International Diabetes Federation

The IDF consensus definition of the

METABOLIC SYNDROME

IN CHILDREN AND ADOLESCENTS

The IDF consensus definition of the metabolic syndrome in children and adolescents was developed during a consensus workshop under the initiative of Professors Sir George Alberti and Paul Zimmet. The definition is a follow-up of the IDF consensus worldwide definition of the metabolic syndrome in adults which was published in 2005. The workshop was held on behalf of the IDF Task Force on Epidemiology and Prevention.

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| **Intro**duction

The metabolic syndrome in adults has been defined as a cluster of the most dangerous risk factors for cardiovascular disease and type 2 diabetes, which include abdominal obesity, high cholesterol, high blood pressure, diabetes (if not yet present) and raised fasting plasma glucose.[2]

Already, a quarter of the world's adult population has metabolic syndrome and this condition is appearing with increasing frequency in children and adolescents, due to the growing obesity epidemic within this young population.[3-4-5] People with metabolic syndrome are two to three times as likely to have a heart attack or stroke and five times as likely to develop type 2 diabetes compared with people without the syndrome.[2] Both diabetes and cardiovascular disease cause death and disability. Almost four million deaths every year are a consequence of diabetes-related causes, and with diabetes set to increase and reach 380 million people within a generation, the death toll can only rise.

In 2005, the International Diabetes Federation (IDF) published its definition of the metabolic syndrome in adults.[2] The intention was to rationalize the existing multiple definitions of the syndrome and to have a single, universally accepted diagnostic tool that is easy to use in clinical practice and that does not rely upon measurements only available in research settings. Additionally, the use of a single unified definition makes it possible to estimate the global prevalence of metabolic syndrome and make valid comparisons between countries.

To date, no unified definition exists to assess risk or outcomes in children and adolescents, and existing adult-based definitions of the metabolic syndrome were not felt appropriate to address the problem in this age group. The intention of this consensus definition of metabolic syndrome in children and adolescents is similar to the definition in adults: to obtain a universally accepted tool which is easy to use for the early diagnosis of metabolic syndrome, in order to take preventive measures before the child or adolescent develops diabetes or cardiovascular disease.

Obesity: a key risk factor

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Obesity, particularly in the central (abdominal) region, is associated with an increase in risk of cardiovascular disease and has been determined as a key precipitating factor for type 2 diabetes.[7] It is a key component in the IDF definition of metabolic syndrome in adults. Its role can clearly be demonstrated in Japan where a parallel rise in type 2 diabetes and obesity in children has occurred over the last few decades.[8]

Intrauterine events for the unborn child and factors during early development years predispose a child to disorders such as obesity, prediabetes, and metabolic syndrome. The presence of maternal gestational diabetes,[9] low birth weight,[10] and infant feeding practices[11] for example contribute to a child's future level of risk. Other factors can be genetic, socio-economic or environmental (an obesogenic environment for example).[12]

At the same time, urbanization, unhealthy diet and increasingly sedentary lifestyle are major contributors to such disorders and have contributed to increasing the prevalence of childhood obesity, particularly in developing countries.[13]

| **Global burden** of obesity

In 2004, the World Health Organization (WHO) estimated that approximately 22 million children under the age of five years were overweight or obese.[14] According to a report from the International Obesity Task Force (IOTF), at least 10% of school-aged children between five and 17 years are overweight or obese, representing a total of 155 million children. Around 30-45 million within that figure are classified as obese, accounting for 2-3% of the world's children aged 5-17.[15] And the situation is getting worse. In the United States, for example, the rate of overweight and obesity among children and adolescents aged 6 to 18 years increased to more than 25% in the 1990s from 15% in the 1970s.[16]

Such increases are not restricted to developed countries; they are quickly reaching many low- and middle-income countries. Globally, it is estimated that 17 of the 22 million children under five live in major economically developing countries.[17] In China for example, the rate of overweight and obesity observed in a study of urban schoolchildren increased from almost 8% in 1991 to more than 12% six years later.[16] In Brazil, the rate of overweight and obesity among children and adolescents 6 to 18 years old more than tripled from 4% in the mid 1970s to over 13% in the late 1990s.[16]

Obesity in early life is of particular concern due to its associated health consequences and its influence on young people's psychosocial development. Obesity is also difficult and costly to cure, and previously obese people experience tremendous challenges to maintain a healthy body weight. Additionally, a number of studies have shown that overweight and obesity in childhood and adolescence tend to persist into young adulthood. Approximately one half of overweight adolescents and over one third of overweight children remain obese as adults. Childhood obesity also confers long-term effects on mortality and morbidity.[16]

> "This is the first generation where children may die before their parents."
> Paul Zimmet

Each of these children is at increased risk of developing metabolic syndrome and subsequently progressing to type 2 diabetes and cardiovascular disease in later life. Early identification of children at risk and preventive action are therefore very important. Unless action is taken, diabetes experts agree that this is the first generation where children may die before their parents.

The need for a unified definition

To date, no formal definition for the diagnosis of the metabolic syndrome in children and adolescents has been developed. However, the rapid rise in obesity trends underlines the urgency for a definition that could be used to further understand who is at high risk of health complications and to distinguish them from those with "simple" uncomplicated obesity.

The new IDF definition of metabolic syndrome in children and adolescents is inspired, in part, by the IDF worldwide definition of metabolic syndrome in adults.[2] It builds on previous studies that used modified adult criteria to investigate its prevalence in children and adolescents (see table 1). [4-18-19-20-21]

The wide variety of cut-off points used highlighted the need for a single definition that would use a consistent set of criteria, which would be easily measurable, with age-specific and sex-specific cut-off points.

Table 1: A range of the published metabolic syndrome definitions in pediatrics

	Cook et al. *Arch Pediatr Adolesc Med*, 2003; 157, 821-7[4]	de Ferranti et al. *Circulation*, 2004; 110, 2494-7[21]	Cruz et al. *J Clin Endocrinol Metab*, 2004; 89, 108-13[22]	Weiss et al. *N Engl J Med*, 2004; 350, 2362-74[3]	Ford et al. *Diabetes Care*, 2005; 28, 878-81[44]
Three or more of the following					
1	Fasting glucose ≥110 mg/dL	Fasting glucose ≥6.1 mmol/L (≥110 mg/dL)	Impaired glucose tolerance (ADA criterion)	Impaired glucose tolerance (ADA criterion)	Fasting glucose ≥110 mg/dL (additional analysis with ≥100 mg/dL)
2	WC ≥90th percentile (age- and sex-specific, NHANES III)	WC >75th percentile	WC ≥90th percentile (age-, sex- and race-specific, NHANES III)	BMI –Z score ≥2.0 (age- and sex-specific)	WC ≥90th percentile (sex-specific, NHANES III)
3	Triglycerides ≥110 mg/dL (age-specific, NCEP)	Triglycerides ≥1.1 mmol/L (≥100 mg/dL)	Triglycerides ≥90th percentile (age- and sex-specific, NHANES III)	Triglycerides >95th percentile (age-, sex- and race-specific, NGHS)	Triglycerides ≥110 mg/dL (age-specific, NCEP)
4	HDL-C ≤40 mg/dL (all ages/ sexes, NCEP)	HDL-C <1.3 mmol/L (<50 mg/dL)	HDL-C ≤10th percentile (age- and sex-specific, NHANES III)	HDL-C <5th percentile (age-, sex- and race-specific, NGHS)	HDL-C ≤40 mg/dL (all ages/ sexes, NCEP)
5	Blood pressure ≥90th percentile (age-, sex- and height-specific, NHBPEP)	Blood pressure >90th percentile	Blood pressure >90th percentile (age-, sex- and height-specific, NHBPEP)	Blood pressure >95th percentile (age-, sex- and height-specific, NHBPEP)	Blood pressure ≥90th percentile (age-, sex- and height-specific, NHBPEP)

Rationale for the new definition

The new definition is simple and easy to apply in clinical practice. Similarly to the adult criteria, waist measurement is the main component because it is an independent predictor of insulin resistance, lipid levels, and blood pressure.[19-23] Moreover, in young people who are obese and have similar body-mass index (BMI), insulin sensitivity is lower in those with high amounts of visceral adipose tissue and high waist/hip ratio than in those with low amounts.[24-25]

However, transposing the single definition for adults to children is problematic.

Although one single definition, albeit with gender and ethnicity specific cut-off points, is suitable for use in the at-risk adult population, transposing it to children and adolescents is problematic. Blood pressure, lipid levels as well as body size and proportions change with age and development. Puberty has an impact on fat distribution and on both insulin sensitivity and secretion.[26]

Therefore, single cut-off points cannot be used to define abnormalities in children. Percentiles, rather than absolute values of waist circumference have been used to compensate for variation in child development and ethnic origin. So for example, values above the 90th, 95th or 97th percentile for gender and age are used. Although there has not been universal agreement as to which level to use for the criteria for the metabolic syndrome, several studies,[2,3,18] have used the 90th percentile as a cut-off for waist circumference. Children with a waist circumference higher than the 90th percentile are more likely to have multiple cardiovascular disease risk factors than are those with a waist circumference below this level.[27-28-29] IDF has chosen to use the 90th percentile as a cut-off for waist circumference, which will be reassessed when more outcome data become available.

Diagnosis of metabolic syndrome in children and adolescents

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The new IDF definition is divided according to age-groups because of developmental challenges presented by age-related differences in children and adolescents: age 6 years to younger than 10 years; age 10 years to younger than 16 years; and 16 years or older. Children who are younger than 6 years were excluded from the definition because of insufficient data for this age-group. In all three age groups, abdominal obesity is the "*sine qua non*".

IDF suggests that the metabolic syndrome should not be diagnosed in children younger than 10 years, but that a strong message for weight reduction should be delivered for those with abdominal obesity.

For children age 10 years or older, metabolic syndrome can be diagnosed with abdominal obesity and the presence of two or more other clinical features (ie elevated triglycerides, low HDL-cholesterol, high blood pressure, increased plasma glucose). In the absence of contemporary definitive data, the criteria adhere to the absolute values in the IDF adult definition, except that waist circumference percentiles are recommended and one (rather than a sex-specific) cut-off is used for HDL-cholesterol levels.

For children older than 16 years, the IDF adult criteria can be used. Further research is needed to identify optimum criteria for the definition of the syndrome.

Table 2: The IDF consensus definition of metabolic syndrome in children and adolescents

Age group (years)	Obesity* (WC)	Triglycerides	HDL-C	Blood pressure	Glucose (mmol/L) or known T2DM
6–<10	≥90th percentile	Metabolic syndrome cannot be diagnosed, but further measurements should be made if there is a family history of metabolic syndrome, T2DM, dyslipidemia, cardiovascular disease, hypertension and/or obesity.			
10–<16 Metabolic syndrome	≥90th percentile or adult cut-off if lower	≥1.7 mmol/L (≥150 mg/dL)	<1.03 mmol/L (<40 mg/dL)	Systolic ≥130/ diastolic ≥85 mm Hg	≥5.6 mmol/L (100 mg/dL) (If ≥5.6 mmol/L [or known T2DM] recommend an OGTT)
16+ Metabolic syndrome	Use existing IDF criteria for adults, ie: Central obesity (defined as waist circumference ≥ 94cm for Europid men and ≥ 80cm for Europid women, with ethnicity specific values for other groups*) plus any two of the following four factors: • raised triglycerides: ≥ 1.7mmol/L • reduced HDL-cholesterol: <1.03mmol/L (<40 mg/dL) in males and <1.29mmol/L (<50 mg/dL) in females, or specific treatment for these lipid abnormalities • raised blood pressure: systolic B♂ =130 or diastolic B♂ =85mm Hg, or treatment of previously diagnosed hypertension • impaired fasting glycemia (IFG): fasting plasma glucose (FPG) =5.6 mmol/L (≥100 mg/dL), or previously diagnosed type 2 diabetes				

WC: waist circumference; HDL-C: high-density lipoprotein cholesterol; T2DM: type 2 diabetes mellitus; OGTT: oral glucose tolerance test.
*The IDF Consensus group recognises that there are ethnic, gender and age differences but research is still needed on outcomes to establish risk.

Recommendations for prevention / treatment

"Early detection followed by treatment is vital to halt the progression of the metabolic syndrome and safeguard the future health of children and adolescents."

Sir George Alberti

IDF recommends that prevention and primary management for the metabolic syndrome is a healthy lifestyle. This includes:

- moderate calorie restriction (to achieve a 5–10 per cent loss of body weight in the first year)
- moderate increase in physical activity
- change in dietary composition.

Pharmacotherapy can be included if its safety has been clearly demonstrated.

Early detection and treatment is likely to reduce morbidity and mortality in adulthood and help keep to a minimum the global burden of cardiovascular disease and type 2 diabetes mellitus.

IDF hopes that the present booklet may also be used as a tool to make governments and society more aware of the problems associated with obesity and the likelihood of progression to metabolic syndrome in children and adolescents. The anticipated outcome is that it will encourage governments to create environments that allow for lifestyle changes. This will require a coordinated approach across all sectors including health, education, sports and agriculture, but it is the only way to curb the future burden of type 2 diabetes and cardiovascular disease.

Recommendations for future research

Although it has been demonstrated in adults that the clustering of three or more components of the metabolic syndrome significantly increases the risk for cardiovascular disease and the new onset of diabetes, few, if any, outcome data in children exist. The IDF criteria for metabolic syndrome in children and adolescents may change in future as more outcome data become available. IDF has identified areas where more research is currently needed in order to identify optimal criteria for defining risk of future metabolic syndrome, diabetes and cardiovascular disease beginning in this age group.

Key recommendations from IDF for future research include the following:

1. Improved understanding of the relation between body fat and its distribution in children and adolescents
2. Investigation of whether early growth patterns predict future adiposity and other features of the syndrome; and whether low birth weight predicts future metabolic syndrome, diabetes and cardiovascular disease
3. Factor analysis in children and adolescents to establish grouping of metabolic characteristics such as adiposity, dyslipidemia, hyperinsulinemia, hypoadiponectinemia and insulin resistance
4. Investigation of how obesity in children should be better defined, eg weight/height, waist circumference, etc
5. Development of ethnic specific age and sex normal ranges for waist circumference, ideally based on healthy values
6. Ethnic specific studies of waist circumference versus visceral fat based on imaging
7. Studies of adiponectin, leptin, etc in children and adolescents as predictors of metabolic syndrome in adulthood.
8. Initiation of long-term studies of cohorts of children of different ethnic origin into adulthood to define the natural history and effectiveness of interventions, particularly those relating to lifestyle.

Conclusion

The intention of the IDF consensus group was primarily to suppress the confusion that could arise from the multiple interpretations of the metabolic syndrome in children and adolescents. The aim of the definition is to provide a simple, universally accepted tool, which is easy to apply in clinical settings for the early detection and treatment of metabolic syndrome.

In the absence of definitive research findings at this time, the proposed IDF definition of the metabolic syndrome in children and adolescents (Table 2) adheres to the absolute values presented in the adult definition with the exception of waist circumference. As previously indicated, waist circumference percentiles are recommended for use until outcome data from studies in children and adolescents indicate otherwise.

Early detection followed by treatment is needed in order to prevent further health complications such as cardiovascular disease and diabetes in later life. Lifestyle intervention is recommended and pharmacotherapy can be envisaged if its safety has been demonstrated. Early detection and treatment are likely to reduce morbidity and mortality in adulthood as well as minimise the global socio-economic burden of cardiovascular disease and type 2 diabetes.

Frequently Asked **Questions**

Why is obesity a "sine qua non"?

In adults, insulin resistance and abdominal obesity are considered to be significant causative factors in the development of the metabolic syndrome.[30,31-32] The link between obesity, insulin resistance and the risk of developing the metabolic syndrome has also been described in children. However, the measurement of insulin resistance is not practical for clinical use, whereas measurement of abdominal adiposity (fat) can be easily assessed using the simple measure of waist circumference. Waist circumference is known to correlate more strongly with visceral adipose tissue (VAT) than BMI in adults and its correlation has also been recently demonstrated in children.[36]

Additionally, obesity is recognized to be an independent risk factor for the development of cardiovascular disease in adults,[37] and a number of studies (eg Bogalusa Heart study,[38] Muscatine study,[39] NHANES III[3]) have

demonstrated a similar link between childhood obesity and elevated cardiovascular risk in later life.

Waist circumference in children is an independent predictor of insulin resistance, lipid levels and blood pressure - all components of metabolic syndrome.[24,25,40,41] Moreover, in obese youth with similar BMI, insulin sensitivity is lower in those with high visceral adipose tissue and high waist/hip ratio. [24,25] It is also recognized that insulin sensitivity decreases and insulin levels increase with increasing waist circumference percentiles.[42]

In conclusion, these data, combined with the unequivocal evidence of the dangers of abdominal obesity in adulthood, support the use of abdominal obesity as the "*sine qua non*" for the diagnosis of metabolic syndrome in children and adolescents.

How can percentile charts for the waist circumference measurement be obtained?

To date some studies exist that show the waist circumference percentile regression values in some countries. Fernandez JR, Redden D, Pietrobelli A et al[43] for example have produced tables showing waist circumference percentiles in nationally representative samples of American children and adolescents of various ethnic groups (see annex 1).

Why was the 90th percentile chosen as a cut-off point for waist circumference?

Several studies have shown that children with a waist circumference >90th percentile are more likely to have multiple risk factors than those with a waist circumference below this level.[26-28] Several other studies attempting to estimate the prevalence of metabolic syndrome in children and adolescents have already used the 90th percentile as a cut-off point for waist circumference.[3,4,44] The IDF workshop has therefore chosen to use the 90th percentile based on this existing evidence. The group aims to reassess criteria and cut-off points in five years' time, and modify the definition, if necessary, based on new outcome data.

Annex 1

As an indication only, the tables below show the waist circumference percentile regression values in the United States for males and females (reprinted from *Journal of Pediatrics* 2004 vol 145, Fernandez JR, Redden D, Pietrobelli A et al, Waist circumference percentiles in nationally representative samples of African-American, European-American, and Mexican-American children and adolescents, pages 439-44, © 2004, with permission from Elsevier)

Table 3 : Waist circumference percentile regression values in the United States for all children and adolescents combined, according to sex.

	Percentile for boys					Percentile for girls				
	10th	25th	50th	75th	90th	10th	25th	50th	75th	90th
Intercept	39.7	41.3	43.0	43.6	44.0	40.7	41.7	43.2	44.7	46.1
Slope	1.7	1.9	2.0	2.6	3.4	1.6	1.7	2.0	2.4	3.1
Age (y)										
2	43.2	45.0	47.1	48.8	50.8	43.8	45.0	47.1	49.5	52.2
3	44.9	46.9	49.1	51.3	54.2	45.4	46.7	49.1	51.9	55.3
4	46.6	48.7	51.1	53.9	57.6	46.9	48.4	51.1	54.3	58.3
5	48.4	50.6	53.2	56.4	61.0	48.5	50.1	53.0	56.7	61.4
6	50.1	52.4	55.2	59.0	64.4	50.1	51.8	55.0	59.1	64.4
7	51.8	54.3	57.2	61.5	67.8	51.6	53.5	56.9	61.5	67.5
8	53.5	56.1	59.3	64.1	71.2	53.2	55.2	58.9	63.9	70.5
9	55.3	58.0	61.3	66.6	74.6	54.8	56.9	60.8	66.3	73.6
10	57.0	59.8	63.3	69.2	78.0	56.3	58.6	62.8	68.7	76.6
11	58.7	61.7	65.4	71.7	81.4	57.9	60.3	64.8	71.1	79.7
12	60.5	63.5	67.4	74.3	84.8	59.5	62.0	66.7	73.5	82.7
13	62.2	65.4	69.5	76.8	88.2	61.0	63.7	68.7	75.9	85.8
14	63.9	67.2	71.5	79.4	91.6	62.6	65.4	70.6	78.3	88.8
15	65.6	69.1	73.5	81.9	95.0	64.2	67.1	72.6	80.7	91.9
16	67.4	70.9	75.6	84.5	98.4	65.7	68.8	74.6	83.1	94.9
17	69.1	72.8	77.6	87.0	101.8	67.3	70.5	76.5	85.5	98.0
18	70.8	74.6	79.6	89.6	105.2	68.9	72.2	78.5	87.9	101.0

Table 4 : Estimated value for percentile regression for European-American children and adolescents

	Percentile for boys					Percentile for girls				
	10th	25th	50th	75th	90th	10th	25th	50th	75th	90th
Intercept	39.3	43.2	42.9	43.3	43.8	39.9	41.8	43.6	45.0	46.8
Slope	1.8	1.9	2.1	2.6	3.4	1.6	1.7	1.9	2.3	2.9
Age (y)										
2	42.9	46.9	47.1	48.6	50.6	43.1	45.1	47.4	49.6	52.5
3	44.7	48.8	49.2	51.2	54.0	44.7	46.8	49.3	51.9	55.4
4	46.5	50.6	51.3	53.8	57.4	46.3	48.5	51.2	54.2	58.2
5	48.3	52.5	53.3	56.5	60.8	47.9	50.2	53.1	56.5	61.1
6	50.1	54.3	55.4	59.1	64.2	49.5	51.8	55.0	58.8	64.0
7	51.9	56.2	57.5	61.7	67.6	51.1	53.5	56.9	61.1	66.8
8	53.7	58.1	59.6	64.3	71.0	52.7	55.2	58.8	63.4	69.7
9	55.5	59.9	61.7	67.0	74.3	54.3	56.9	60.7	65.7	72.6
10	57.3	61.8	63.7	69.6	77.7	55.9	58.6	62.5	68.0	75.5
11	59.1	63.6	65.8	72.2	81.1	57.5	60.2	64.4	70.3	78.3
12	60.9	65.5	67.9	74.9	84.5	59.1	61.9	66.3	72.6	81.2
13	62.7	67.4	70.0	77.5	87.9	60.7	63.6	68.2	74.9	84.1
14	64.5	69.2	72.1	80.1	91.3	62.3	65.3	70.1	77.2	86.9
15	66.3	71.1	74.1	82.8	94.7	63.9	67.0	72.0	79.5	89.8
16	68.1	72.9	76.2	85.4	98.1	65.5	68.6	73.9	81.8	92.7
17	69.9	74.8	78.3	88.0	101.5	67.1	70.3	75.8	84.1	95.5
18	71.7	76.7	80.4	90.6	104.9	68.7	72.0	77.7	86.4	98.4

Table 5 : Estimated value for percentile regression for African-American children and adolescents

	Percentile for boys					Percentile for girls				
	10th	25th	50th	75th	90th	10th	25th	50th	75th	90th
Intercept	40.1	41.2	42.7	44.1	43.6	39.9	41.2	41.7	42.1	42.8
Slope	1.6	1.7	1.9	2.2	3.2	1.6	1.7	2.1	2.8	3.7
Age (y)										
2	43.2	44.6	46.4	48.5	50.0	43.0	44.6	46.0	47.7	50.1
3	44.8	46.3	48.3	50.7	53.2	44.6	46.3	48.1	50.6	53.8
4	46.3	48.0	50.1	52.9	56.4	46.1	48.0	50.2	53.4	57.5
5	47.9	49.7	52.0	55.1	59.6	47.7	49.7	52.3	56.2	61.1
6	49.4	51.4	53.9	57.3	62.8	49.2	51.4	54.5	59.0	64.8

Table 5 continued

	Percentile for boys					Percentile for girls				
	10th	25th	50th	75th	90th	10th	25th	50th	75th	90th
7	51.0	53.1	55.7	59.5	66.1	50.8	53.2	56.6	61.8	68.5
8	52.5	54.8	57.6	61.7	69.3	52.4	54.9	58.7	64.7	72.2
9	54.1	56.4	59.4	63.9	72.5	53.9	56.6	60.9	67.5	75.8
10	55.6	58.1	61.3	66.1	75.7	55.5	58.3	63.0	70.3	79.5
11	57.2	59.8	63.2	68.3	78.9	57.0	60.0	65.1	73.1	83.2
12	58.7	61.5	65.0	70.5	82.1	58.6	61.7	67.3	75.9	86.9
13	60.3	63.2	66.9	72.7	85.3	60.2	63.4	69.4	78.8	90.5
14	61.8	64.9	68.7	74.9	88.5	61.7	65.1	71.5	81.6	94.2
15	63.4	66.6	70.6	77.1	91.7	63.3	66.8	73.6	84.4	97.9
16	64.9	68.3	72.5	79.3	94.9	64.8	68.5	75.8	87.2	101.6
17	66.5	70.0	74.3	81.5	98.2	66.4	70.3	77.9	90.0	105.2
18	68.0	71.7	76.2	83.7	101.4	68.0	72.0	80.0	92.9	108.9

Table 6 : Estimated value for percentile regression for Mexican-American children and adolescents

	Percentile for boys					Percentile for girls				
	10th	25th	50th	75th	90th	10th	25th	50th	75th	90th
Intercept	41.0	41.8	43.3	44.3	46.2	41.4	42.1	43.9	44.8	47.1
Slope	1.7	1.9	2.2	2.7	3.5	1.5	1.8	2.1	2.6	3.2
Age (y)										
2	44.4	45.6	47.6	49.8	53.2	44.5	45.7	48.0	50.0	53.5
3	46.1	47.5	49.8	52.5	56.7	46.0	47.4	50.1	52.6	56.7
4	47.8	49.4	52.0	55.3	60.2	47.5	49.2	52.2	55.2	59.9
5	49.5	51.3	54.2	58.0	63.6	49.0	51.0	54.2	57.8	63.0
6	51.2	53.2	56.3	60.7	67.1	50.5	52.7	56.3	60.4	66.2
7	52.9	55.1	58.5	63.4	70.6	52.0	54.5	58.4	63.0	69.4
8	54.6	57.0	60.7	66.2	74.1	53.5	56.3	60.4	65.6	72.6
9	56.3	58.9	62.9	68.9	77.6	55.0	58.0	62.5	68.2	75.8
10	58.0	60.8	65.1	71.6	81.0	56.5	59.8	64.6	70.8	78.9
11	59.7	62.7	67.2	74.4	84.5	58.1	61.6	66.6	73.4	82.1
12	61.4	64.6	69.4	77.1	88.0	59.6	63.4	68.7	76.0	85.3
13	63.1	66.5	71.6	79.8	91.5	61.1	65.1	70.8	78.6	88.5
14	64.8	68.4	73.8	82.6	95.0	62.6	66.9	72.9	81.2	91.7
15	66.5	70.3	76.0	85.3	98.4	64.1	68.7	74.9	83.8	94.8
16	68.2	72.2	78.1	88.0	101.9	65.6	70.4	77.0	86.4	98.0
17	69.9	74.1	80.3	90.7	105.4	67.1	72.2	79.1	89.0	101.2
18	71.6	76.0	82.5	93.5	108.9	68.6	74.0	81.1	91.6	104.4

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