.99)	0.96	0.98	0.53	1.00	0.94 (0.90-0.99)	0.90	0.99	0.66	1.00
Method C- P_{5}(H)	0.96 (0.95-0.97)	1.00	0.92	0.26	1.00	0.98 (0.98-0.99)	1.00	0.96	0.36	1.00
Method C- P_{50}(H)	0.99 (0.98-0.99)	1.00	0.97	0.49	1.00	0.97 (0.93-1.00)	0.94	0.99	0.67	1.00
Method C- P_{95}(H)	0.93 (0.89-0.97)	0.86	0.99	0.82	1.00	0.83 (0.76-0.90)	0.67	1.00	0.92	0.99
Method D	0.91 (0.86-0.95)	0.84	0.98	0.54	1.00	0.96 (0.93-0.99)	0.94	0.97	0.40	1.00
Method E	0.90 (0.85-0.95)	0.81	1.00	0.82	0.99	0.91 (0.86-0.97)	0.83	1.00	0.90	1.00
Poland										
Method A- P_{5}(H)	0.94 (0.93-0.95)	1.00	0.87	0.34	1.00	0.96 (0.95-0.97)	1.00	0.92	0.48	1.00
Method A- P_{50}(H)	0.96 (0.95-0.98)	0.96	0.97	0.66	1.00	0.98 (0.97-0.99)	0.99	0.98	0.76	1.00
Method A- P_{95}(H)	0.92 (0.89-0.96)	0.85	1.00	0.93	0.99	0.89 (0.85-0.92)	0.78	1.00	0.94	0.98
Method B- P_{5}(H)	0.91 (0.89-0.92)	1.00	0.81	0.26	1.00	0.93 (0.92-0.94)	1.00	0.86	0.34	1.00
Method B- P_{50}(H)	0.95 (0.94-0.96)	0.99	0.91	0.41	1.00	0.98 (0.97-0.98)	1.00	0.95	0.60	1.00
Method B- P_{95}(H)	0.95 (0.93-0.97)	0.95	0.96	0.61	1.00	0.95 (0.92-0.97)	0.91	0.98	0.81	0.99
Method C- P_{5}(H)	0.94 (0.93-0.95)	1.00	0.88	0.35	1.00	0.96 (0.95-0.97)	0.99	0.92	0.48	1.00
Method C- P_{50}(H)	0.96 (0.95-0.98)	0.98	0.95	0.58	1.00	0.96 (0.93-0.98)	0.93	0.98	0.80	0.99
Method C- P_{95}(H)	0.95 (0.92-0.97)	0.91	0.99	0.84	0.99	0.83 (0.78-0.87)	0.65	1.00	0.97	0.98
Method D	0.89 (0.86-0.92)	0.88	0.91	0.40	0.99	0.91 (0.89-0.94)	0.92	0.91	0.43	0.99
Method E	0.95 (0.92-0.97)	0.90	0.99	0.84	0.99	0.93 (0.90-0.95)	0.85	0.99	0.95	0.99

Tunisia										
Method A- P_5(H)	0.99 (0.98-0.99)	1.00	0.97	0.56	1.00	0.97 (0.94-0.99)	0.98	0.95	0.54	1.00
Method A- P_{50}(H)	0.93 (0.85-1.00)	0.86	0.99	0.89	0.99	0.94 (0.90-0.99)	0.89	0.99	0.85	0.99
Method A- P_{95}(H)	0.84 (0.74-0.95)	0.69	1.00	1.00	0.99	0.67 (0.58-0.75)	0.33	1.00	1.00	0.96
Method B- P_5(H)	0.97 (0.96-0.99)	1.00	0.95	0.42	1.00	0.97 (0.94-0.99)	0.98	0.95	0.54	1.00
Method B- P_{50}(H)	0.93 (0.85-1.00)	0.86	0.99	0.80	0.99	0.95 (0.91-0.99)	0.91	0.99	0.84	0.99
Method B- P_{95}(H)	0.93 (0.85-1.00)	0.86	0.99	0.86	0.99	0.72 (0.63-0.80)	0.44	1.00	0.93	0.97
Method C- P_5(H)	0.98 (0.97-0.99)	1.00	0.95	0.44	1.00	0.95 (0.91-0.99)	0.91	0.99	0.81	0.99
Method C- P_{50}(H)	0.94 (0.88-1.00)	0.90	0.99	0.74	1.00	0.76 (0.68-0.85)	0.53	1.00	0.94	0.97
Method C- P_{95}(H)	0.88 (0.79-0.97)	0.76	1.00	0.95	0.99	0.61 (0.53-0.70)	0.23	1.00	1.00	0.95
Method D	0.89 (0.80-0.98)	0.79	0.99	0.72	0.99	0.96 (0.95-0.97)	1.00	0.92	0.43	1.00
Method E	0.96 (0.91-1.00)	0.93	1.00	0.92	1.00	0.94 (0.90-0.99)	0.89	0.99	0.88	0.99
USA										
Method A- P_5(H)	0.96 (0.96- 0.97)	1.00	0.92	0.26	1.00	0.98 (0.97-0.98)	1.00	0.96	0.34	1.00
Method A- P_{50}(H)	0.97 (0.95- 0.98)	0.95	0.98	0.53	1.00	0.97 (0.95-0.99)	0.96	0.98	0.55	1.00
Method A- P_{95}(H)	0.86 (0.81-0.90)	0.71	1.00	0.91	0.99	0.85 (0.80-0.90)	0.70	1.00	0.89	0.99
Method B- P_5(H)	0.93 (0.93-0.94)	1.00	0.87	0.17	1.00	0.96 (0.96-0.97)	1.00	0.92	0.23	1.00
Method B- P_{50}(H)	0.97 (0.96-0.98)	0.99	0.94	0.32	1.00	0.98 (0.96-0.99)	0.98	0.97	0.42	1.00
Method B- P_{95}(H)	0.93 (0.90-0.96)	0.88	0.98	0.53	1.00	0.90 (0.86-0.94)	0.80	0.99	0.65	1.00
Method C- P_5(H)	0.96 (0.95-0.97)	1.00	0.92	0.26	1.00	0.97 (0.96-0.98)	0.98	0.96	0.35	1.00
Method C- P_{50}(H)	0.97 (0.96-0.99)	0.97	0.97	0.50	1.00	0.92 (0.89-0.96)	0.86	0.99	0.67	1.00
Method C- P_{95}(H)	0.91 (0.87-0.94)	0.82	0.99	0.80	0.99	0.79 (0.74-0.85)	0.59	1.00	0.92	0.99

Method D	0.87 (0.83- 0.91)	0.77	0.98	0.47	0.99	0.94 (0.92-0.97)	0.92	0.97	0.43	1.00
Method E	0.94 (0.90- 0.97)	0.88	0.99	0.80	1.00	0.88 (0.83-0.92)	0.76	1.00	0.89	0.99

AUC, area under the curve; CI, confidence interval; Sen, sensitivity; Spe, specificity; PPV, positive predictive value; NPV, negative predictive value
$P_5(H)$, $P_{50}(H)$, $P_{95}(H)$: 5^{th}, 50^{th} and 95^{th} percentiles of a child's height

Table S6 Performance of the 11 simplified methods for the identification of elevated blood pressure in children and adolescents from the pooling data

Simplified method	Boys					Girls				
	AUC (95%CI)	Sen	Spe	PPV	NPV	AUC (95%CI)	Sen	Spe	PPV	NPV
Method A- P_5(H)	0.95 (0.95-0.95)	1.00	0.90	0.75	1.00	0.97 (0.97-0.97)	1.00	0.93	0.77	1.00
Method A- P_{50}(H)	0.98 (0.98-0.98)	0.98	0.97	0.92	1.00	0.99 (0.98-0.99)	0.99	0.98	0.91	1.00
Method A- P_{95}(H)	0.97 (0.97-0.98)	0.95	1.00	0.99	0.99	0.97 (0.97-0.97)	0.94	1.00	0.99	0.99
Method B- P_5(H)	0.93 (0.93-0.93)	0.99	0.87	0.69	1.00	0.95 (0.94-0.95)	1.00	0.89	0.67	1.00
Method B- P_{50}(H)	0.96 (0.96-0.96)	0.98	0.95	0.84	0.99	0.97 (0.96-0.97)	0.97	0.96	0.84	0.99
Method B- P_{95}(H)	0.98 (0.97-0.98)	0.96	0.99	0.95	0.99	0.97 (0.96-0.97)	0.94	0.99	0.96	0.99
Method C- P_5(H)	0.95 (0.95-0.95)	0.99	0.91	0.76	1.00	0.96 (0.96-0.96)	1.00	0.93	0.75	1.00
Method C- P_{50}(H)	0.97 (0.97-0.97)	0.97	0.97	0.90	0.99	0.97 (0.97-0.98)	0.97	0.98	0.91	0.99
Method C- P_{95}(H)	0.97 (0.97-0.97)	0.94	1.00	0.99	0.98	0.96 (0.95-0.96)	0.91	1.00	1.00	0.98
Method D	0.82 (0.82-0.83)	0.84	0.81	0.55	0.95	0.86 (0.85-0.86)	0.95	0.77	0.47	0.99
Method E	0.96 (0.96-0.97)	0.94	0.99	0.98	0.98	0.96 0.95-0.96)	0.92	1.00	0.98	0.98

AUC, area under the curve; CI, confidence interval; Sen, sensitivity; Spe, specificity; PPV, positive predictive value; NPV, negative predictive value

P_5(H), P_{50}(H), P_{95}(H): 5^{th}, 50^{th} and 95^{th} percentiles of a child's height