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ADOLESCENT NUTRITION 2000-2017: DHS DATA ON ADOLESCENTS AGE 15-19

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DHS Comparative Report No. 47

Adolescent Nutrition 2000-2017: DHS Data on Adolescents Age 15-19

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PREFACE

The Demographic and Health Surveys (DHS) Program is one of the principal sources of international data on fertility, family planning, maternal and child health, nutrition, mortality, environmental health, HIV/AIDS, malaria, and provision of health services.

One of the objectives of The DHS Program is to provide policymakers and program managers in low- and middle-income countries with easily accessible data on levels and trends for a wide range of health and demographic indicators. DHS Comparative Reports provide such information, usually for a large number of countries in each report. These reports are largely descriptive, without multivariate methods, but when possible they include confidence intervals and/or statistical tests.

The topics in this series are selected by The DHS Program in consultation with the U.S. Agency for International Development.

It is hoped that the DHS Comparative Reports will be useful to researchers, policymakers, and survey specialists, particularly those engaged in work in low- and middle-income countries.

Sunita Kishor
Director, The DHS Program

EXECUTIVE SUMMARY

Adolescence is an important stage in the lifecycle for growth and development. During this time, adolescents achieve 15%-20% of their adult height, up to 60% of their skeletal mass, and half their adult body weight (Spear 2002). To support their rapid growth and development, adolescents have an increased need for energy, protein, iron, and other micronutrients (Spear 2002). The period of adolescence also presents an opportunity to lay a positive foundation for healthy offspring from early childhood on to adulthood (Prentice et al. 2013).

This report summarizes information on nutrition for adolescent girls and boys age 15-19, using data from Demographic and Health Surveys (DHS), conducted in 65 low-income and 22 middle-income countries. The report describes the current prevalence of anthropometric measurements, childbearing, anemia, iron supplementation, and women's dietary diversity. It compares nutritional indicators for adolescents with those for adults. It also examines nutritional trends from 2000-17 and describes the prevalence of key nutrition variables stratified by education level, employment, residence, and wealth.

The findings show that a double burden of malnutrition is prevalent, both for non-pregnant girls and for boys. For girls, more than 10% were overweight and obese in almost half of the countries studied. Moreover, in most countries, overweight and obesity were a larger problem than thinness. For boys, more than 10% were thin in over half of countries, and thinness was a larger problem than overweight and obesity. Compared with girls and boys, adults were more likely to be overweight and obese, highlighting the importance of preventing overweight and obesity during adolescence. Short stature in girls was prevalent across all regions, but most prevalent in South Asia, likely reflecting the influence of childhood stunting as well as inadequate nutrition in adolescence. Short stature and low body mass index (BMI) place girls at higher risk of complications during pregnancy. Given that childbearing during adolescence is prevalent across all countries, preventing adolescent pregnancy and improving adolescent nutrition is warranted.

Anemia is a severe public health problem (>40%) for non-pregnant girls in almost half of countries, and for boys in over a quarter of countries. Further, in most regions, anemia prevalence is higher among pregnant girls than non-pregnant girls. The high prevalence of anemia in both girls and boys indicates a need for interventions to address anemia in ways that effectively reach all adolescents, including boys as well as girls. The findings on iron supplementation among childbearing girls show that about one-fifth of girls consumed iron tablets for at least 90 days during their last pregnancy. Data on dietary diversity was limited to a few countries, but it showed that girls' diets lacked diversity.

More data on adolescent nutrition are needed to inform policies and programs, including data on early adolescence (age 10-14). Particularly lacking is information on micronutrient status and diet, as well as coverage of adolescent nutrition interventions. Some progress has been made in developing policy guidelines that support adolescent nutrition at the global and country levels (WHO 2018), and with better data these guidelines could be strengthened. Further, in many cases the need for coverage data is hindered by a lack of interventions or their scale-up for adolescents. Continued collection of diverse nutrition data among adolescents is required to ensure that adolescents receive optimal nutrition to support their growth and development.

1 INTRODUCTION AND RATIONALE

Adolescents currently comprise one-sixth of the world's population, and over 90% of adolescents live in sub-Saharan Africa and in South and Southeast Asia (UNFPA and WHO 2017; WHO 2017). Adolescents, defined as young people age 10-19, have increased macro and micronutrient requirements to support pubertal growth and development (Das et al. 2017; WHO 2017). Approximately 15-20% of adult height, up to 60% of skeletal mass, and 50% of adult body weight is gained during the adolescent period (Spear 2002). Poor nutrition during this time can result in adverse health conditions later in life and poor reproductive health outcomes (WHO 2018).

Anthropometric measurements, including body mass index (BMI)-for-age and height-for-age, are used to monitor the changes in pubertal growth during adolescence (Spear 2002). Over-nutrition and undernutrition are both major public health problems, with the former increasing the risk for noncommunicable diseases such as diabetes and cardiovascular disease, and the latter resulting in damage to tissue and organs (NCD Risk Factor Collaboration 2017; Rome 2003; WHO 2013). Further, although underweight and short stature or stunting are major concerns for children under age 5, evidence suggests that adequate nutrition during adolescence may present another window of opportunity for catch-up growth from nutritional deficiencies suffered during early childhood (Prentice et al. 2013). For girls, low BMI and short stature during childbearing years increase the risk of adverse birth outcomes and obstetric complications (Black et al. 2013).

Anemia is a leading cause of morbidity among adolescents; it can be caused by several factors, including nutritional deficiencies, infections, and genetic conditions (GBD 2013 Collaboration 2016; Kassebaum et al. 2014; Mokdad et al. 2016). During adolescence, in addition to increased energy needs, girls and boys also have increased protein and nutrient needs, including iron, to support their own growth (Spear 2002). Insufficient iron stores during adolescence and other micronutrient deficiencies are a cause of concern for girls as they enter the childbearing years, due to higher nutrient demands during pregnancy and lactation (Steer 2000).

Adolescence provides a unique period in the lifecycle to address nutrition. In low and middle countries, dietary intake data for adolescents is limited. Several interventions can halt the rise of malnutrition in adolescents, including promoting a healthy diet and supplementing the diet with micronutrients (WHO 2018c). Data on nutrition coverage is limited, however. While data exist on iron supplementation during pregnancy, the focus has not been in adolescents.

There has been an increased focus on adolescent nutrition in recent years (Patton et al. 2016). This is an important step in improving the wellbeing of adolescents and of future generations. Yet, the lack of nationally representative data on adolescent nutrition impedes countries' ability to guide policy and programs. To address this gap we used Demographic and Health Survey (DHS) data to describe the status of nutrition indicators among adolescent girls and boys age 15-19 at the country and world region levels. The objectives are to: (1) characterize the magnitude and trends of adolescent malnutrition, defined as thinness, overweight and obesity, short stature, and anemia; (2) describe dietary intake and the coverage of iron supplementation; (3) describe variations in outcomes by sex, wealth, residence, and education; and (4) compare nutritional indicators between adolescents and adults. The report is intended to provide policymakers and program implementers with information on the state of adolescent nutrition around the world.

2 DATA AND METHODS

2.1 DHS Survey Selection

The study included all DHS surveys conducted from 2000-17 with availability of data for girls or boys age 15-19 on anemia, anthropometry, iron supplementation, or women's diet diversity score. In addition, data were included on adolescent childbearing from the most recent country survey between 2000-17. A summary of the total number of country surveys included for each outcome is found in Table 1, and all country surveys are listed in Appendix 1. The data for age group 15-19 are nationally representative. A few surveys included only ever-married women[1] rather than all women. The inferences from ever-married respondents limit the interpretation of certain indicators as they apply to all adolescents.

Table 1 Total number of country surveys with data on adolescent nutrition by world region

	Adolescent childbearing	Anemia		Anthropometry		Iron supplementation	Women's diet diversity
Region	Girls N	Girls N	Boys N	Girls N	Boys N	Girls N	Girls N
Total Surveys	65	98	32	138	22	136	18
East Asia and Pacific	4	6	0	6	0	8	2
Europe and Central Asia	7	7	1	9	2	6	2
Latin America and Caribbean	9	17	3	22	1	22	4
Middle East and North Africa	4	7	0	11	0	9	1
South Asia	6	5	2	13	4	9	0
sub-Saharan Africa	35	56	26	77	15	82	9
Total Most Recent Surveys	65	48	22	62	17	62	18
East Asia and Pacific	4	3	0	3	0	4	2
Europe and Central Asia	7	5	1	7	2	6	2
Latin America and Caribbean	9	6	2	9	1	8	4
Middle East and North Africa	4	3	0	4	0	4	1
South Asia	6	3	1	5	3	5	0
sub-Saharan Africa	35	28	18	34	11	35	9

2.2 Definitions of Data Used

Outcome variables

Adolescent childbearing. Among women age 15-19, the percentage who have given birth or are currently pregnant with their first child.

Anemia. Hemoglobin concentrations measured using the HemoCue® machine (Pullum et al. 2017). Anemia categories (Table 2) defined using the World Health Organization (WHO) recommended cutoffs for hemoglobin concentrations adjusted for altitude and smoking according to age, sex, and pregnancy status (WHO 2011). In this report, we present anemia status among non-pregnant girls in the main body of the

[1] DHS surveys that sampled ever-married women include Afghanistan 2015, Bangladesh 2014, Egypt 2014, Jordan 2012, Maldives 2009, Pakistan 2012-13, and Turkey 2003-04.

report. Anemia status among pregnant girls is limited to pooled world region data in the main body of the report, while individual estimates are in the appendix, due to sample-size limitations in several surveys.

Table 2 World Health Organization hemoglobin cutoffs used to define anemia

	Anemia measured by hemoglobin (g/dL)			
Population	Any anemia	Mild	Moderate	Severe
Non-pregnant women (15 years and above)	<12.0	11.9-11.0	10.9-8.0	<8.0
Pregnant women	<11.0	10.9-10.0	9.9-7.0	<7.0
Men (15 years and above)	<13.0	12.9-11.0	10.9-8.0	<8.0

Anthropometry. Height and weight measurements are taken using a Shorr Board and SECA digital scale, respectively (ICF 2012). Short stature, thinness, and overweight and obesity were characterized using both Body Mass Index (BMI) adult cutoffs and BMI-for-age based on the WHO child and adolescent growth standards (de Onis et al. 2007) (Table 3). BMI was not calculated for pregnant women or women who had given birth in the two months before the survey due to the weight changes as a result of pregnancy. BMI-for-age z-scores and height-for-age z-score outside of -5SD and +5SD and -6 and +6SD, respectively, were considered implausible and omitted in the analyses (de Onis et al. 2007).

In this report we present all anthropometry outcomes using the WHO growth references for adolescents in the main body of the report and present the WHO adult cutoffs, as is currently standard for the DHS, in Appendix 2.

Table 3 World Health Organization categories for adolescent BMI-for-age and short stature and adult BMI and short stature

	Adolescent	Adult
Body Mass Index (BMI) Categories		
Thin or underweight (adults)	BMI-for-age z-score < -2SD	BMI <18.5 kg/m^2
Normal	BMI-for-age z-score -2SD - +1SD	BMI 18.5 kg/m^2 - 24.9 kg/m^2
Overweight/obese	BMI-for-age z-score > +1SD	BMI ≥25 kg/m^2
Stature		
Short stature	Height-for-age z-score of < -2SD	<145 cm

Iron supplementation. Among women age 15-49 with a child born within the last five years, the receipt of iron supplementation and the number of days women took iron tablets or syrup during their last pregnancy. Therefore, iron supplementation was categorized as no receipt of iron tablets or syrup, consumption of iron tablets or syrup for 1-89 days, and consumption of iron tablets or syrup for 90 days or more.

Women's dietary diversity. Among women age 15-49, with a child under age 3 living with them, the percentage consuming foods from nine food groups in the 24 hours preceding the survey. The nine food groups included: grains, roots, and tubers; legumes, beans, nuts, and seeds; dairy products; eggs; organ meat; flesh foods; vitamin-A-rich dark green leafy vegetables; other vitamin A-rich vegetables and fruits; and other fruits. The mean number of food groups consumed was calculated to give the Women's Dietary Diversity Score (FAO 2013). In addition to the nine food groups, consumption of sugary snack foods such

as chocolates, sweets, candies, pastries, and cakes/biscuits in the 24 hours preceding the survey is also presented.

Household and respondent characteristics

Education level. Categories of respondent's level of educational attainment, commonly defined as none, primary, secondary, and higher, but can vary between surveys. Using this list, we created a dichotomous variable "none/primary" and "secondary/higher."

Occupation. Respondent's employment status in the 12 months before the survey was classified by occupation and type of agricultural land worked. Using the list of occupation types, we created a dichotomous variable "employed" and "not working."

Residence. Country census definitions were used to characterize rural and urban residence.

Wealth index. A composite measure of a household's cumulative living standard divided into quintiles. Using the wealth quintile data, we created a dichotomous variable defined as "poorer (q1 to q3) and wealthier" (q4 and q5).

2.3 Analysis

All statistical analyses were conducted using Stata 15.0 (StataCorp.2017.Statistical Software: Release 15. College Station, TX: StataCorp LP).

For world region estimates, we used only the most recent country survey. Countries were grouped according to the World Bank classification system (The World Bank Group 2018). Sampling weights from country surveys were denormalized. First, a total country population of women and men was obtained from the United Nations World Population Prospects and matched to the survey year (United Nations Population Division 2017). Then a denormalization factor was calculated by dividing the total country population of women or men age 15-49 in the survey year by the total number of women or men interviewed in the survey. Subsequently, this factor was multiplied by the survey sampling weight. Sampling errors were calculated, and regional sample sizes and estimates are presented at the aggregate level.

For individual survey estimates, the 'svy' command was used to allow for the cluster sampling design of the surveys, and sampling weights were included to achieve nationally representative samples.

Prevalence estimates and 95% confidence intervals were calculated for adolescent childbearing, anemia, BMI-for-age, iron supplementation, short stature, and women's diet diversity. The prevalence estimates were stratified by the demographic covariates, and differences >5% are reported. For comparisons between adolescents and adults the absolute percentage point difference in prevalence was calculated. No statistical tests for differences were performed for the analyses.

3 RESULTS

3.1 BMI-for-Age

3.1.1 World region data

For girls, the world region estimates included the most recent survey from 62 countries (Table 4). There were three surveys from East Asia and Pacific covering 20% of the region; seven surveys from Europe and Central Asia covering 32% of the region; nine surveys from Latin America and Caribbean covering 23% of the region; four surveys from Middle East and North Africa covering 21% of the region; five surveys from South Asia covering 63% of the region; and 34 surveys from sub-Saharan Africa covering 72% of the region. For boys, the world region estimates included the most recent surveys from 17 countries (Table 4). There were no surveys from East Asia and Pacific; two surveys from Europe and Central Asia; one survey from Latin America and Caribbean; no surveys from Middle East and North Africa; three surveys from South Asia; and 11 surveys from sub-Saharan Africa covering 23% of the region.

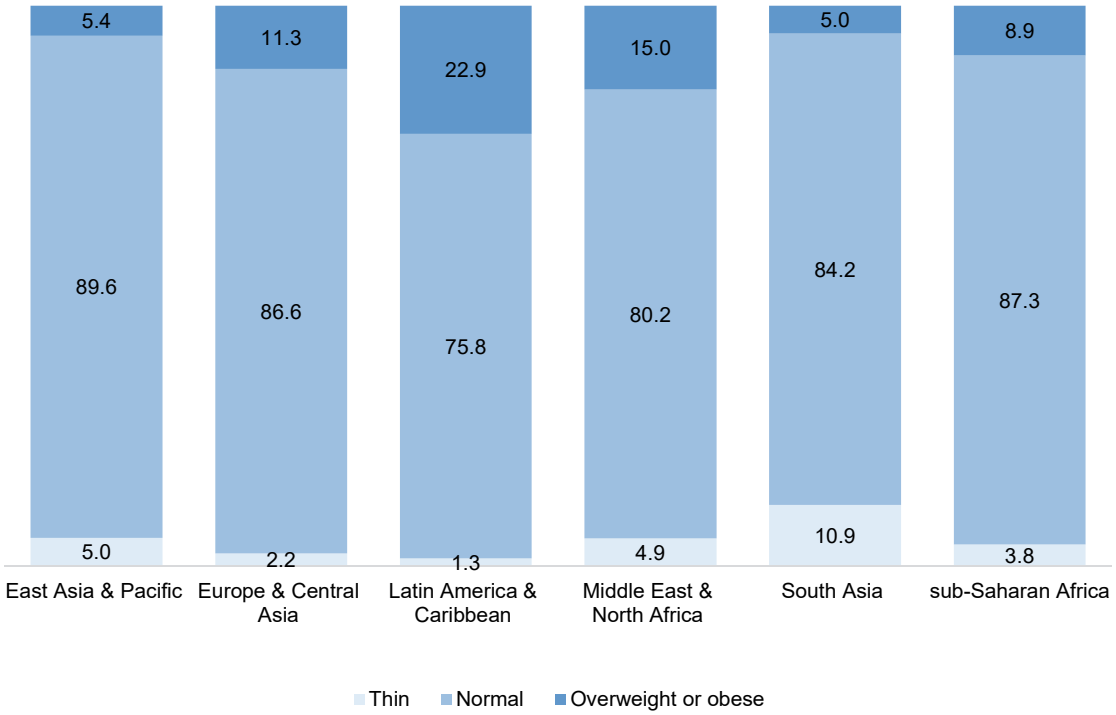
Table 4 List of countries included in each world region for BMI/BMI-for-age for girls and boys age 15-19

World region	Countries (girls)	Countries (boys)
East Asia and Pacific	Cambodia, Myanmar, Timor-Leste	none
Europe and Central Asia	Albania, Armenia, Azerbaijan, Kyrgyz Republic, Moldova, Tajikistan, Turkey	Albania, Azerbaijan
Latin America and Caribbean	Bolivia, Colombia, Dominican Republic, Guatemala, Guyana, Haiti, Honduras, Nicaragua, Peru	Guyana
Middle East and North Africa	Egypt, Jordan, Morocco, Yemen	None
South Asia	Bangladesh, India, Maldives, Nepal, Pakistan	Bangladesh, India, Nepal
sub-Saharan Africa	Benin, Burkina Faso, Burundi, Cameroon, Chad, Comoros, Congo, Congo Democratic Republic, Côte d'Ivoire, Ethiopia, Gabon, Gambia, Ghana, Guinea, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mozambique, Namibia, Niger, Nigeria, Rwanda, São Tomé and Principe, Senegal, Sierra Leone, Swaziland, Tanzania, Togo, Uganda, Zambia, Zimbabwe	Ethiopia, Ghana, Lesotho, Namibia, Rwanda, São Tomé and Principe, Senegal, Sierra Leone, Swaziland, Uganda, Zimbabwe

Prevalence of BMI-for-age

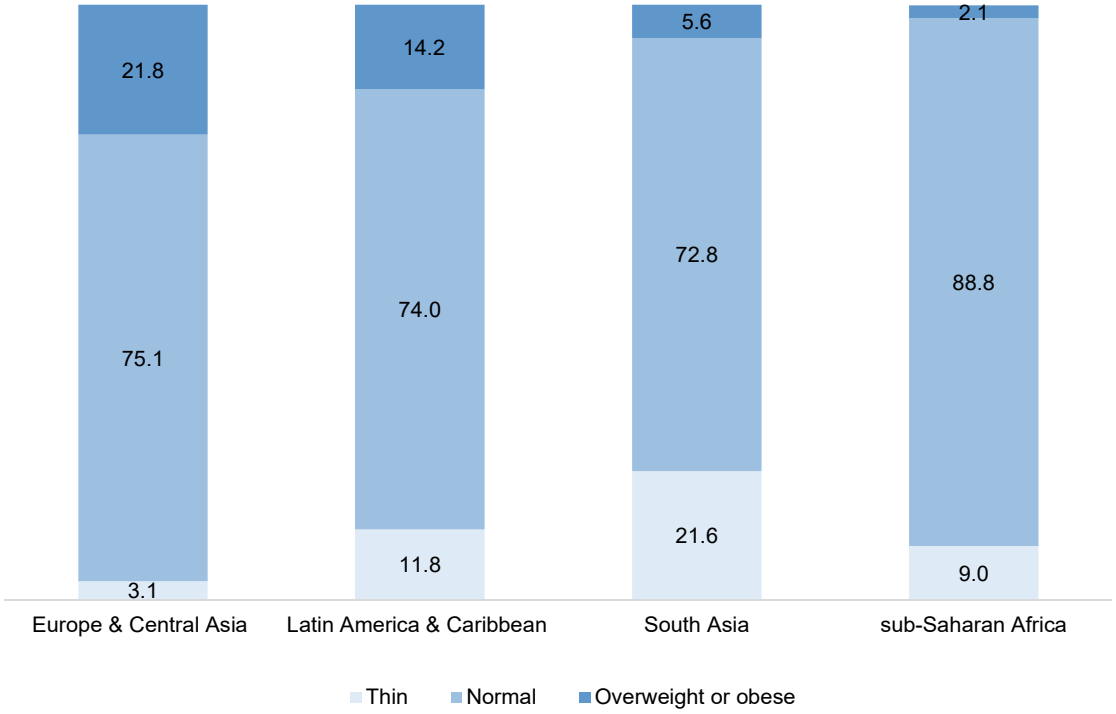
Figure 1(a) and 1(b) shows the prevalence of thinness and overweight and obesity across world regions for girls and boys, respectively. Among girls, prevalence of overweight and obesity is greater than thinness in Europe and Central Asia (11% versus 2%), Latin America and Caribbean (23% versus 1%), Middle East and North Africa (15% versus 5%), and sub-Saharan Africa (9% versus 4%). Different patterns are seen in East Asia and Pacific, where prevalence of thinness is the same as for overweight and obesity, and in South Asia, where prevalence of thinness is double that of overweight and obesity. For boys, overweight and obesity prevalence is greater than thinness in Europe and Central Asia (22% versus 3%) and Latin America (14% versus 12%), whereas prevalence of thinness is greater than overweight and obesity in South Asia (22% versus 6%) and sub-Saharan Africa (9% versus 2%).

Figure 1(a) BMI-for-age among non-pregnant girls age 15-19, by world region



Note: Thin: BMI-for-age <-2SD; Normal: BMI-for-age -2SD to +1SD; Overweight/obese: BMI-for-age > +1SD

Figure 1(b) BMI-for-age among boys age 15-19, by world region



Note: Thin: BMI-for-age <-2SD; Normal: BMI-for-age -2SD to +1SD; Overweight/obese: BMI-for-age > +1SD

Comparisons between BMI-for-age in adolescents and BMI in adults

The study compared BMI-for-age for adolescents with BMI for adults. Table 5 shows that the absolute percentage point (pp) difference in thinness between girls and adult women is negative, indicating women are thinner than girls in South Asia (-18.5pp), sub-Saharan Africa (-6.9pp), Latin America and Caribbean (-1.3pp), and Europe and Central Asia (-0.9pp). There is one exception, for thinness in Middle East and North Africa (+1.0pp), which suggests that adolescents in this region are slightly thinner than adults. For most countries the patterns are similar to regional patterns (Appendix A2.1). For overweight and obesity, the percentage point difference between girls and women is also negative in Middle East and North Africa (-54.3pp), Europe and Central Asia (-40.9pp), Latin America and Caribbean (-33.1pp), sub-Saharan Africa (-16.2pp), and South Asia (-13.1pp). Country patterns are consistent with regional patterns indicating that women are also more overweight and obese than girls. The magnitude of the differences between girls and women in overweight and obesity are greater than the differences in thinness.

Table 5 Comparison between BMI-for-age in non-pregnant girls age 15-19 and BMI in women age 20-49

		Prevalence 15-19 yrs				Prevalence 20-49 yrs				Percentage point difference (15-19 yrs – 20-49 yrs)
World region	**BMI category**	**N**	**%**	**LB**	**UB**	**N**	**%**	**LB**	**UB**	
East Asia and Pacific	Thin	5,535	5.0	4.0	6.3	27,811	13.4	12.6	14.2	-8.4
	Normal		89.6	87.7	91.2		59.9	58.8	60.9	29.7
	Overweight/Obese		5.4	4.3	6.7		26.7	25.7	27.9	-21.3
Europe and Central Asia	Thin	7,126	2.2	1.8	2.6	38,528	3.1	2.8	3.4	-0.9
	Normal		86.6	84.8	88.2		44.7	43.5	46.0	41.9
	Overweight/Obese		11.3	9.7	13.1		52.2	50.9	53.4	-40.9
Latin America and Caribbean	Thin	27,825	1.3	1.1	1.5	117,322	2.6	2.5	2.7	-1.3
	Normal		75.8	75.1	76.5		41.4	41.0	41.9	34.4
	Overweight/Obese		22.9	22.2	23.7		56.0	55.5	56.4	-33.1
Middle East and North Africa	Thin	7,485	4.9	4.3	5.5	53,380	3.9	3.7	4.2	1.0
	Normal		80.2	78.9	81.4		26.8	26.1	27.4	53.4
	Overweight/Obese		15.0	13.8	16.2		69.3	68.5	70.0	-54.3
South Asia	Thin	102,825	10.9	10.6	11.2	118,932	29.4	28.8	30.0	-18.5
	Normal		84.2	83.8	84.5		52.5	52.0	52.9	31.7
	Overweight/Obese		5.0	4.7	5.2		18.1	17.6	18.7	-13.1
sub-Saharan Africa	Thin	47,594	3.8	3.5	4.2	198,456	10.7	10.4	11.0	-6.9
	Normal		87.3	86.7	87.8		64.2	63.8	64.7	23.1
	Overweight/Obese		8.9	8.4	9.3		25.1	24.6	25.6	-16.2

LB and UB refer to the lower and upper bounds of the 95% confidence interval.
Samples exclude pregnant women and women with birth in the preceding 2 months.
Estimates for world regions were population-weighted. N includes the total number for all BMI categories (thin, normal, and overweight/obese).

Table 6 shows that the absolute percentage point difference in thinness between boys and adult men is positive in South Asia (+6.2pp), Latin America and Caribbean (+3.8pp), Europe and Central Asia (+2.6pp), and sub-Saharan Africa (+1.9pp). For overweight and obesity, the percentage point difference between boys and men is negative in Europe and Central Asia (-28.0pp), Latin America and Caribbean (-22.8pp), South Asia (-15.4pp), and sub-Saharan Africa (-12.9pp). The patterns for thinness and overweight and obesity are

consistent among countries and indicate that boys are thinner than men, and that men are more overweight and obese than boys (Appendix A2.2).

Table 6 Comparison between BMI-for-age in boys age 15-19 and BMI in men age 20-49

		Prevalence 15-19				Prevalence 20-49				Percentage point difference (15-19 yrs – 20-49 yrs)
World region	**BMI category**	**N**	**%**	**LB**	**UB**	**N**	**%**	**LB**	**UB**	
Europe and Central Asia	Thin	897	3.1	1.5	6.3	4,049	0.5	0.3	1.0	2.6
	Normal		75.1	70.3	79.3		49.6	46.7	52.6	25.5
	Overweight/Obese		21.8	17.9	26.3		49.8	46.9	52.8	-28.0
Latin America and Caribbean	Thin	567	11.8	8.8	15.6	2,567	8.0	6.6	9.6	3.8
	Normal		74.0	69.2	78.3		55.0	52.5	57.5	19.0
	Overweight/Obese		14.2	11.2	17.8		37.0	34.4	39.7	-22.8
South Asia	Thin	16,426	21.6	20.6	22.6	86,021	15.4	15.0	15.8	6.2
	Normal		72.8	71.7	73.9		63.6	63.0	64.2	9.2
	Overweight/Obese		5.6	5.0	6.2		21.0	20.5	21.6	-15.4
sub-Saharan Africa	Thin	11,032	9.0	8.0	10.1	39,025	7.1	6.6	7.6	1.9
	Normal		88.8	87.6	90.0		77.9	76.8	78.9	10.9
	Overweight/Obese		2.1	1.7	2.8		15.0	14.0	16.0	-12.9

LB and UB refer to the lower and upper bounds of the 95% confidence interval.
ND, not displayed, when the percentage is based on less than 25 unweighted cases.
Estimates for world regions were population-weighted. N includes the total number for all BMI categories (thin, normal, and overweight/obese).

3.1.2 Country data

Prevalence of BMI-for-age

Figure 2(a) and 2(b) shows a map of the prevalence of thinness for girls and boys, and Appendix A2.3 and A2.4 provide the prevalence estimate figures. Among girls, in 62 countries, the prevalence of thinness is less than 2% in 48% of countries, 2-10% in 48% of countries, and over 10% in 3% of countries. The three countries with the highest prevalence of thinness in girls are Senegal (9%), Yemen (10%), and India (11%). Among boys, in 17 countries, the prevalence of thinness is less than 2% in 11% of countries, 2-10% in 48% of countries, and over 10% in 41% of countries. The three countries with the highest prevalence of thinness in boys are Namibia (22%), Senegal (25%), and Ethiopia (28%).

Figure 2(a) Percentage of thinness among non-pregnant girls age 15-19, by country

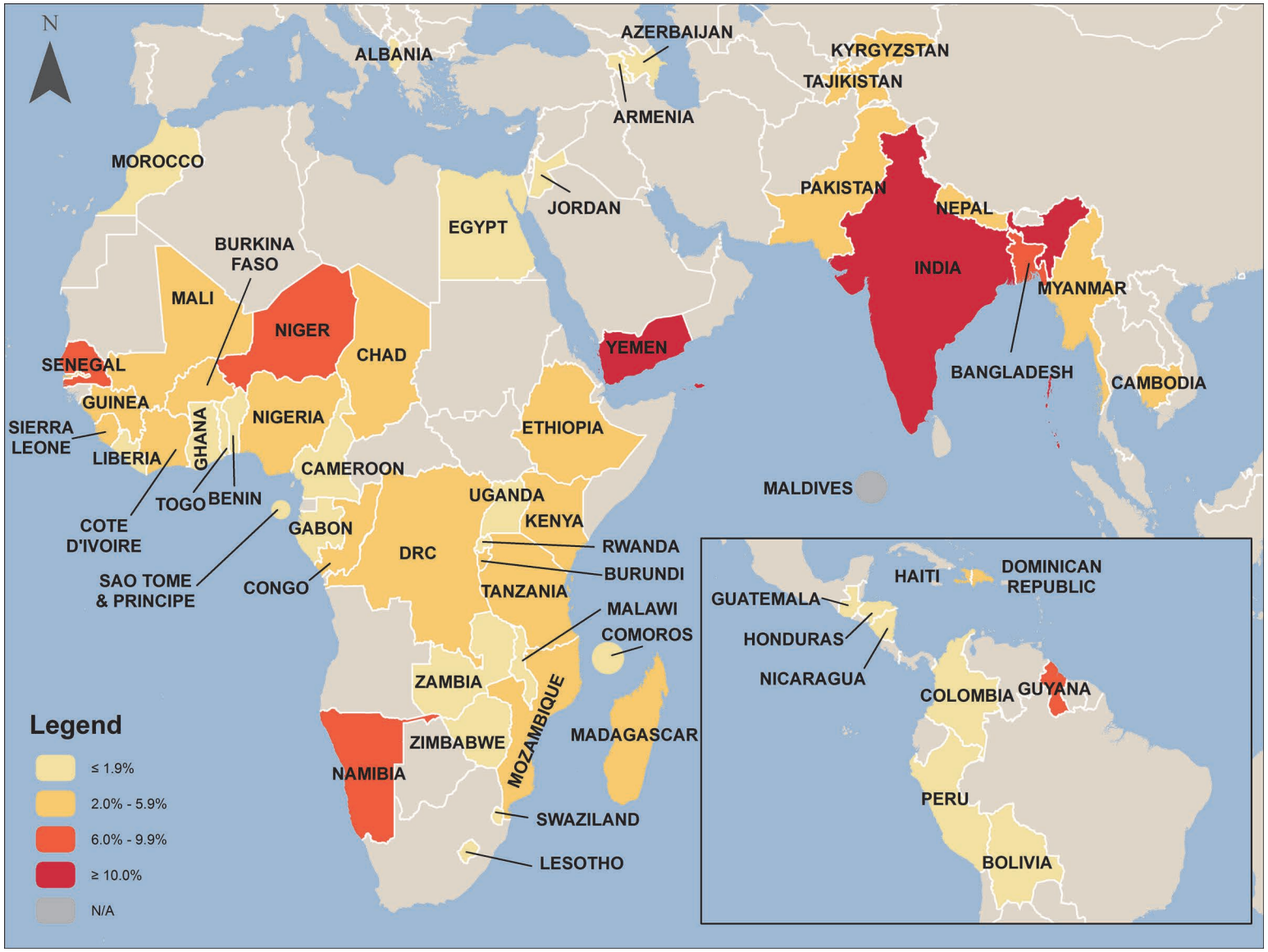


Figure 2(b) Percentage of thinness among boys age 15-19, by country

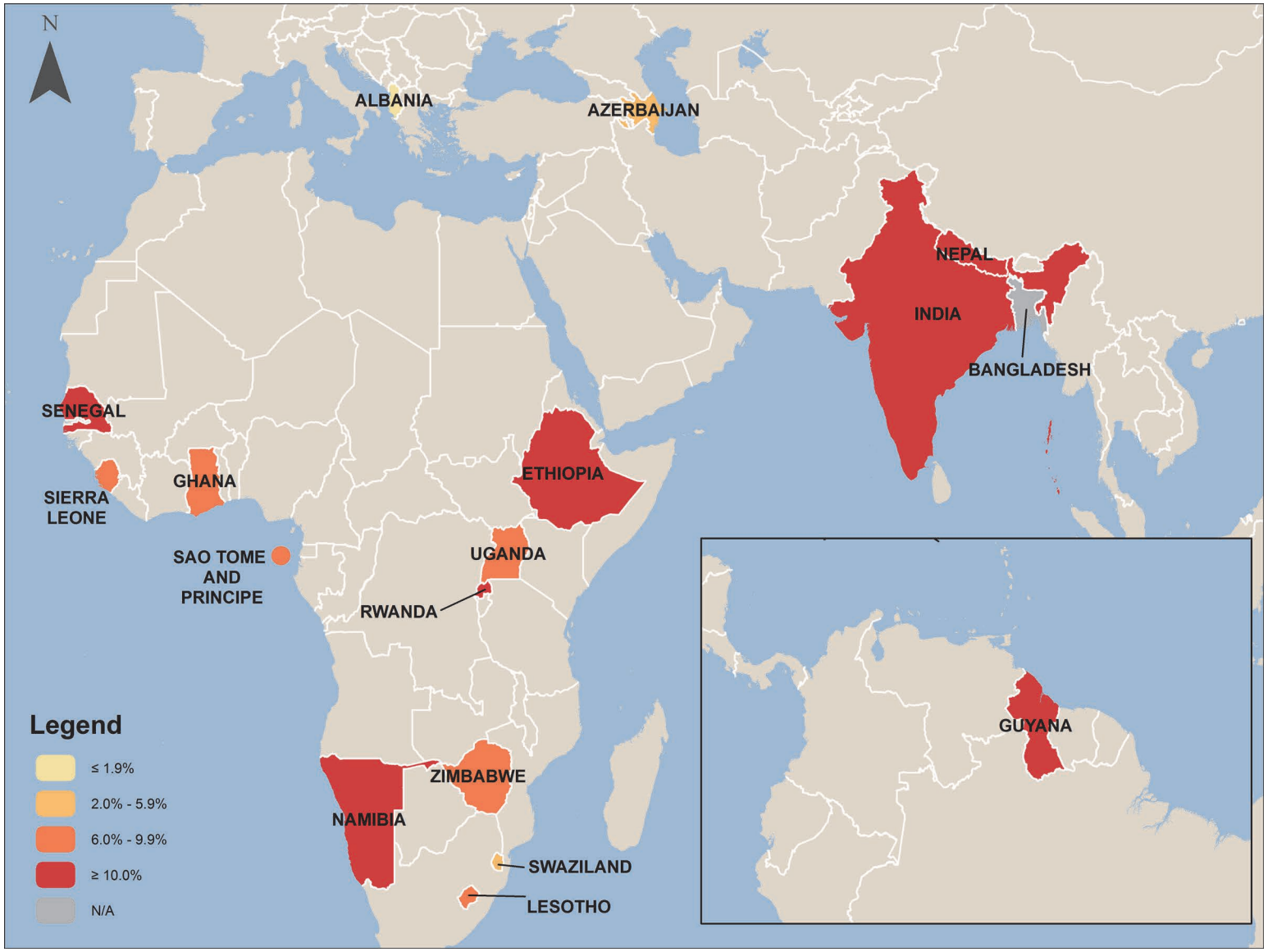


Figure 3(a) and 3(b) shows a map of the prevalence of overweight and obesity for girls and boys, and Appendix A2.3 and A2.4 provide the prevalence estimate figures for girls and boys respectively. Among girls, in 62 countries, the prevalence of overweight and obesity is less than 2% in 5% of countries, 2-10% in 42% of countries, and over 10% in 53% of countries. The three countries with the highest prevalence of overweight and obesity in girls are Guatemala (27%), Jordan (39%), and Egypt (51%). For boys, in 17 countries, the prevalence is less than 2% in 29% of countries, 2-10% in 53% of countries, and over 10% in 18% of countries. The three countries with the highest prevalence of overweight and obesity in boys are Guyana (14%), Azerbaijan (20%) and Albania (28%).

Figure 3(a) Percentage of overweight/obesity among non-pregnant girls age 15-19, by country

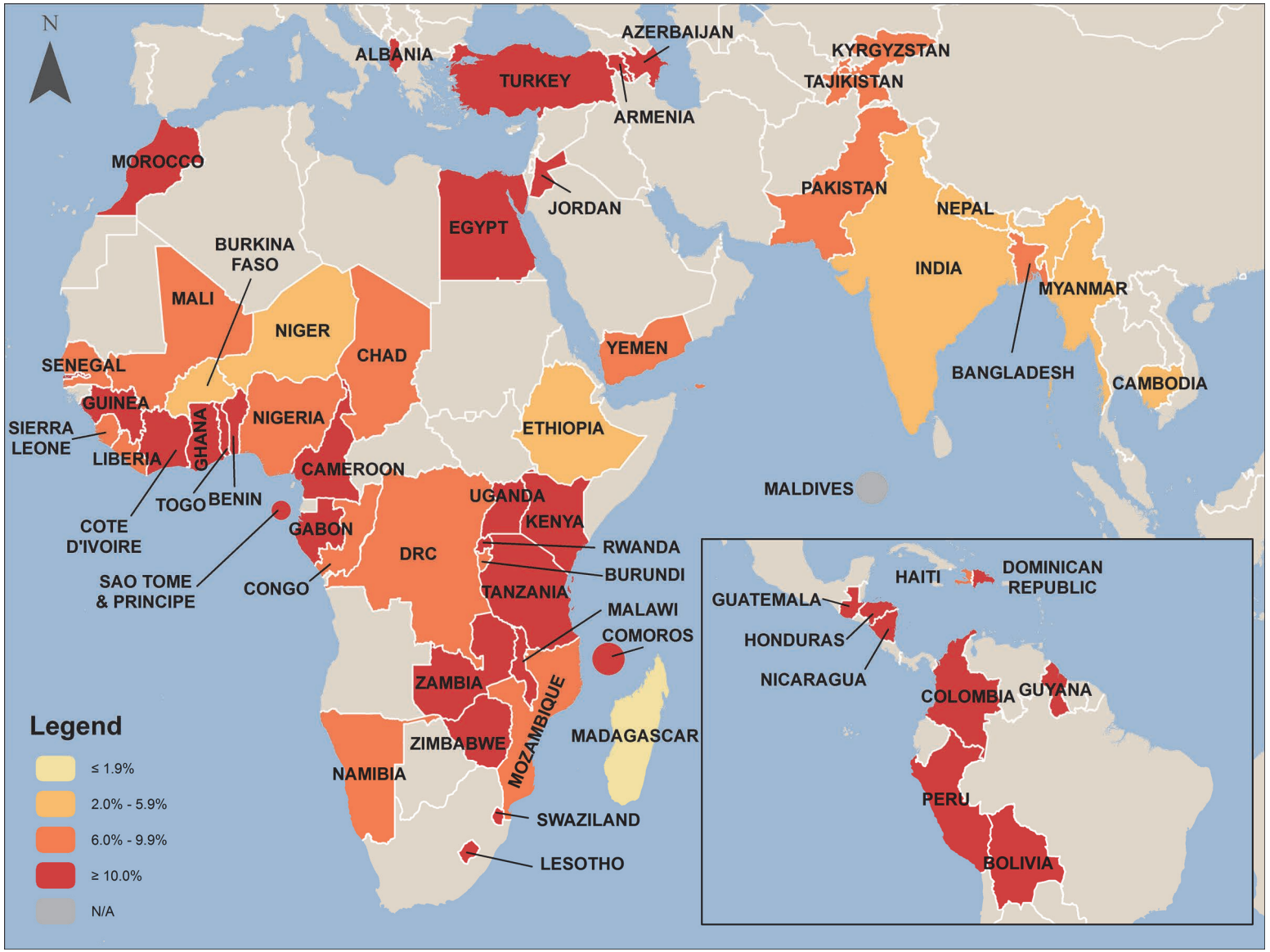
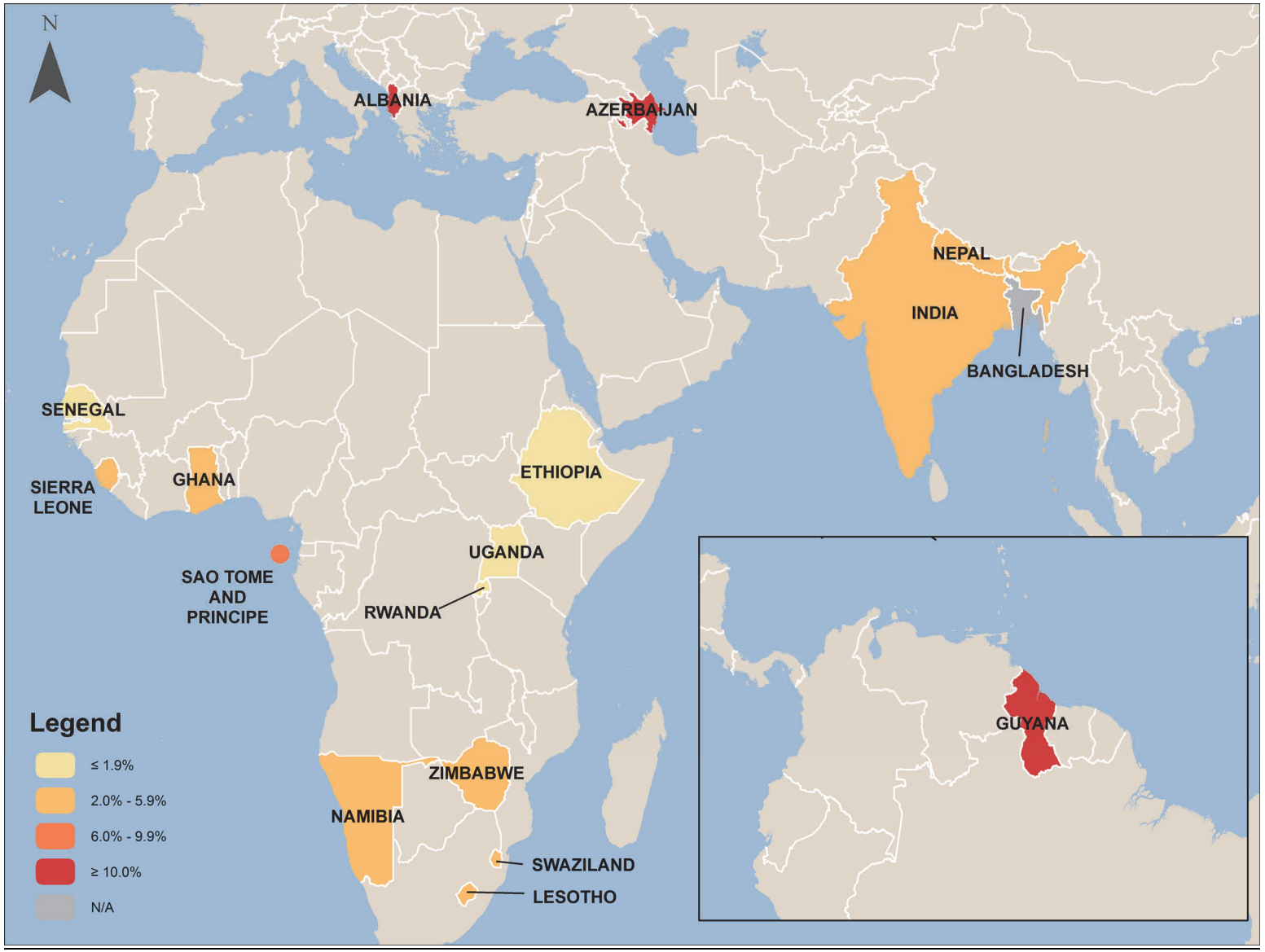


Figure 3(b) Percentage of overweight/obesity among boys age 15-19, by country



Prevalence of BMI-for-age by demographic variables

Patterns in the prevalence of thinness and overweight and obesity vary by residence, education, wealth, and employment status in girls (Figure 4(a)-(d) and Figure 5(a)-(d)) and boys (Figure 6(a)-(d) and Figure 7(a)-(d)). Differences in the prevalence of thinness and overweight and obesity by covariate are noted if the difference is at least 5%, and countries are noted if there are five or fewer countries with this difference (Appendix A2.5-12).

- Among girls, prevalence of thinness in rural areas is similar to urban areas in all 58 countries studied. Conversely, in 23 of the countries, girls in urban areas have higher prevalence of overweight and obesity compared with rural areas.

- Among boys in Ethiopia, Namibia, and Nepal, thinness is more prevalent in rural areas than urban areas. In all countries overweight and obesity among boys is similar by urban and rural residence.

- Thinness is more prevalent among girls with secondary or higher education in Guyana, while in Nepal it is higher among girls with primary or no education. In many countries prevalence of overweight and obesity is higher among girls with secondary or higher education (17 of 55 countries). The opposite pattern is observed in Bolivia, Colombia, Egypt, Jordan, and Peru, where overweight and obesity is more prevalent among girls with primary or no education.

- Thinness is more prevalent among boys with primary or no education in Ethiopia, Namibia, and Senegal. Similarly in Albania, prevalence of overweight and obesity is higher among boys with primary or no education.

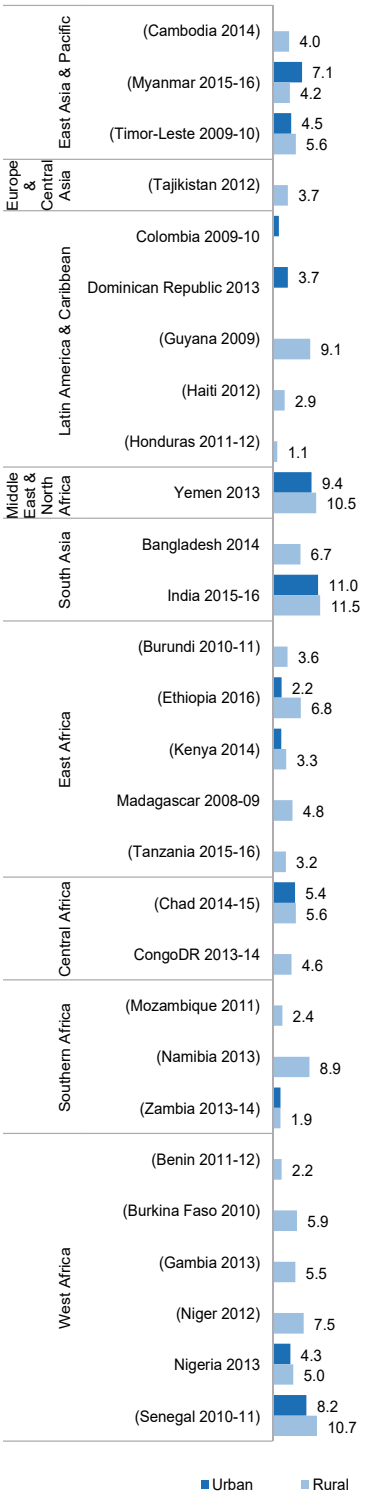
- Among girls, prevalence of thinness is similar by wealth levels in all countries. In contrast, in several countries, overweight and obesity is more prevalent among girls in wealthier households (16 of 56 countries). An exception is Egypt, where girls in poorer households have higher prevalence of overweight and obesity.

- Among boys, thinness is more prevalent in wealthier households in Guyana, but in Namibia it is higher among boys in poorer households. Prevalence of overweight and obesity is higher among boys in wealthier households in Guyana, India, and Nepal.

- Among girls, prevalence of thinness is similar by employment status in all countries. In Bolivia, Nicaragua, Swaziland, and Zimbabwe, employed girls have higher prevalence of overweight and obesity, while in Cameroon and Malawi, girls who are not working have higher prevalence of overweight and obesity.

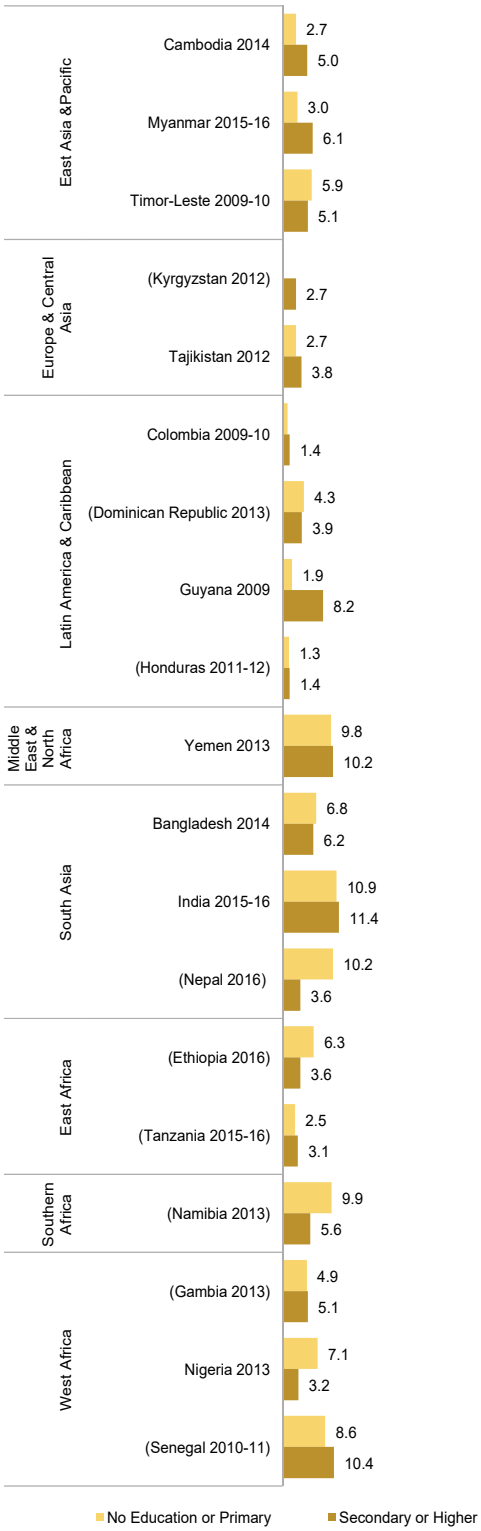
- Among boys, in Senegal and Uganda thinness is more prevalent among those who are not working, while in Albania boys who are employed have higher prevalence of overweight and obesity.

Figure 4(a) Percentage of thin non-pregnant girls age 15-19, by residence



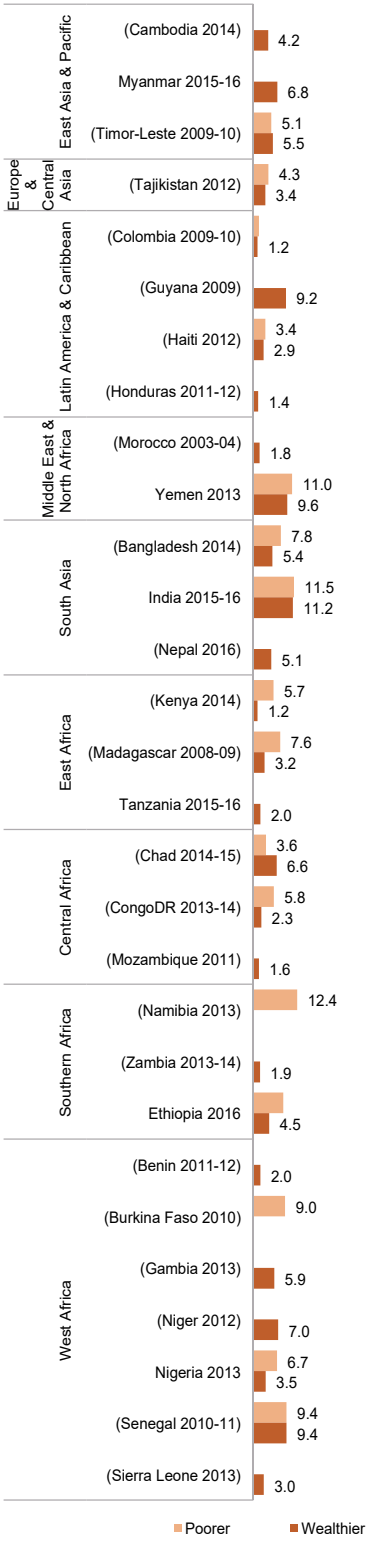
Note: For countries where the percentage is based on fewer than 25 unweighted cases, data is suppressed. For countries in parentheses, at least one percentage is based on 25-49 unweighted cases.

Figure 4(b) Percentage of thin non-pregnant girls age 15-19, by education level



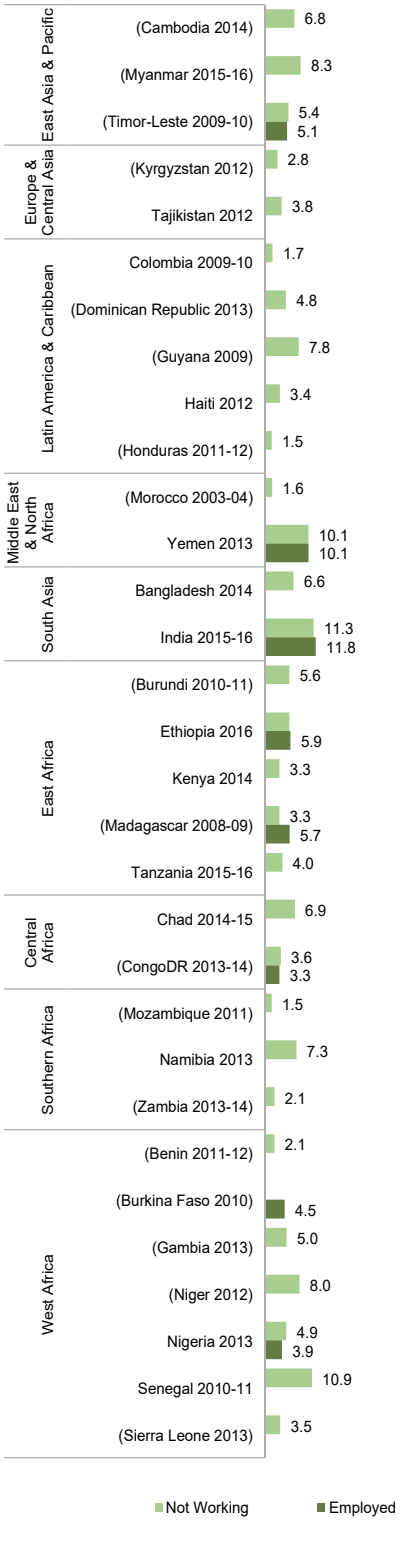
Note: For countries where the percentage is based on fewer than 25 unweighted cases, data is suppressed. For countries in parentheses, at least one percentage is based on 25-49 unweighted cases.

Figure 4(c) Percentage of thin non-pregnant girls age 15-19, by wealth quintile



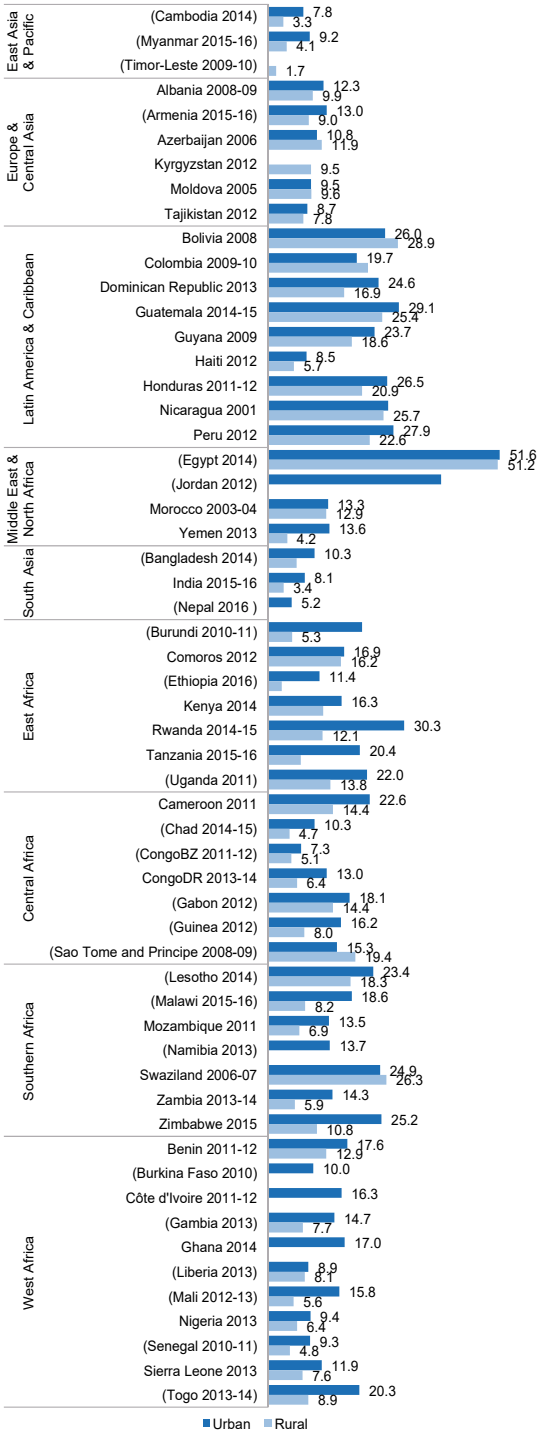
Note: For countries where the percentage is based on fewer than 25 unweighted cases, data is suppressed. For countries in parentheses, at least one percentage is based on 25-49 unweighted cases.

Figure 4(d) Percentage of thin non-pregnant girls age 15-19, by employment status



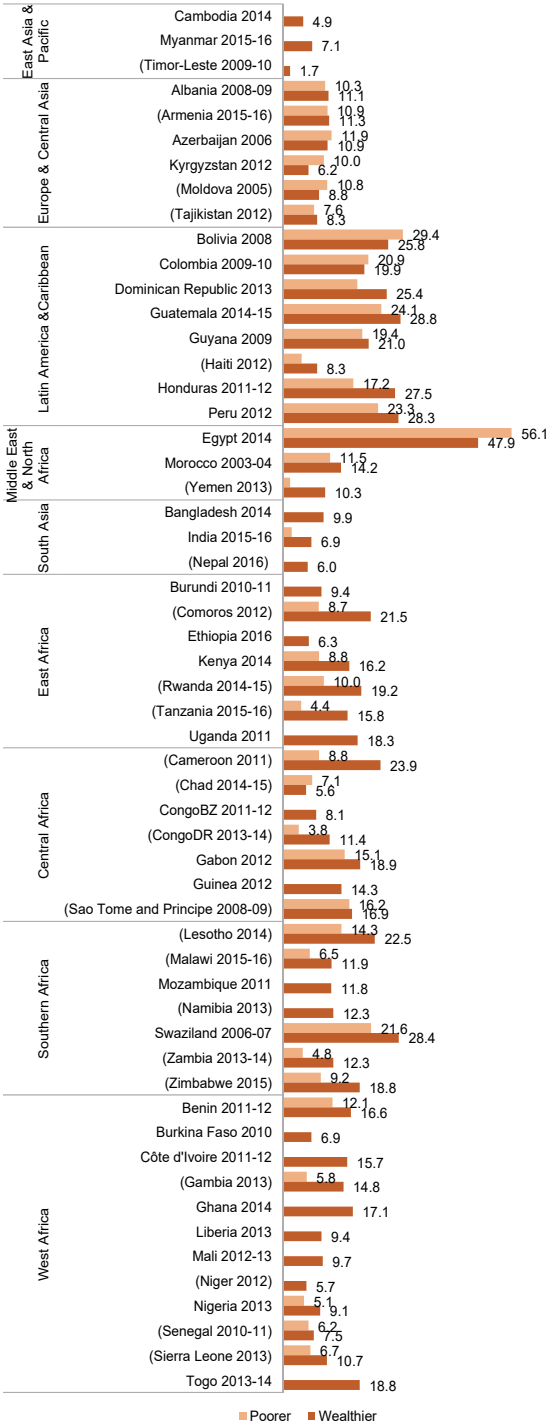
Note: For countries where the percentage is based on fewer than 25 unweighted cases, data is suppressed. For countries in parentheses, at least one percentage is based on 25-49 unweighted cases.

Figure 5(a) Percentage of overweight/obese non-pregnant girls age 15-19, by residence



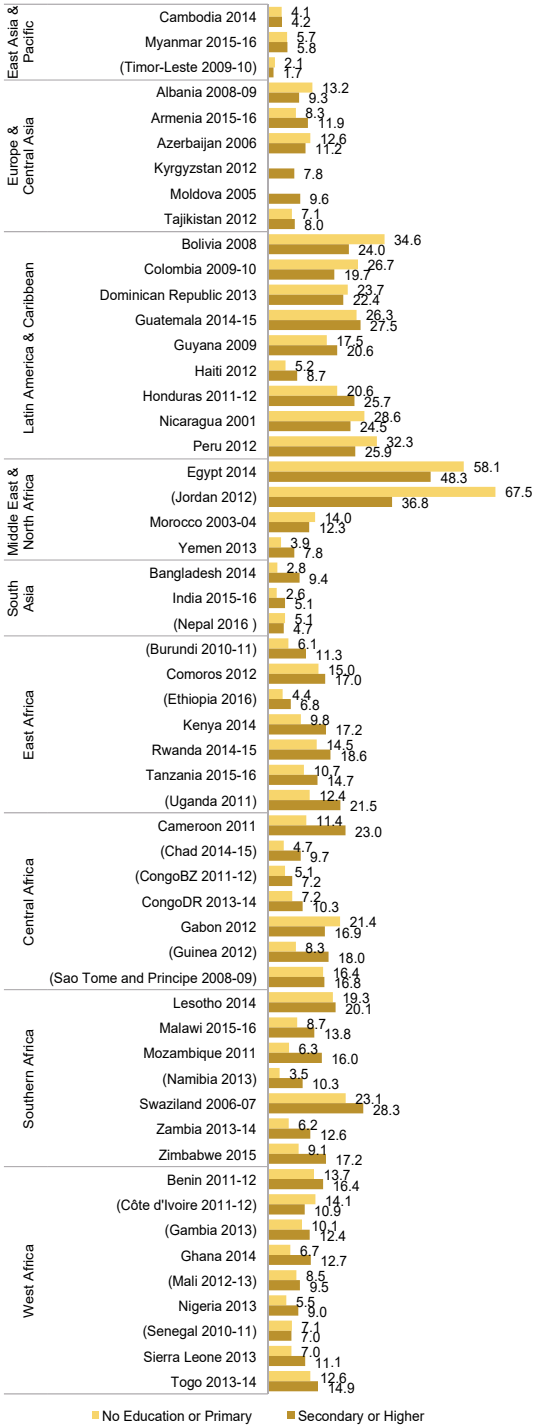
Note: For countries where the percentage is based on fewer than 25 unweighted cases, data is suppressed. For countries in parentheses, at least one percentage is based on 25-49 unweighted cases.

Figure 5(b) Percentage of overweight/obese non-pregnant girls age 15-19, by wealth quintile



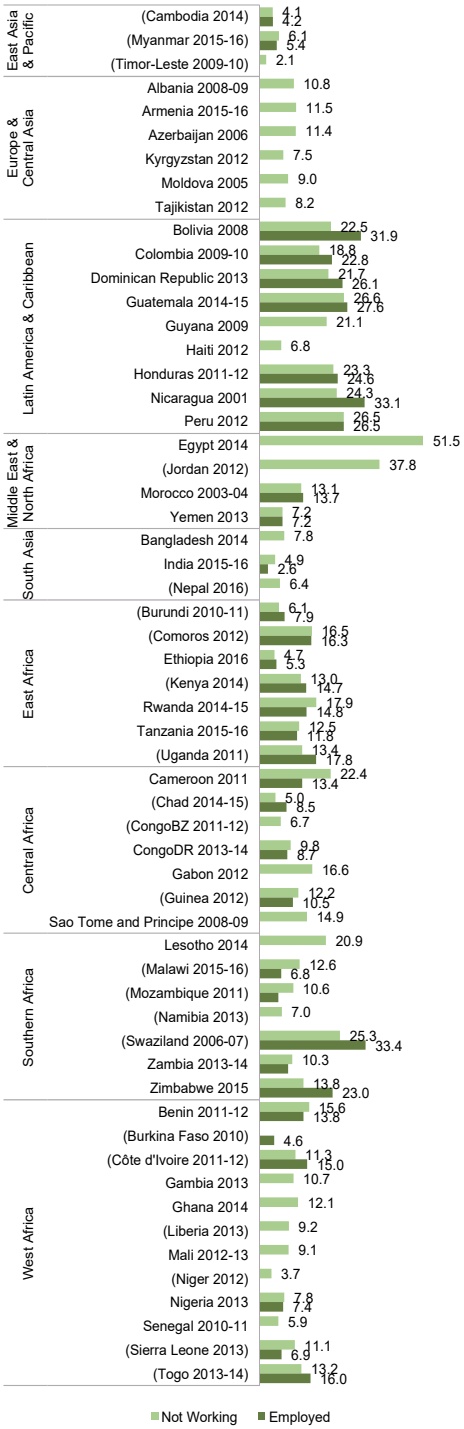
Note: For countries where the percentage is based on fewer than 25 unweighted cases, data is suppressed. For countries in parentheses, at least one percentage is based on 25-49 unweighted cases.

Figure 5(c) Percentage of overweight/obese non-pregnant girls age 15-19, by education level



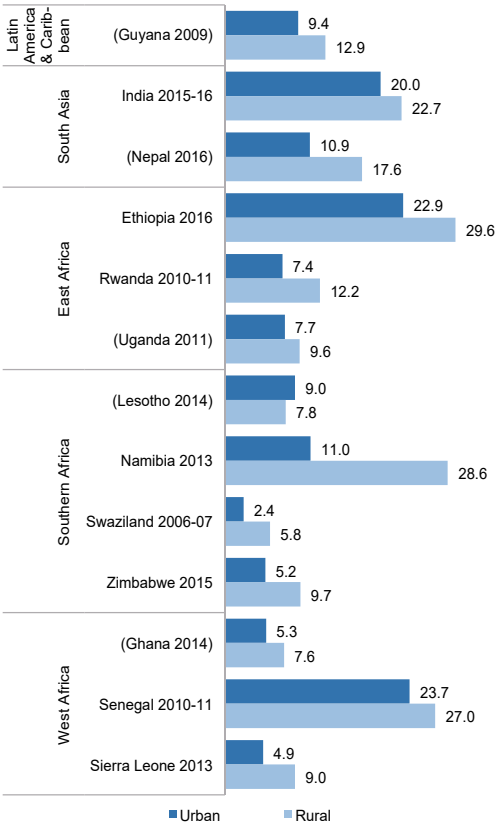
Note: For countries where the percentage is based on fewer than 25 unweighted cases, data is suppressed. For countries in parentheses, at least one percentage is based on 25-49 unweighted cases.

Figure 5(d) Percentage of overweight/obese non-pregnant girls age 15-19, by employment status



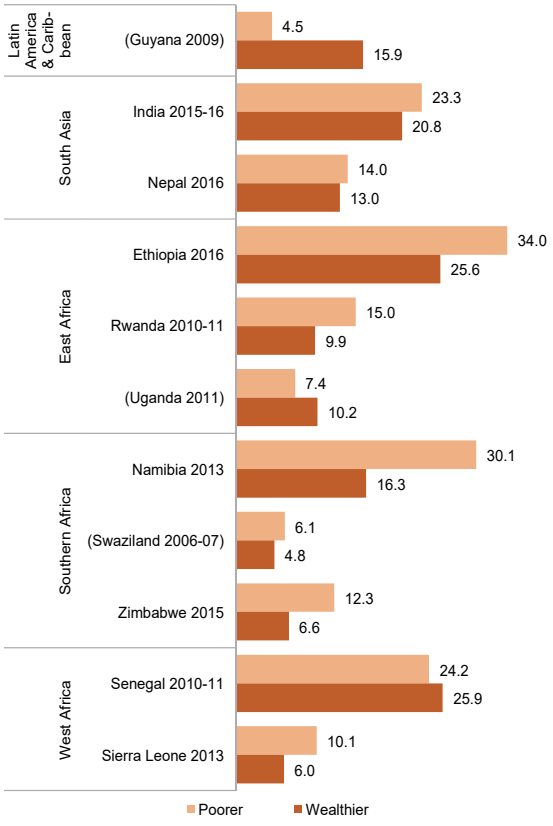
Note: For countries where the percentage is based on fewer than 25 unweighted cases, data is suppressed. For countries in parentheses, at least one percentage is based on 25-49 unweighted cases.

Figure 6(a) Percentage of thin boys age 15-19, by residence



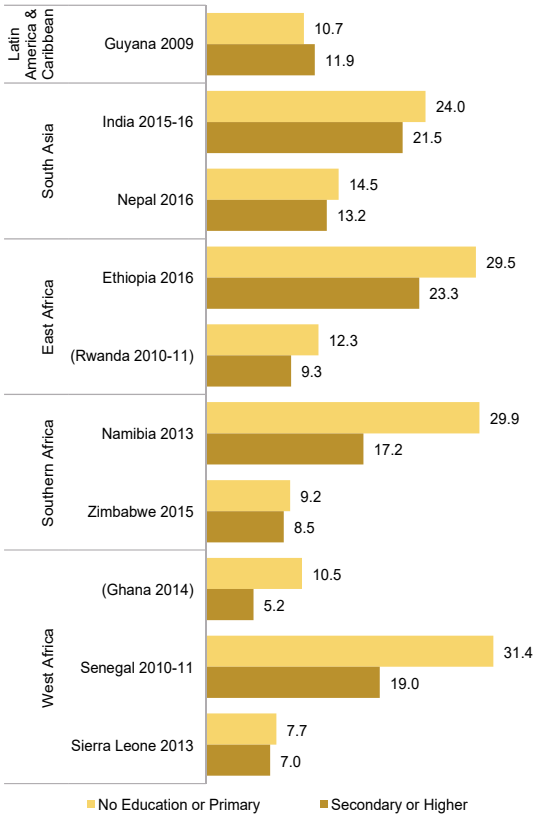
Note: For countries where the percentage is based on fewer than 25 unweighted cases, data is suppressed. For countries in parentheses, at least one percentage is based on 25-49 unweighted cases.

Figure 6(b) Percentage of thin boys age 15-19, by wealth quintile



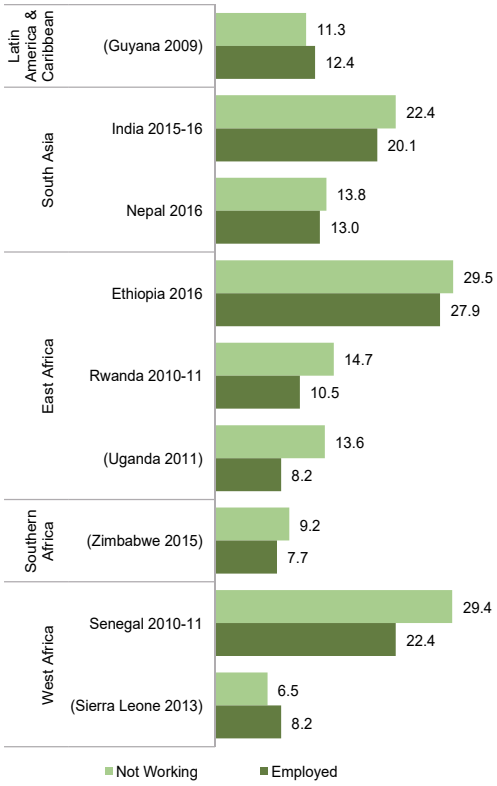
Note: For countries where the percentage is based on fewer than 25 unweighted cases, data is suppressed. For countries in parentheses, at least one percentage is based on 25-49 unweighted cases.

Figure 6(c) Percentage of thin boys age 15-19, by education level



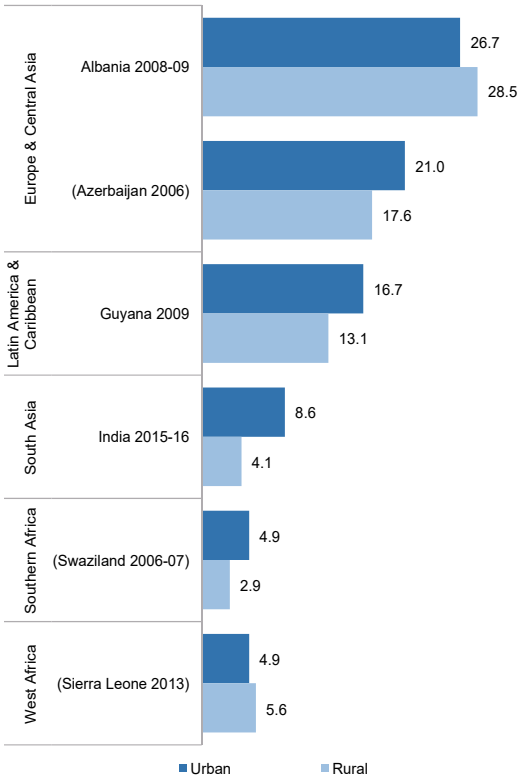
Note: For countries where the percentage is based on fewer than 25 unweighted cases, data is suppressed. For countries in parentheses, at least one percentage is based on 25-49 unweighted cases.

Figure 6(d) Percentage of thin boys age 15-19, by employment status



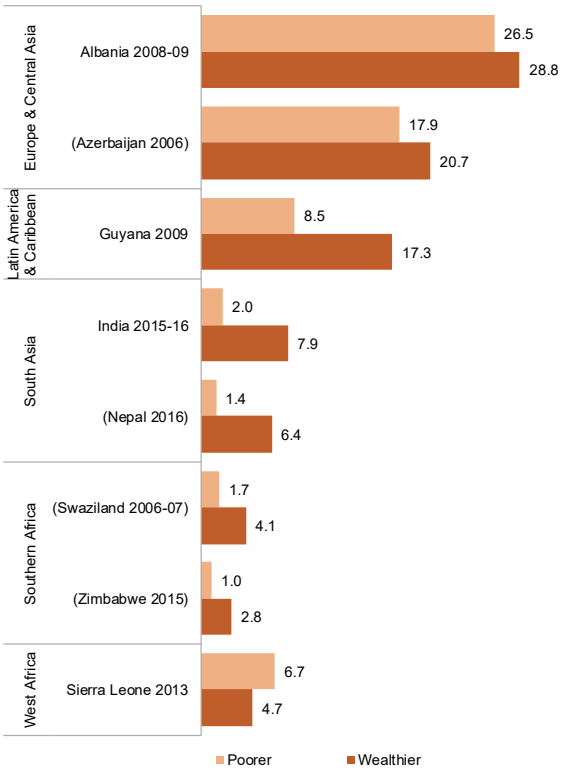
Note: For countries where the percentage is based on fewer than 25 unweighted cases, data is suppressed. For countries in parentheses, at least one percentage is based on 25-49 unweighted cases.

Figure 7(a) Percentage of overweight/obese boys age 15-19, by residence



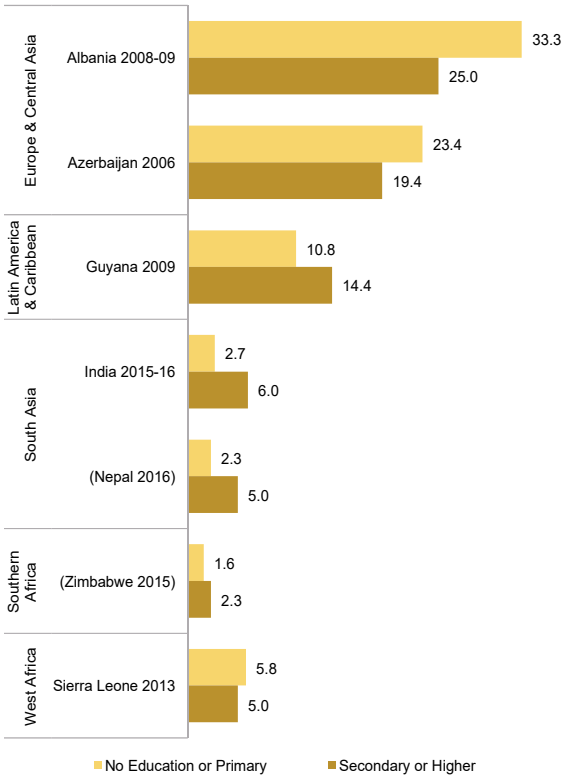
Note: For countries where the percentage is based on fewer than 25 unweighted cases, data is suppressed. For countries in parentheses, at least one percentage is based on 25-49 unweighted cases.

Figure 7(b) Percentage of overweight/obese boys age 15-19, by wealth quintile



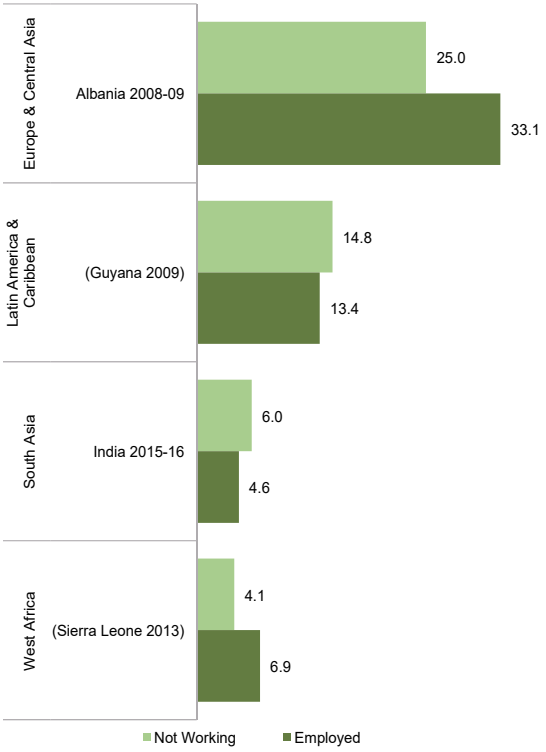
Note: For countries where the percentage is based on fewer than 25 unweighted cases, data is suppressed. For countries in parentheses, at least one percentage is based on 25-49 unweighted cases.

Figure 7(c) Percentage of overweight/obese boys age 15-19, by education level



Note: For countries where the percentage is based on fewer than 25 unweighted cases, data is suppressed. For countries in parentheses, at least one percentage is based on 25-49 unweighted cases.

Figure 7(d) Percentage of overweight/obese boys age 15-19, by employment status



Note: For countries where the percentage is based on fewer than 25 unweighted cases, data is suppressed. For countries in parentheses, at least one percentage is based on 25-49 unweighted cases.

Trend data

In total, 39 countries have multiple surveys available for girls, and five countries have multiple surveys for boys (Appendix A2.13-14). The three countries with the greatest change over time are noted.

The trends in prevalence of girls' thinness show small changes over time in most countries (Figures 8-13). Ethiopia (-6.6pp), Bangladesh (-3.5pp), and Burkina Faso (-2.5pp) had the greatest declines in prevalence of thinness between surveys, while Mali (+3.0pp), Nepal (+2.5pp), and Congo (+1.9pp) had the greatest increases. For overweight and obesity, changes over time are generally larger than for thinness in most countries. Declines in prevalence of overweight and obesity are greatest in Sierra Leone (-17.0pp), Armenia (-7.9pp), Congo (-7.2pp), and Jordan (-6.1pp), while increases in prevalence of overweight and obesity are greatest in Benin (+8.1pp), Mali (+8.9pp), and Bangladesh (+6.5pp).

Figure 14 shows trend data for boys in five countries. The greatest declines in prevalence of thinness among boys were in Ethiopia (-8.3pp), India (-7.4pp), and Zimbabwe (-3.9pp). There are no countries where thinness increased in prevalence. Changes in overweight and obesity are small, with the greatest increases in prevalence seen in India (+3.6pp), Zimbabwe (+0.4pp), and Ethiopia (+0.3pp).

Figure 8 **BMI-for-age country trends for non-pregnant girls age 15-19, East Asia and Pacific**

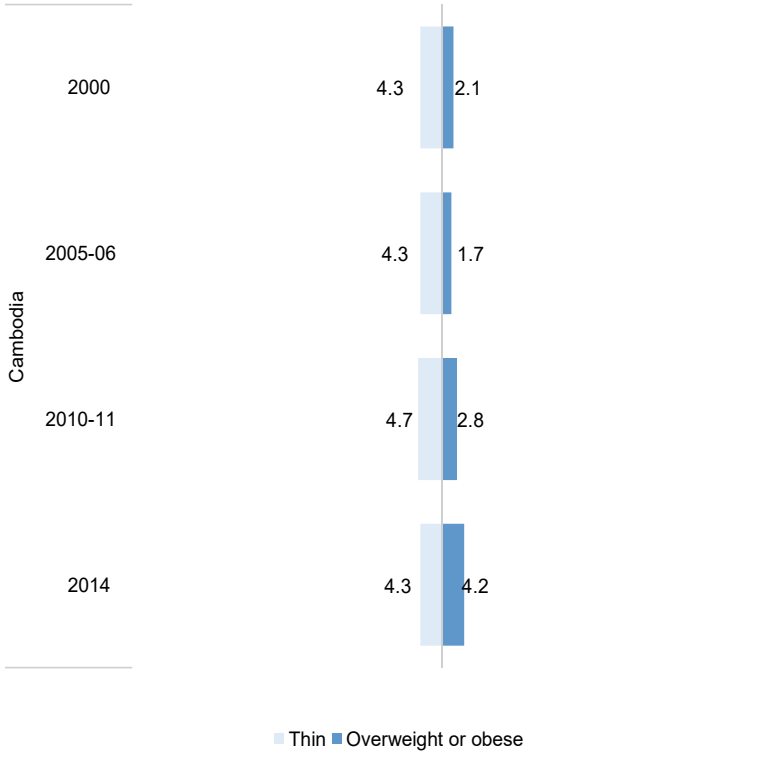


Figure 9 **BMI-for-age country trends for non-pregnant girls age 15-19, Europe and Central Asia**

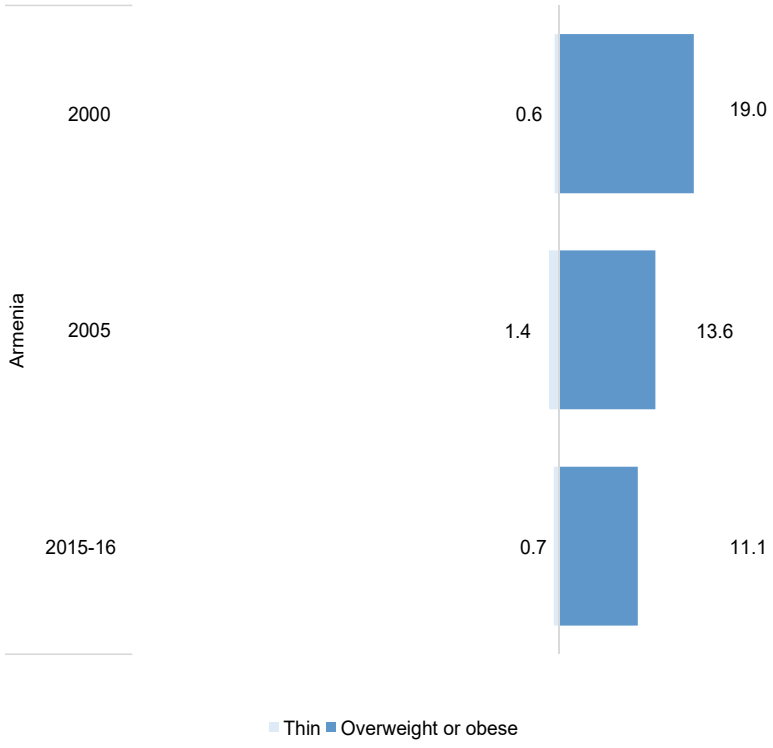


Figure 10 **BMI-for-age country trends for non-pregnant girls age 15-19, Latin America and Caribbean**

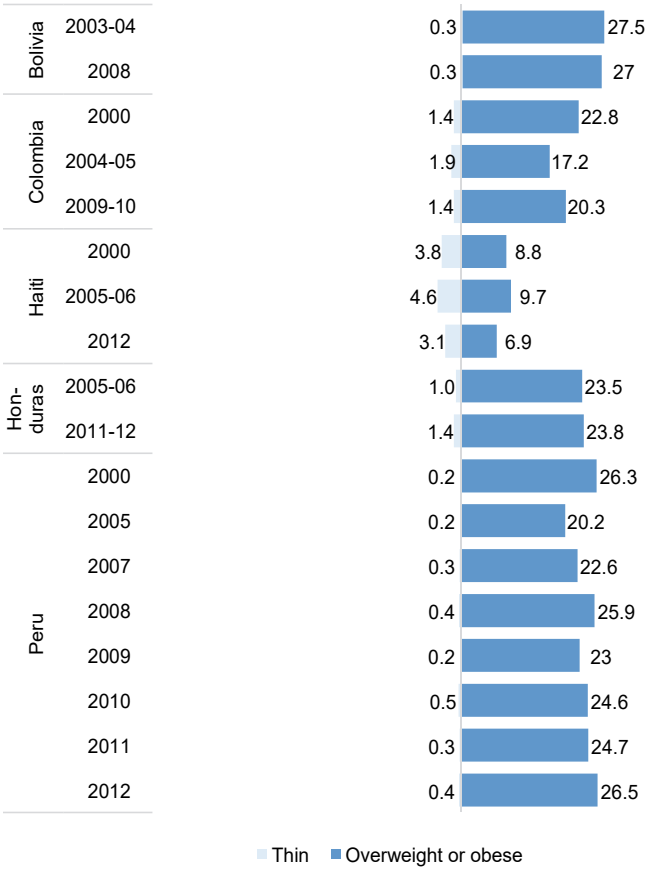


Figure 11 **BMI-for-age country trends for non-pregnant girls age 15-19, Middle East and North Africa**

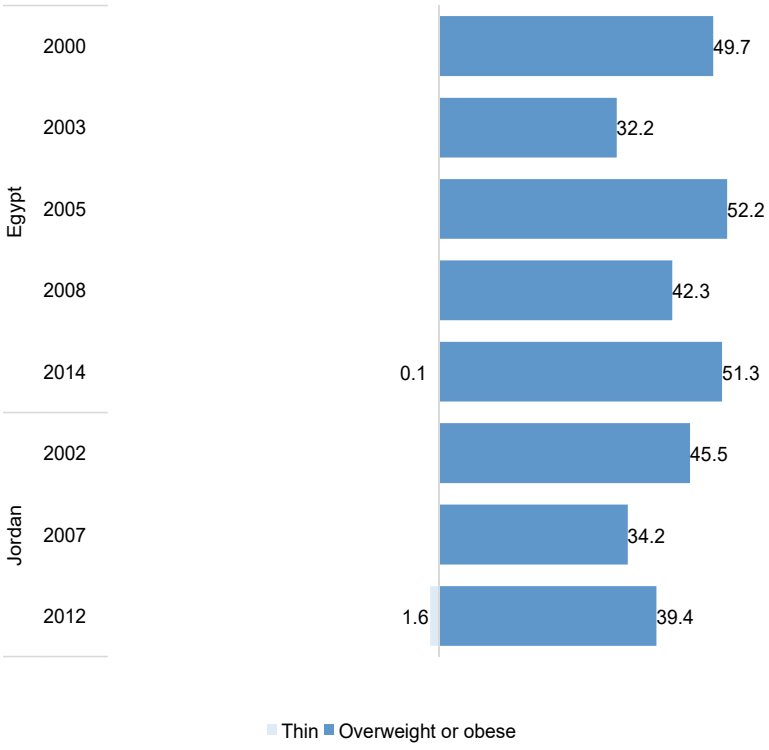


Figure 12 BMI-for-age country trends for non-pregnant girls age 15-19, South Asia

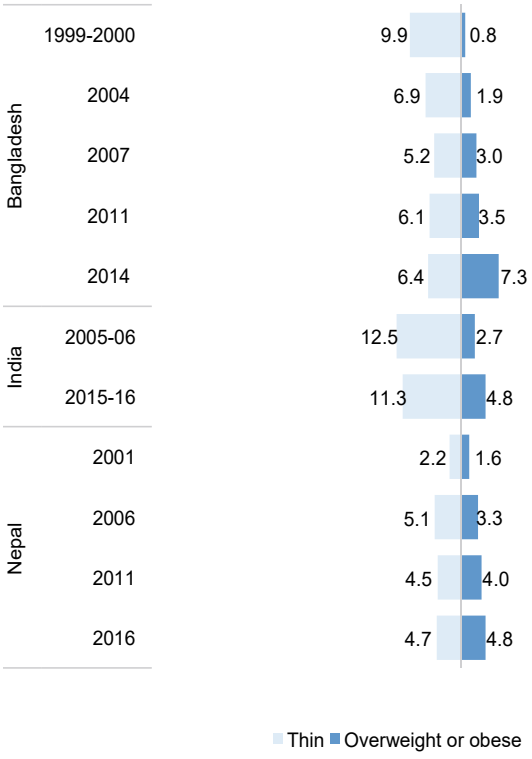


Figure 13 BMI-for-age country trends for non-pregnant girls age 15-19, sub-Saharan Africa

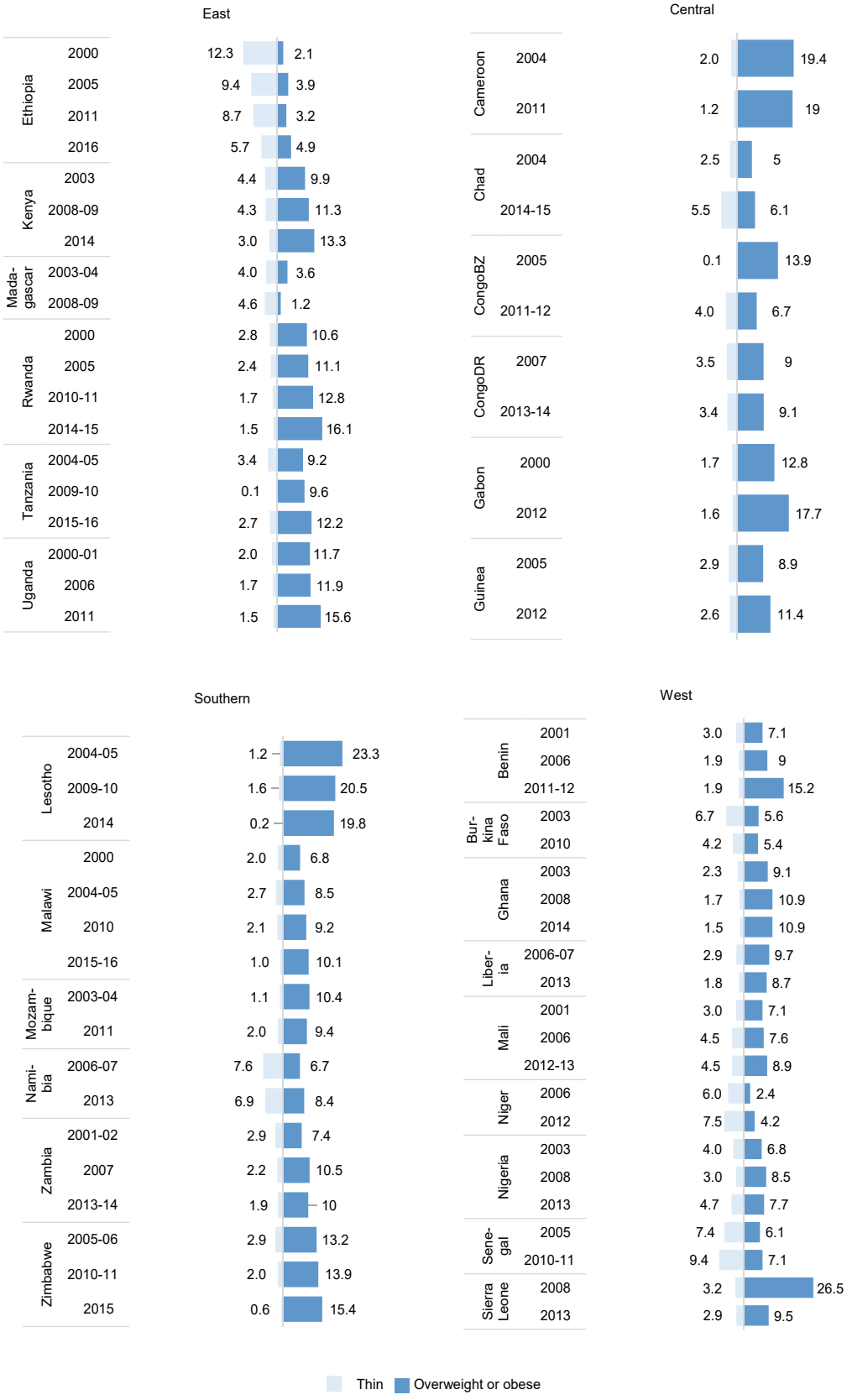
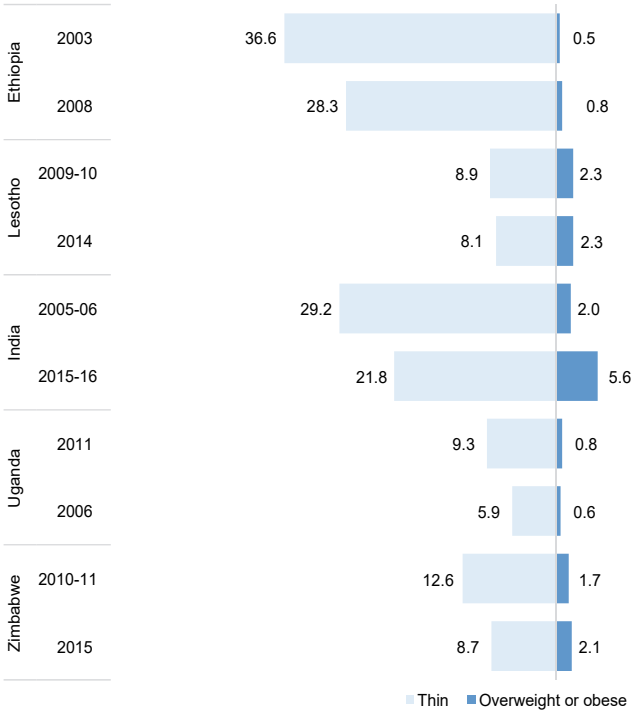


Figure 14 BMI-for-age country trends for boys age 15-19, all world regions



3.2 Stature

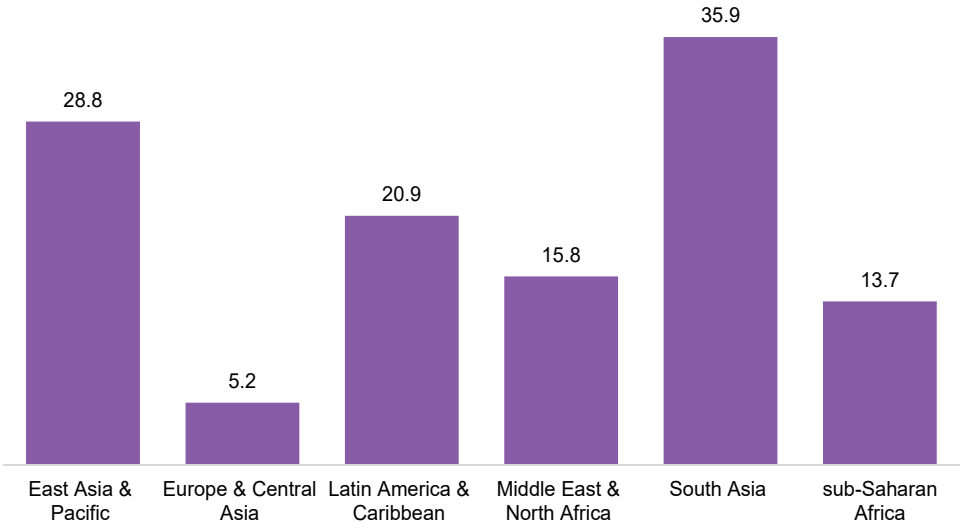
3.2.1 World region data

The same world region data sources for BMI-for-age among girls were used to calculate estimations of short stature (Table 4).

Prevalence of short stature

Figure 15 shows the prevalence of short stature across world regions for girls. Prevalence of short stature is highest in South Asia (36%), followed by East Asia and Pacific (29%), Latin America and Caribbean (21%), Middle East and North Africa (16%), sub-Saharan Africa (14%), and Europe and Central Asia (5%).

Figure 15 Short stature among girls age 15-19, by world region



Note: Short stature: height-for-age <-2SD.

Comparisons between short stature in girls (HAZ<-2SD) and women (<145cm)

Short stature, HAZ<-2SD, for girls was compared to short stature (<145cm) for women. The absolute percentage point difference in prevalence of short stature between girls and women is positive for all regions and countries (Appendix A3.1), indicating that prevalence of short stature is more common among girls than women. These differences (from greatest to least) are: South Asia (+25.1pp), East Asia and Pacific (+22.6pp), Latin America and Caribbean (+12.5pp), sub-Saharan Africa (+11.8pp), and Europe and Central Asia (+3.9pp) (Table 7).

Table 7 Comparison between HAZ<-2SD in girls age 15-19 and stature <145cm in women age 20-49

	Prevalence 15-19 yrs				Prevalence 20-49 yrs				Percentage point difference (15-19 yrs – 20-49 yrs)
World region	**N**	**%**	**LB**	**UB**	**N**	**%**	**LB**	**UB**	
East Asia and Pacific	5,707	28.8	26.3	31.3	30,133	6.2	5.7	6.7	22.6
Europe and Central Asia	7,256	5.2	4.5	6.1	41,126	1.3	1.1	1.6	3.9
Latin America and Caribbean	26,785	20.9	20.1	21.6	123,636	8.4	8.2	8.7	12.5
Middle East and North Africa	8,491	15.8	14.7	16.8	59,743	1.4	1.3	1.6	14.4
South Asia	105,659	35.9	35.4	36.4	596,430	10.8	10.6	10.9	25.1
sub-Saharan Africa	51,320	13.7	13.1	14.4	227,036	1.9	1.8	2.0	11.8

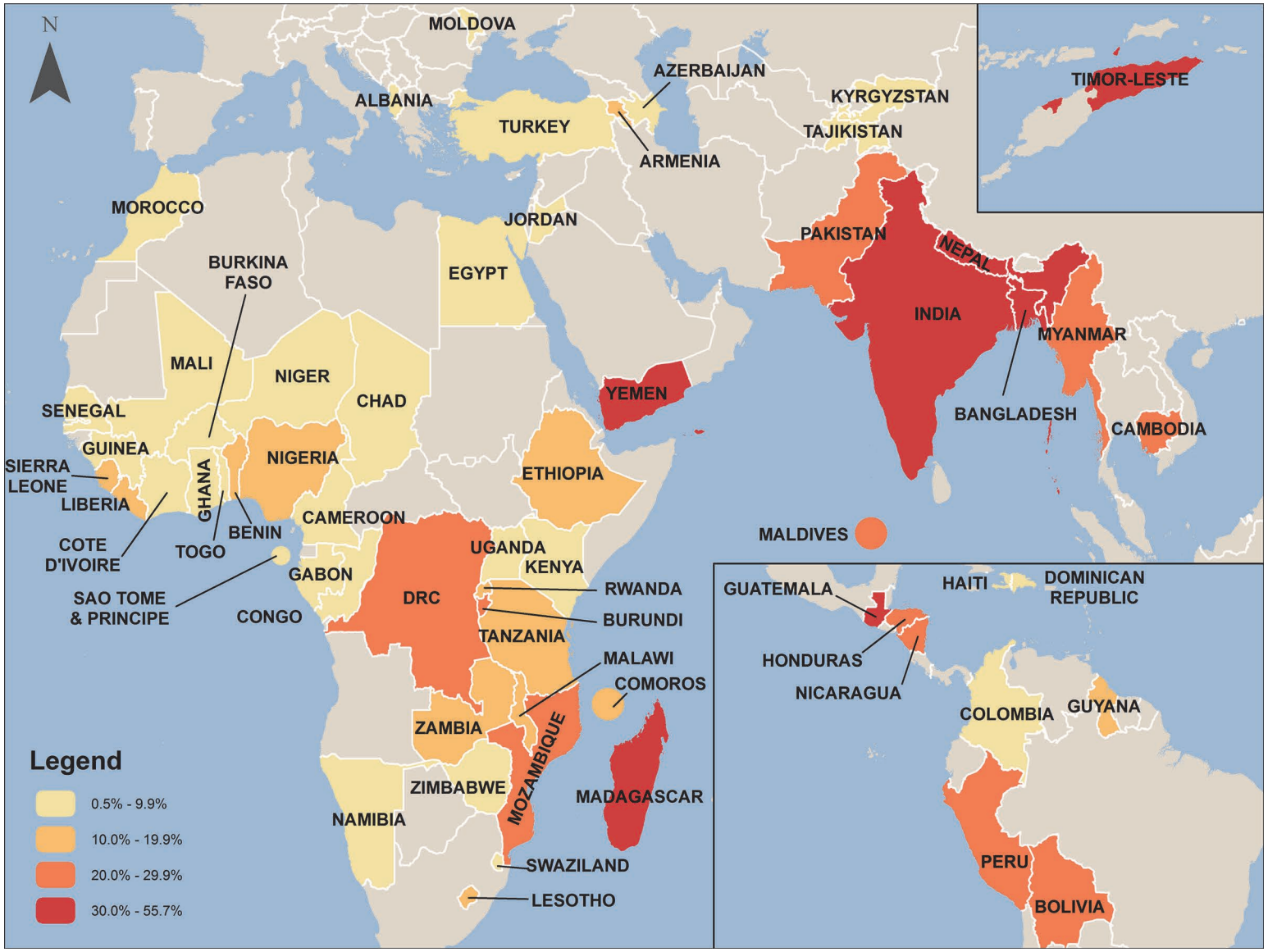
LB and UB refer to the lower and upper bounds of the 95% confidence interval.
Estimates for world regions were population-weighted.

3.2.2 Country data

Prevalence of short stature

Figure 16 shows the prevalence of short stature among girls. Prevalence estimates in the 62 countries studied are less than 2% in 2% of countries, 2-10% in 48% of countries, and over 10% in 50% of countries. The three countries with the highest prevalence are Bangladesh (39%), Guatemala (51%), and Timor-Leste (56%).

Figure 16 **Percentage of short stature girls age 15-19, by country**

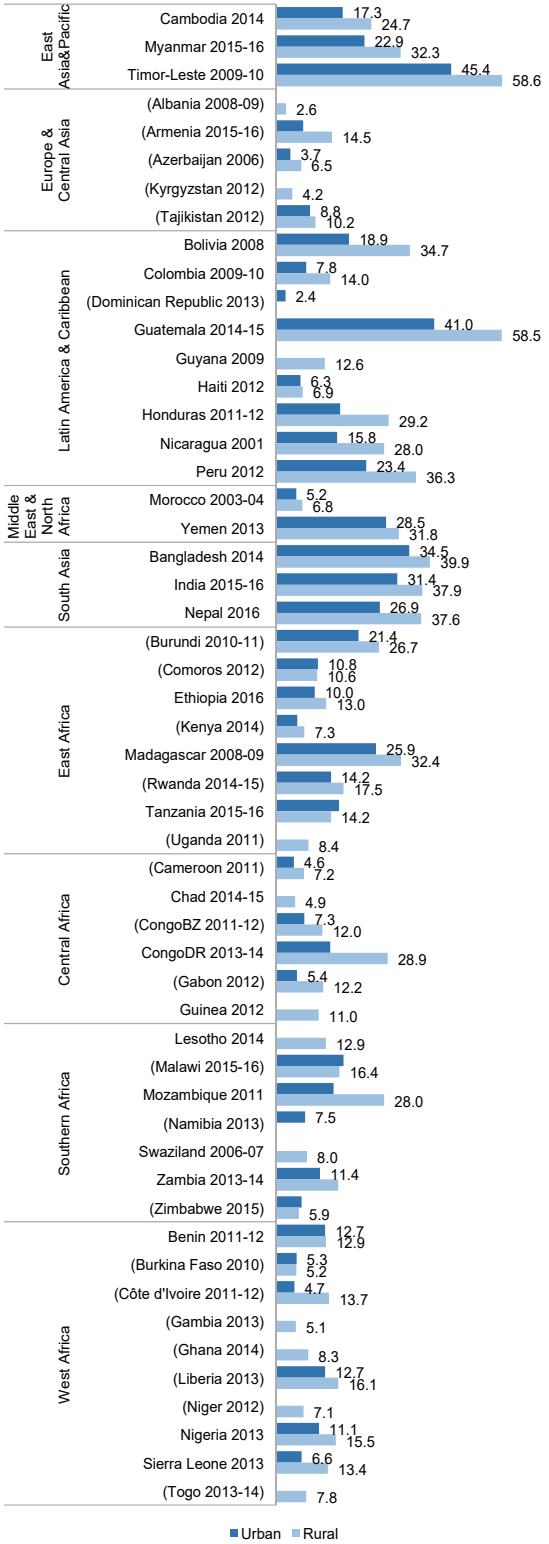


Prevalence of short stature by demographic variables

Patterns in the prevalence of short stature among girls vary by residence, education, wealth, and employment status (Figure 17(a)-(d)). Differences in the prevalence of short stature by covariate are noted if the difference is at least 5%, and countries are noted if there are five countries or fewer with this difference (Appendix A3.2-3.5).

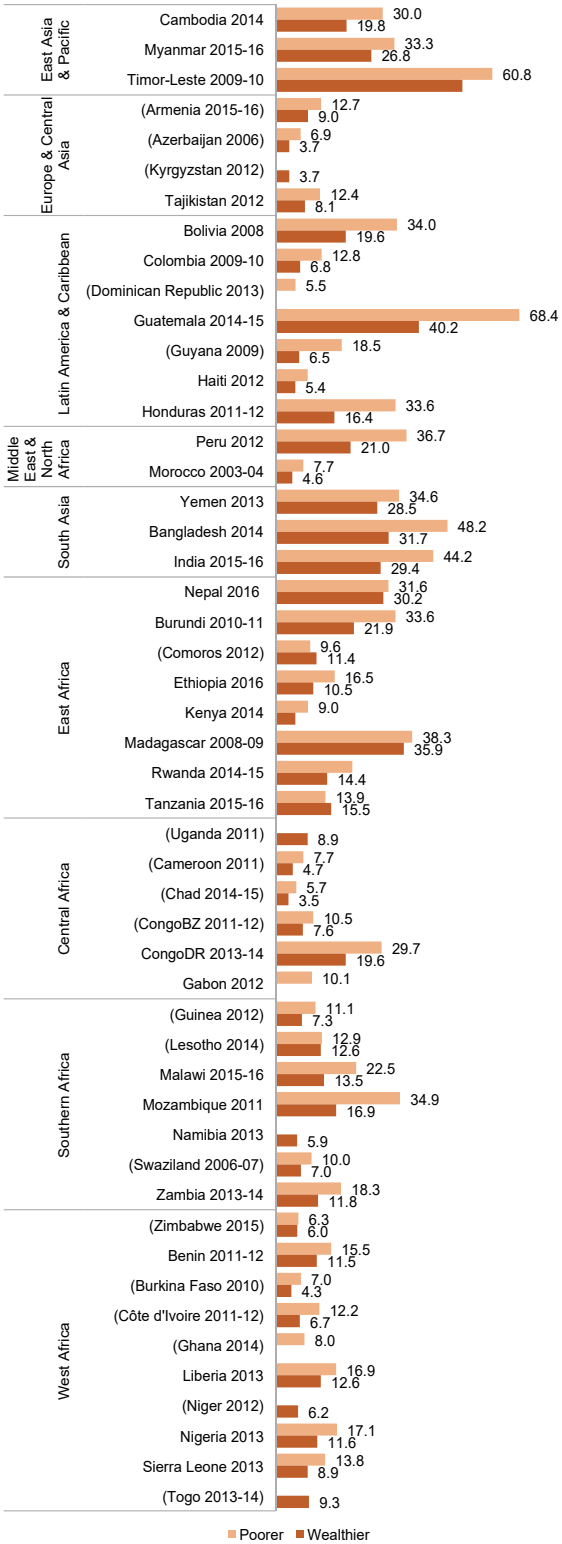
- In about a third of countries, prevalence of short stature is higher in rural than urban areas (20 of 53 countries).
- In over half of countries, prevalence of short stature is higher among girls with primary or no education than girls with a secondary/higher education (27 of 51 countries).
- In 42% of countries, prevalence of short stature is higher among girls in poorer households than wealthier households (21 of 50 countries).
- There are no consistent patterns in prevalence of short stature by employment. Employed girls have higher prevalence of short stature than girls not working in a few countries (7 of 54 countries).

Figure 17(a) Percentage of short stature girls age 15-19, by residence



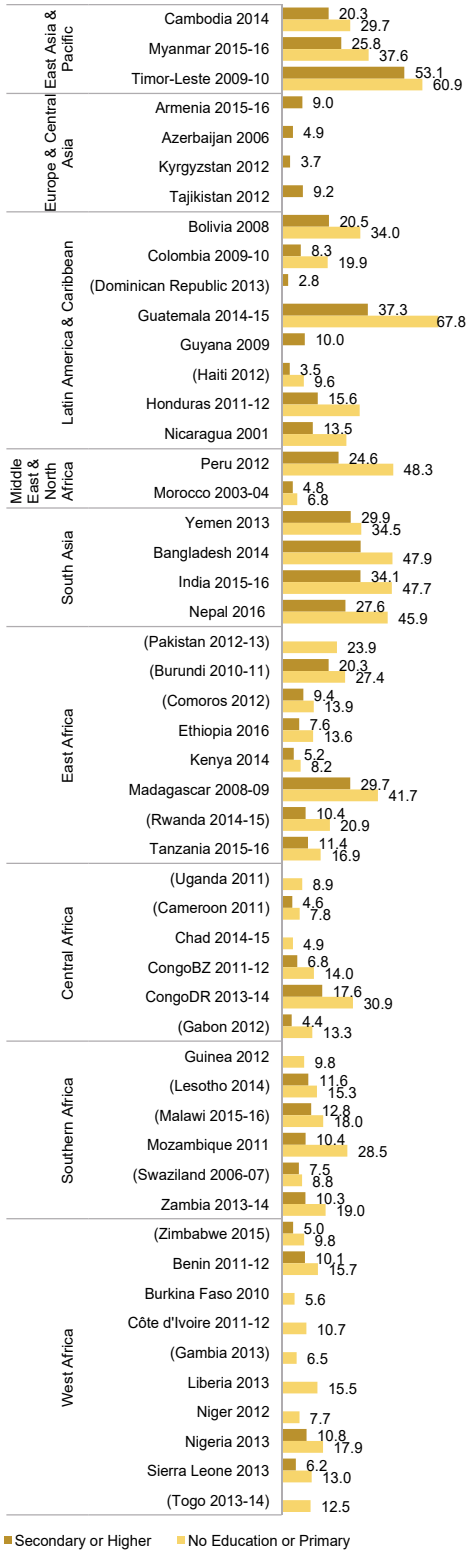
Note: For countries where the percentage is based on fewer than 25 unweighted cases, data is suppressed. For countries in parentheses, at least one percentage is based on 25-49 unweighted cases.

Figure 17(b) Percentage of short stature girls age 15-19, by wealth quintile



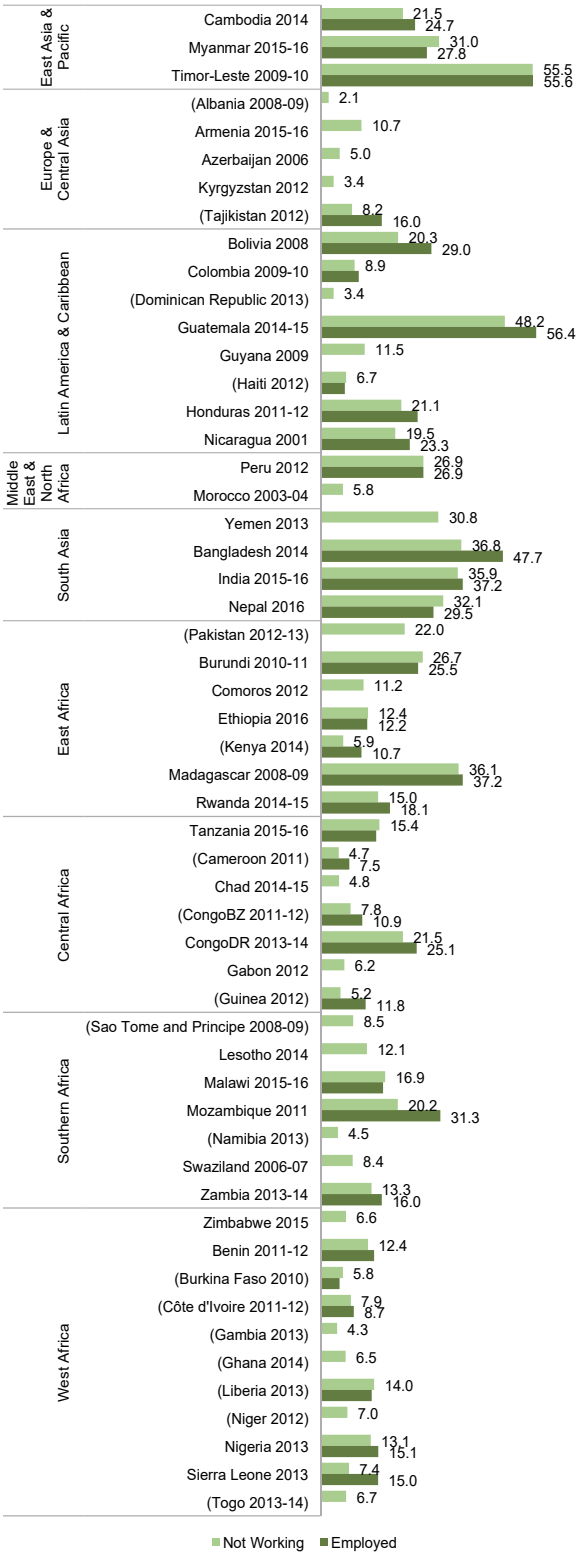
Note: For countries where the percentage is based on fewer than 25 unweighted cases, data is suppressed. For countries in parentheses, at least one percentage is based on 25-49 unweighted cases.

Figure 17(c) Percentage of short stature girls age 15-19, by education level



Note: For countries where the percentage is based on fewer than 25 unweighted cases, data is suppressed. For countries in parentheses, at least one percentage is based on 25-49 unweighted cases.

Figure 17(d) Percentage of short stature girls age 15-19, by employment status



Note: For countries where the percentage is based on fewer than 25 unweighted cases, data is suppressed. For countries in parentheses, at least one percentage is based on 25-49 unweighted cases.

Trend data

In total, 39 countries have multiple DHS surveys available for girls (Appendix A3.6). The three countries with the greatest change over time are noted. The trends in prevalence of short stature vary by country (Figures 18-23). Prevalence of short stature decreased in most countries, with the greatest decreases in Sierra Leone (-19.9pp), Nepal (-18.2pp), and Bangladesh (-11.9pp). In a few countries the prevalence of short stature increased—most in Armenia (+4.5pp), Madagascar (+2.9pp), and India (+1.8pp).

Figure 18 BMI-for-age country trends for non-pregnant girls age 15-19, East Asia and Pacific

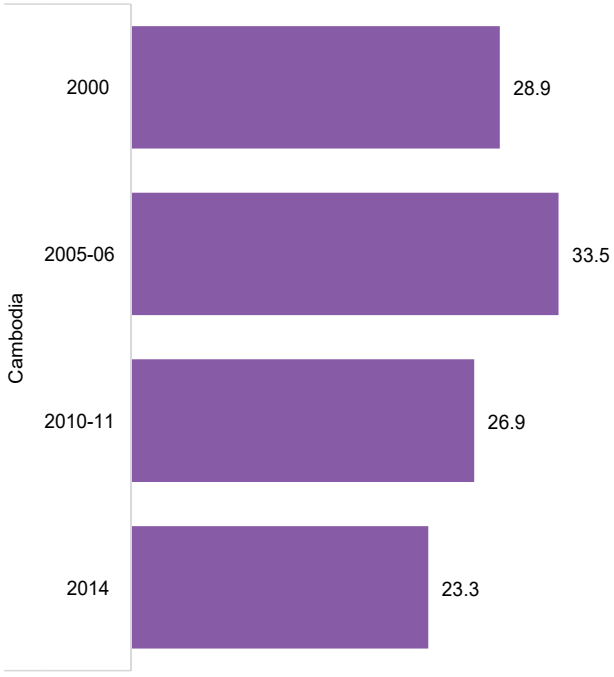


Figure 19 BMI-for-age country trends for non-pregnant girls age 15-19, Europe and Central Asia

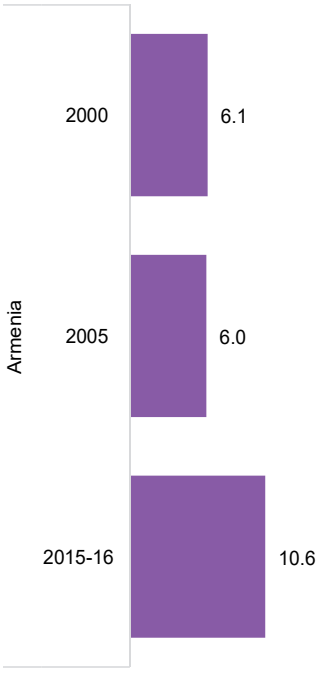


Figure 20 BMI-for-age country trends for non-pregnant girls age 15-19, Latin America and Caribbean

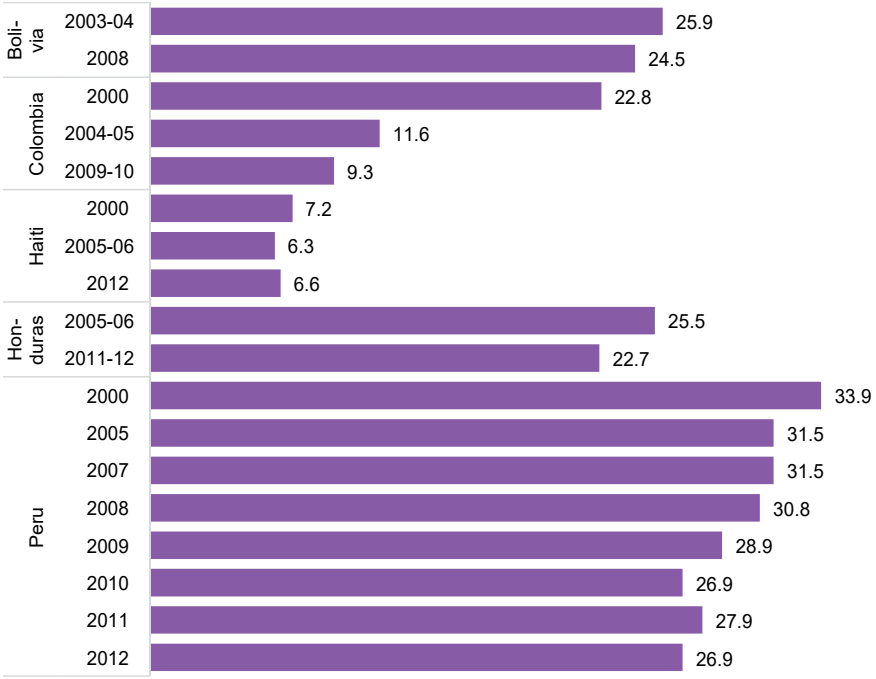


Figure 21 BMI-for-age country trends for non-pregnant girls age 15-19, Middle East and North Africa

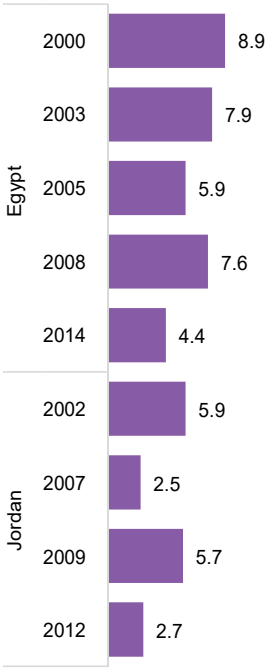


Figure 22 BMI-for-age country trends for non-pregnant girls age 15-19, South Asia

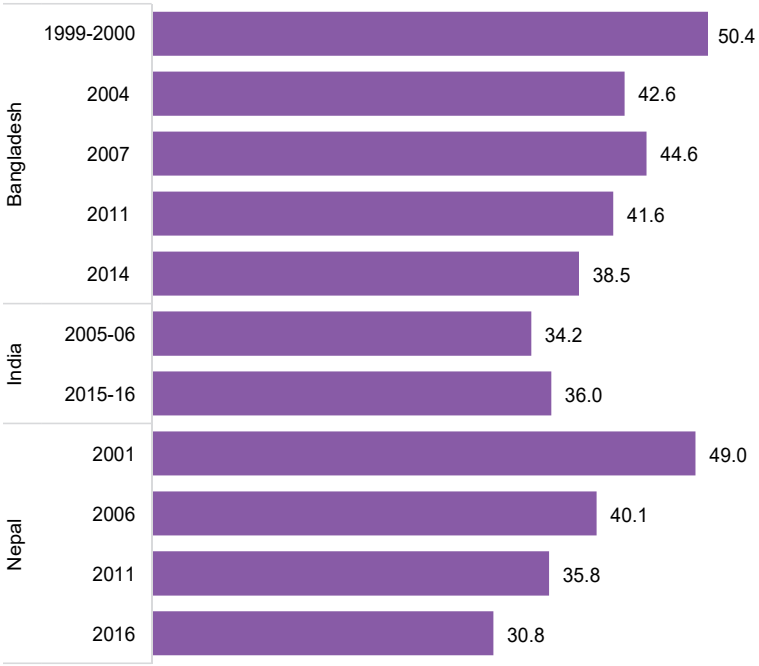
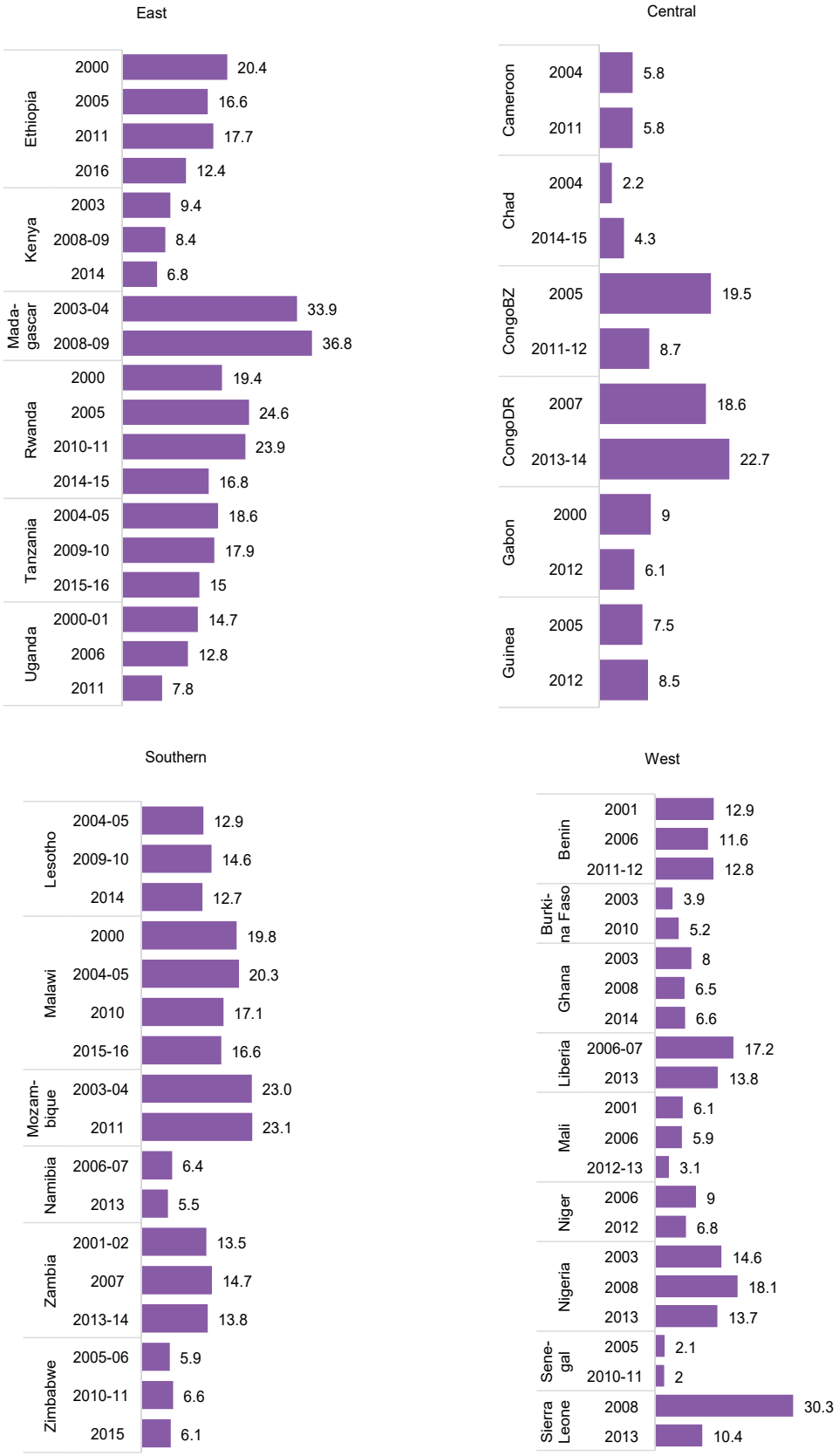


Figure 23 BMI-for-age country trends for non-pregnant girls age 15-19, sub-Saharan Africa



3.3 Childbearing

3.3.1 Country data

Data on childbearing among adolescent girls were available for 65 countries (Table 8). There were six surveys from East Asia and Pacific covering 40% of the region; eight surveys from Europe and Central Asia covering 36% of the region; nine surveys from Latin America and Caribbean covering 23% of the region; four surveys from Middle East and North Africa covering 21% of the region; six surveys from South Asia covering 75% of the region; and 35 surveys from sub-Saharan Africa covering 74% of the region.

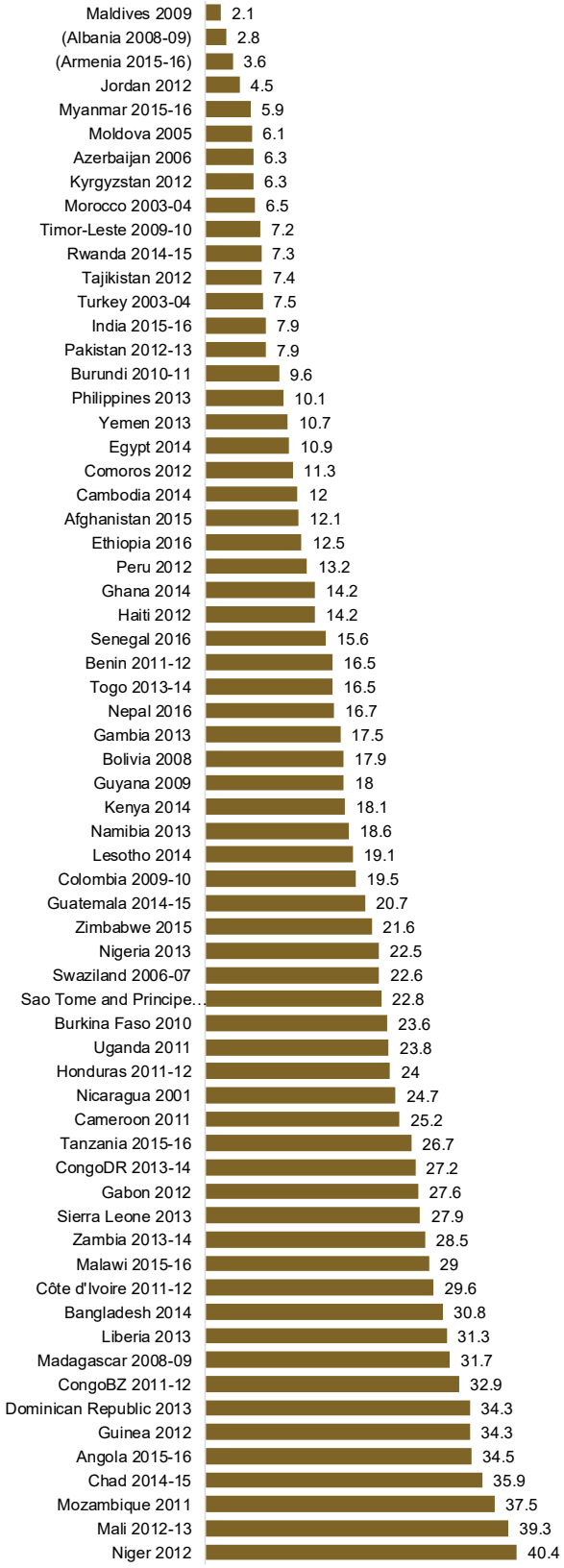
Table 8 List of countries by world region for childbearing among girls

World region	Countries (girls)
East Asia and Pacific	Cambodia, Myanmar, Philippines, Timor-Leste
Europe and Central Asia	Albania, Armenia, Azerbaijan, Kyrgyz Republic, Moldova, Tajikistan, Turkey,
Latin America and Caribbean	Bolivia, Colombia, Dominican Republic, Guatemala, Guyana, Haiti, Honduras, Nicaragua, Peru
Middle East and North Africa	Egypt, Jordan, Morocco, Yemen
South Asia	Afghanistan, Bangladesh, India, Maldives, Nepal, Pakistan
sub-Saharan Africa	Angola, Benin, Burkina Faso, Burundi, Cameroon, Chad, Comoros, Congo, Congo Democratic Republic, Côte d'Ivoire, Ethiopia, Gabon, Gambia, Ghana, Guinea, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mozambique, Namibia, Niger, Nigeria, Rwanda, São Tomé and Principe, Senegal, Sierra Leone, Swaziland, Tanzania, Togo, Uganda, Zambia, Zimbabwe

Prevalence of adolescent childbearing

Figure 24 shows the prevalence of childbearing among girls age 15-19. Prevalence estimates in the 65 countries are less than 10% in 25% of countries, 10-25% in 46% of countries, and over 25% in 29% of countries (Appendix A4.1). The three countries with the highest prevalence of adolescent childbearing are Mozambique (38%), Mali (39%), and Niger (40%).

Figure 24 Percentage of pregnant/childbearing girls age 15-19, by country



Note: For countries in parentheses, the percentage is based on 25-49 unweighted cases.

3.4 Anemia

3.4.1 World region data

For girls, the analysis included the most recent surveys from 48 countries (Table 9). There were three surveys from East Asia and Pacific covering 20% of the region; five surveys from Europe and Central Asia covering 23% of the region; six surveys from Latin America and Caribbean covering 15% of the region; three surveys from Middle East and North Africa covering 16% of the region; three surveys from South Asia covering 38% of the region; and 28 surveys from sub-Saharan Africa covering 60% of the region. For boys, surveys from 22 countries were included (Table 9). There were no surveys from East Asia and Pacific; one survey from Europe and Central Asia; two surveys from Latin America and Caribbean; no surveys from Middle East and North Africa; one survey from South Asia; and 18 surveys from sub-Saharan Africa covering 38% of the region.

Table 9 List of countries included in each world region for anemia for girls and boys age 15-19

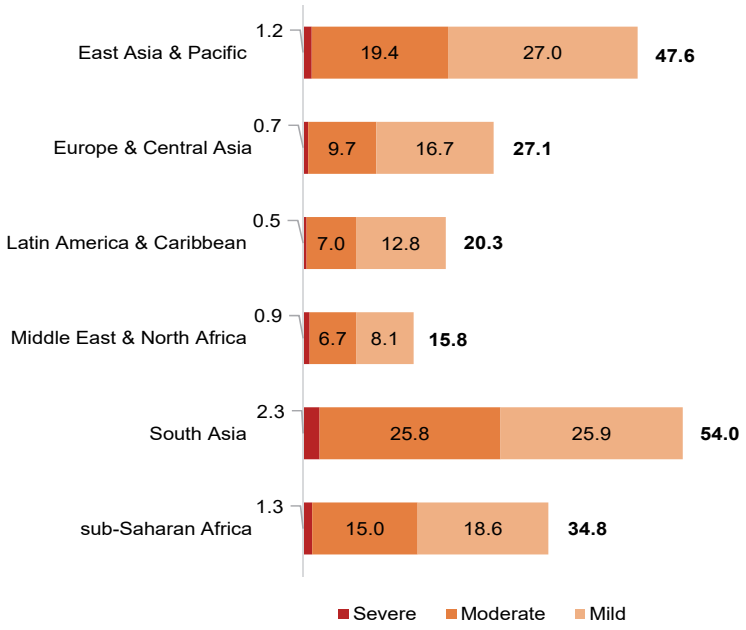
Region	Countries (girls)	Countries (boys)
East Asia and Pacific	Cambodia, Myanmar, Timor-Leste	none
Europe and Central Asia	Albania, Armenia, Azerbaijan, Kyrgyz Republic, Moldova	Albania
Latin America and Caribbean	Bolivia, Guatemala, Guyana, Haiti, Honduras, Peru	Guyana, Haiti
Middle East and North Africa	Egypt, Jordan, Yemen	None
South Asia	Bangladesh, India, Nepal	India
sub-Saharan Africa	Benin, Burkina Faso, Burundi, Cameroon, Congo, Congo Democratic Republic, Côte d'Ivoire, Ethiopia, Gabon, Gambia, Ghana, Guinea, Lesotho, Madagascar, Malawi, Mali, Mozambique, Namibia, Niger, Rwanda, São Tomé and Principe, Senegal, Sierra Leone, Swaziland, Tanzania, Togo, Uganda, Zimbabwe	Burkina Faso, Burundi, Congo Democratic Republic, Côte d'Ivoire, Ethiopia, Gabon, Guinea, Lesotho, Madagascar, Namibia, Niger, São Tomé and Principe, Senegal, Sierra Leone, Swaziland, Togo, Uganda, Zimbabwe

Prevalence of anemia

Figure 25 (a) and (b) shows anemia prevalence across world regions for non-pregnant and pregnant girls respectively. South Asia has the highest prevalence of any anemia among both non-pregnant and pregnant girls (54% and 52% respectively), and Middle East and North Africa has the lowest prevalence (16% and 25% respectively). The burden of any anemia is higher for pregnant girls in all regions except South Asia. The greatest difference in the prevalence of any anemia between non-pregnant and pregnant girls is in sub-Saharan Africa, at 35% and 51% respectively. Across regions, prevalence of severe anemia among non-pregnant and pregnant girls is low, ranging from less than 1% to 2.3%. The prevalence of moderate and mild anemia is distributed relatively equally within the regions except for Latin America and Caribbean, where mild anemia is more prevalent than moderate anemia for both non-pregnant and pregnant girls.

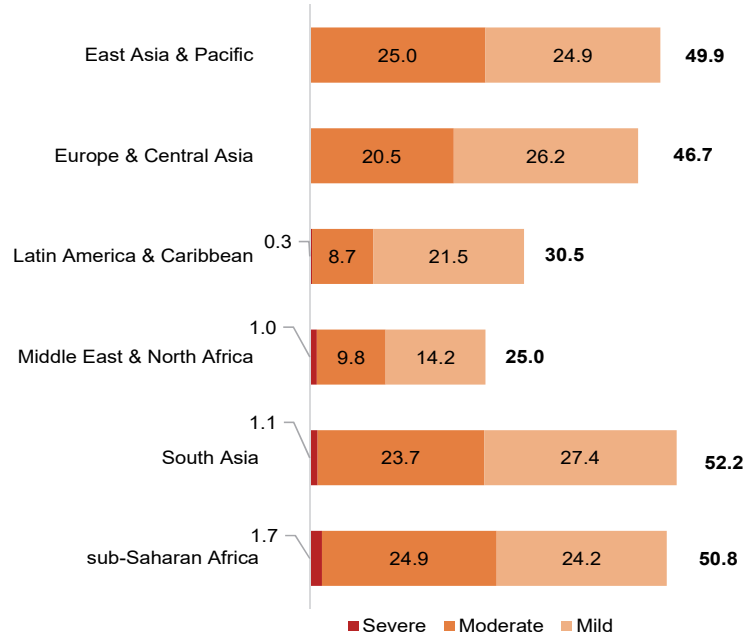
Figure 26 shows anemia prevalence across world regions for boys. The prevalence of any anemia is highest in sub-Saharan Africa (36%), followed by Latin America and Caribbean (35%) and South Asia (30%), and is lowest in Europe and Central Asia (23%). Across regions, mild anemia is more prevalent than moderate anemia, while less than 1% of boys in all regions have severe anemia.

Figure 25(a) Anemia among non-pregnant girls age 15-19, by world region



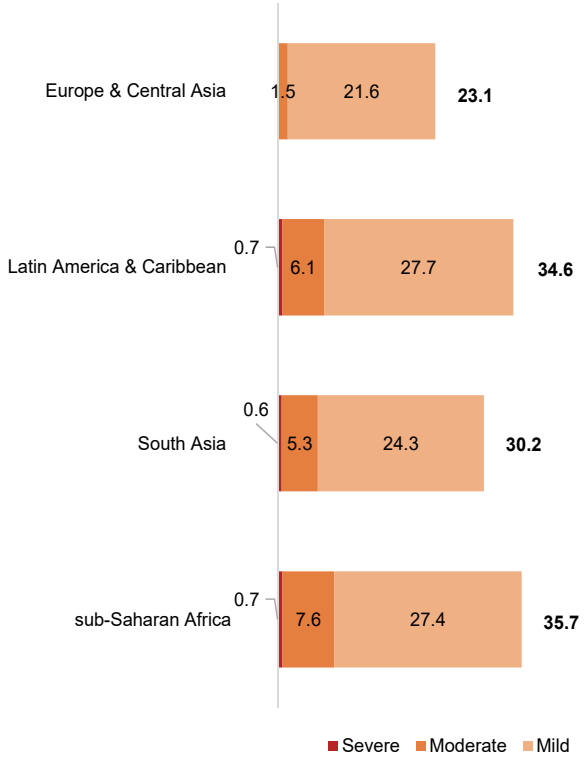
Note: Any Anemia: hemoglobin <12.0g/dL; Mild Anemia: 11.0g/dL-11.9g/dL; Moderate Anemia: hemoglobin 8.0g/dL-10.9g/dL; Severe Anemia: hemoglobin <8.0g/dL

Figure 25(b) Anemia among pregnant girls age 15-19, by world region



Note: Any Anemia: hemoglobin <12.0g/dL; Mild Anemia: 11.0g/dL-11.9g/dL; Moderate Anemia: hemoglobin 8.0g/dL-10.9g/dL; Severe Anemia: hemoglobin <8.0g/dL

Figure 26 Anemia among boys age 15-19, by world region



Note: Any Anemia: hemoglobin <12.0g/dL; Mild Anemia: 11.0g/dL-11.9g/dL; Moderate Anemia: hemoglobin 8.0g/dL-10.9g/dL; Severe Anemia: hemoglobin <8.0g/dL

Comparisons between any anemia in adolescents and adults

The absolute percentage point difference in any anemia between non-pregnant adolescent girls and non-pregnant adult women is high in Middle East and North Africa (-15.5pp), indicating that non-pregnant adult women have higher anemia prevalence than non-pregnant girls (Table 10). There are small differences in both directions in East Asia and Pacific (+2.1pp), Europe and Central Asia (-3.5pp), South Asia (+0.7pp), and sub-Saharan Africa (-0.7pp). Country patterns vary (Appendix A5.1).

Table 10 Anemia comparison between non-pregnant girls age 15-19 and non-pregnant women age 20-49

World region	Anemia category	Prevalence 15-19 yrs				Prevalence 20-49 yrs				Percentage point difference (15-19 yrs – 20-49 yrs)
		N	%	LB	UB	N	%	LB	UB	
East Asia and Pacific	Any	4,574	47.6	45.0	50.3	21,979	45.5	44.3	46.8	2.1
	Mild		27.0	24.7	29.3		24.8	23.9	25.6	2.2
	Moderate		19.4	17.4	21.7		19.4	18.4	20.4	0.0
	Severe		1.2	0.8	1.9		1.4	1.1	1.7	-0.2
Europe and Central Asia	Any	6,395	27.1	25.6	28.7	28,799	30.6	29.5	31.6	-3.5
	Mild		16.7	15.4	18.1		16.1	15.5	16.8	0.6
	Moderate		9.7	8.6	10.9		13.2	12.4	14.0	-3.5
	Severe		0.7	0.5	1.1		1.2	1.0	1.5	-0.5
Latin America and Caribbean	Any	18,484	20.3	19.4	21.2	66,986	20.3	19.8	20.9	0.0
	Mild		12.8	12.1	13.5		12.0	11.6	12.4	0.8
	Moderate		7.0	6.4	7.5		7.6	7.3	7.9	-0.6
	Severe		0.5	0.4	0.7		0.7	0.7	0.8	-0.2
Middle East and North Africa	Any	2,055	15.8	13.1	18.9	17,416	31.3	30.1	32.5	-15.5
	Mild		8.1	6.1	10.7		18.5	17.5	19.5	-10.4
	Moderate		6.7	5.2	8.7		11.6	10.9	12.3	-4.9
	Severe		0.9	0.6	1.5		1.2	1.1	1.4	-0.3
South Asia	Any	21,962	55.5	54.5	56.5	91,607	54.8	54.1	55.4	0.7
	Mild		24.5	23.8	25.3		23.6	23.2	24.0	0.9
	Moderate		27.1	26.2	28.0		27.4	26.9	28.0	-0.3
	Severe		3.9	3.5	4.2		3.7	3.5	3.9	0.2
sub-Saharan Africa	Any	36,924	34.8	33.8	35.9	130,430	35.5	34.8	36.3	-0.7
	Mild		18.6	17.8	19.3		17.7	17.2	18.1	0.9
	Moderate		15.0	14.3	15.7		16.2	15.8	16.7	-1.2
	Severe		1.3	1.1	1.5		1.6	1.5	1.8	-0.3

LB and UB refer to the lower and upper bounds of the 95% confidence interval.
Estimates for world regions were population-weighted. N includes the total number for all anemia categories (mild, moderate, severe).

The absolute percentage point difference in any anemia between boys age 15-19 and adult men, from highest to lowest, is in Latin America and Caribbean (+15.2pp), sub-Saharan Africa (+14.8pp), South Asia (+7.8pp), and Europe and Central Asia (+6.8pp) (Table 11). This pattern indicates that boys have a higher prevalence of anemia compared with men. Country patterns are consistent with regional patterns (Appendix A5.2).

Table 11 Anemia comparison between boys age 15-19 and men age 20-49

World region	Anemia category	Prevalence 15-19 yrs				Prevalence 20-49 yrs				Percentage point difference (15-19 yrs – 20-49 yrs)
		N	%	LB	UB	N	%	LB	UB	
Europe and Central Asia	Any	641	23.1	18.4	28.6	2,283	16.3	13.8	19.0	6.8
	Mild		21.6	16.9	27.1		15.7	13.3	18.3	5.9
	Moderate		1.5	0.7	3.3		0.6	0.3	1.1	0.9
	Severe		0.0	0.0	0.0		0.0	0.0	0.0	0.0
Latin America and Caribbean	Any	2,185	34.6	31.9	37.4	5,949	19.4	17.9	21.0	15.2
	Mild		27.7	25.4	30.2		16.6	15.3	18.0	11.1
	Moderate		6.1	4.6	8.1		2.4	2.0	3.0	3.7
	Severe		0.7	0.4	1.5		0.4	0.2	0.6	0.3
South Asia	Any	18,389	29.1	28.1	30.2	81,330	21.3	20.8	21.8	7.8
	Mild		23.4	22.5	24.3		16.5	16.1	17.0	6.9
	Moderate		5.2	4.8	5.7		4.3	4.1	4.5	0.9
	Severe		0.5	0.4	0.7		0.5	0.4	0.5	0.0
sub-Saharan Africa	Any	20,969	35.7	34.2	37.2	66,902	20.9	20.3	21.7	14.8
	Mild		27.4	26.1	28.7		17.1	16.4	17.7	10.3
	Moderate		7.6	6.8	8.5		3.6	3.3	3.9	4.0
	Severe		0.7	0.4	1.0		0.3	0.3	0.5	0.4

3.4.2 Country data

Prevalence of anemia

Sample sizes were generally insufficient to show prevalence estimates for pregnant girls (Appendix A5.3) and thus all country data are for non-pregnant girls only. Figure 27 (a) and (b) shows the prevalence of any anemia for non-pregnant girls and boys, respectively. In the 48 countries studied, for non-pregnant girls, prevalence is less than 20% in 21% of countries, 20-40% in 33% of countries, and over 40% in 46% of countries (Appendix A5.4). The three countries with the highest prevalence of anemia are Gambia (58%), Gabon (63%), and Yemen (69%).

For boys, in the 22 countries studied, prevalence of anemia is less than 20% in 27% of countries, 20-40% in 45% of countries, and over 40% in 27% of countries (Appendix A5.5). The three countries with the highest prevalence are Niger (43%), Burkina Faso (44%), and Senegal (54%).

Figure 27(a) Percentage of any anemia among non-pregnant girls age 15-19, by country

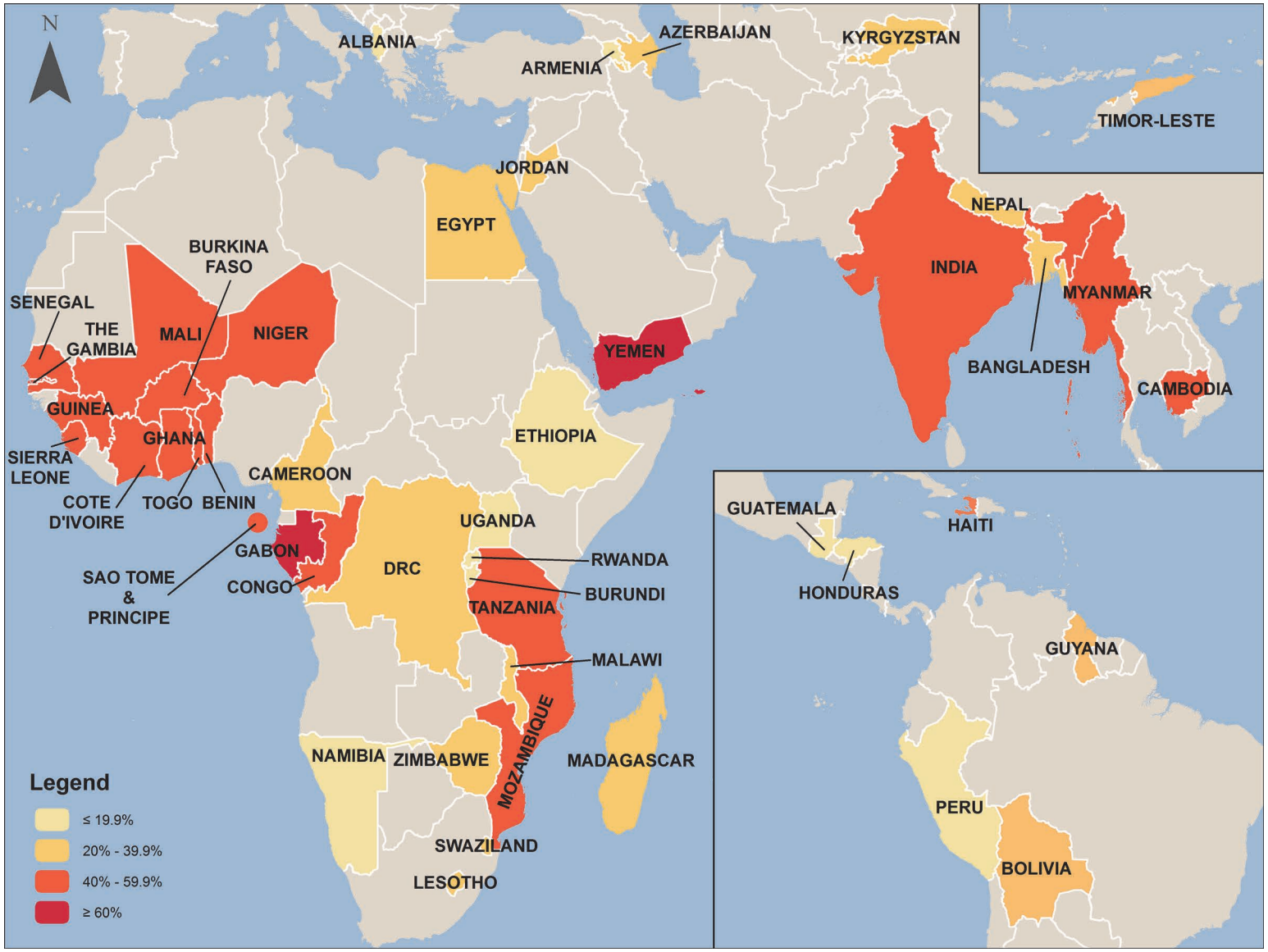
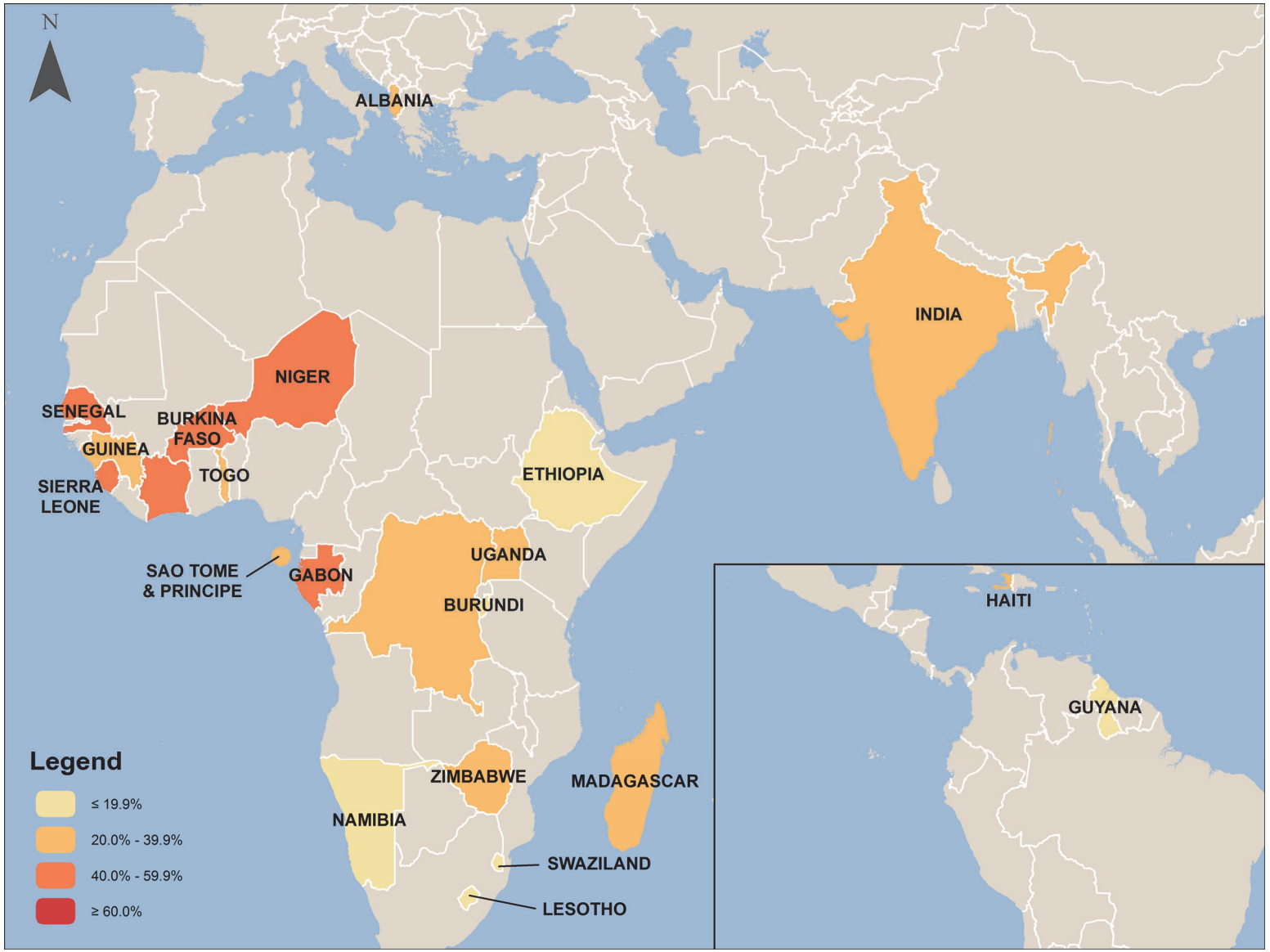


Figure 27(b) Percentage of any anemia among boys age 15-19, by country



Prevalence of anemia by demographic variables

Among girls, patterns in the prevalence of any anemia vary by residence, education, wealth, and employment status (Figure 28(a)-(d)) and boys (Figure 29(a)-(d)). Differences in the prevalence of any anemia by covariate are noted if the difference is at least 5%, and countries are noted if there are five or fewer countries with this difference (Appendix A5.6-13).

- Among girls, prevalence of any anemia is higher in rural than urban areas in about a fifth of countries studied (10 of 48 countries). In Congo, Cameroon, Haiti, Senegal, and Togo, however, any anemia is more prevalent in urban than rural areas.

- Among boys, prevalence of any anemia is higher in rural than urban areas in over half of countries (12 out of 22 countries).

- Among girls in Gabon, Lesotho, Senegal, and Swaziland, prevalence of any anemia is higher among those with secondary or higher education. In many other countries, however, any anemia is more prevalent among girls with primary or no education (18 of 48 countries).

- Among boys in most countries, prevalence of any anemia is higher among those with primary or no education (16 of 21 countries). An exception is Guyana, where any anemia in boys is more prevalent among those with secondary or higher education.

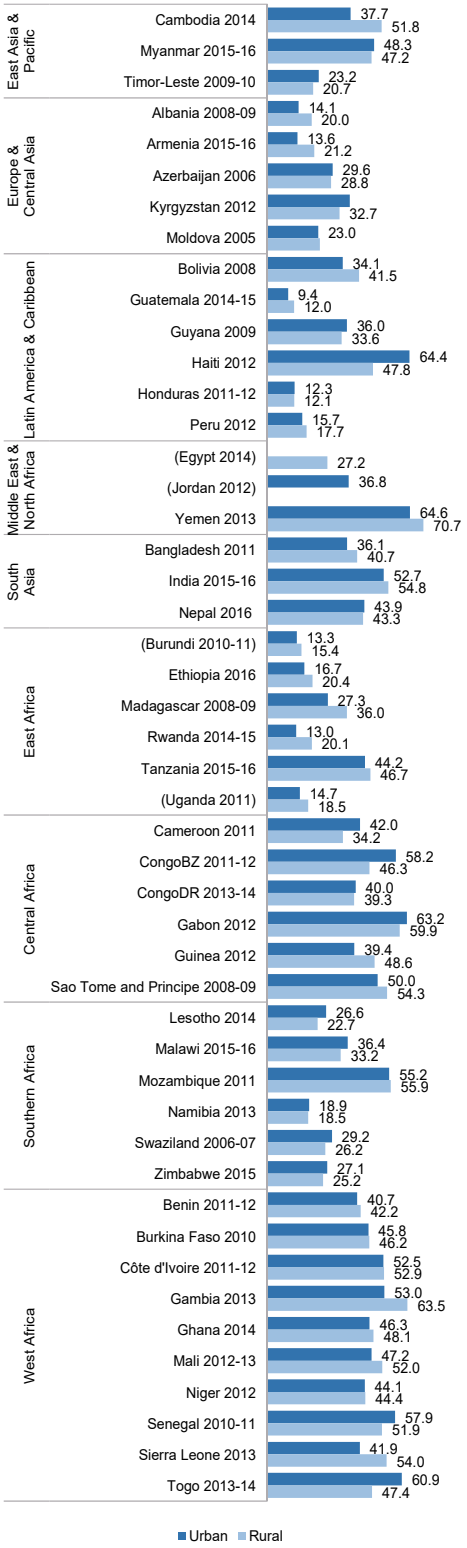
- Among girls, prevalence of any anemia is higher among poorer households compared with wealthier households (10 of 46 countries). Conversely, in 6 of the 46 countries any anemia is more prevalent among girls in wealthier households compared with poorer households.

- Among boys, prevalence of any anemia is higher among poorer households compared with wealthier households in over half of countries (14 of 22 countries).

- In some countries, employed girls have higher prevalence of any anemia than girls who are not working (8 of 48 countries). In Ethiopia, Cameroon, Malawi, Senegal, and Uganda, however, girls who are not working have higher prevalence of any anemia.

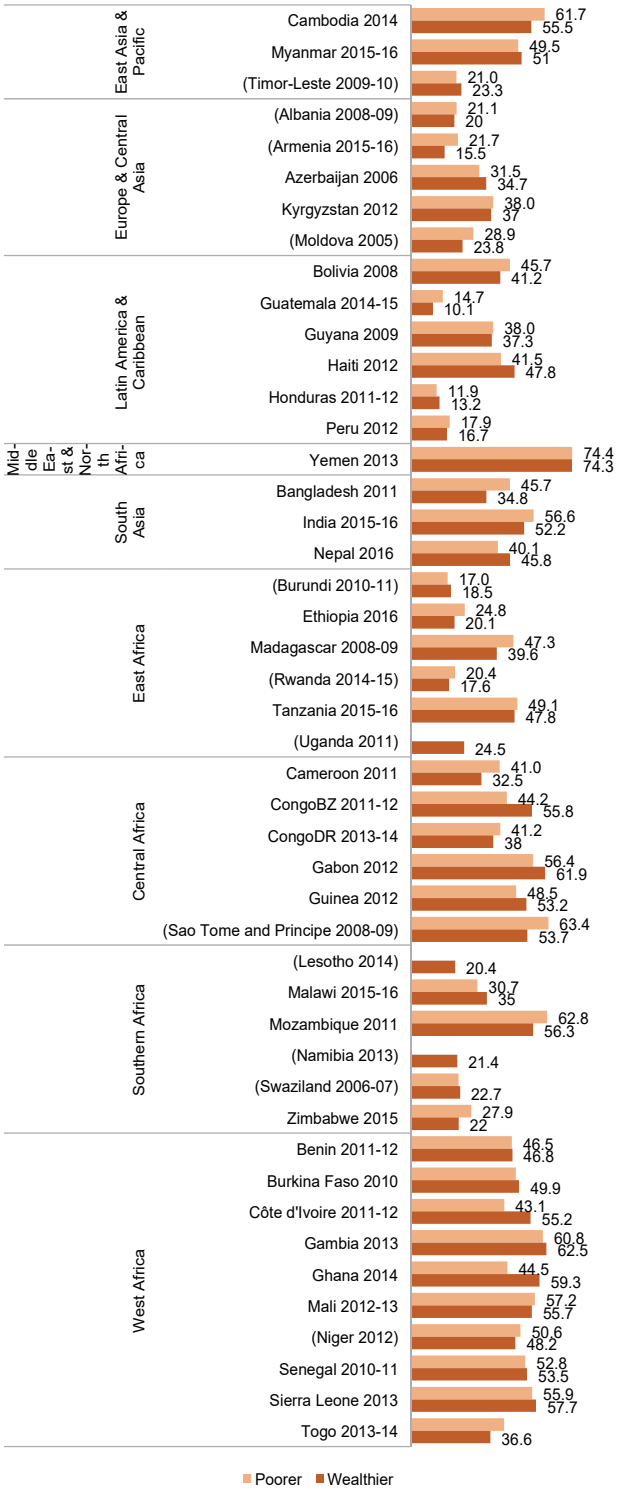
- In Burkina Faso, Niger, and Sierra Leone, employed boys have higher prevalence of any anemia than boys who are not working. Conversely, in Congo Democratic Republic, Ivory Coast, Guinea, Senegal, and Togo, any anemia is more prevalent among boys who are not working.

Figure 28(a) Percentage of anemic non-pregnant girls age 15-19, by residence



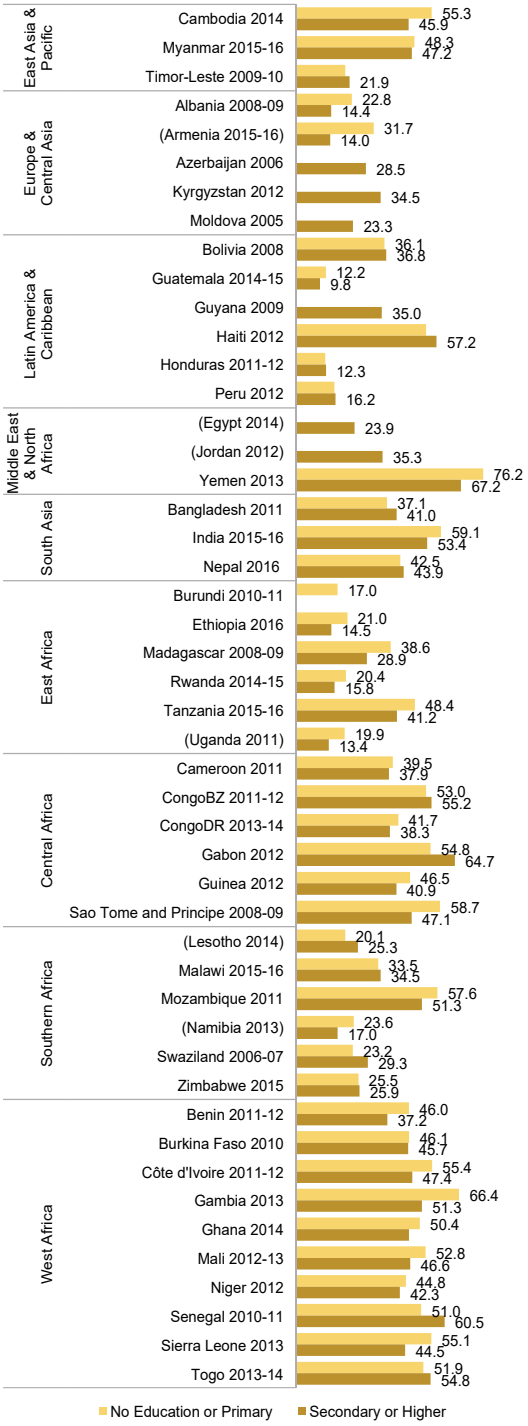
Note: For countries where the percentage is based on fewer than 25 unweighted cases, data is suppressed. For countries in parentheses, at least one percentage is based on 25-49 unweighted cases.

Figure 28(b) Percentage of anemic non-pregnant girls age 15-19, by wealth quintile



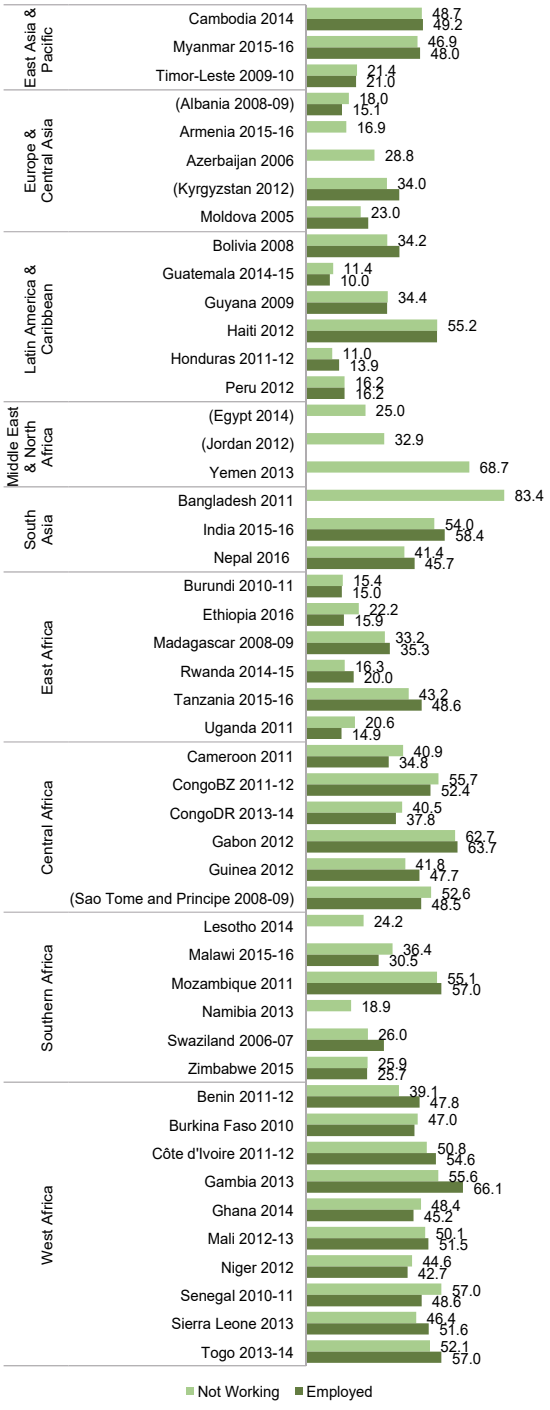
Note: For countries where the percentage is based on fewer than 25 unweighted cases, data is suppressed. For countries in parentheses, at least one percentage is based on 25-49 unweighted cases.

Figure 28(c) Percentage of anemic non-pregnant girls age 15-19, by education level



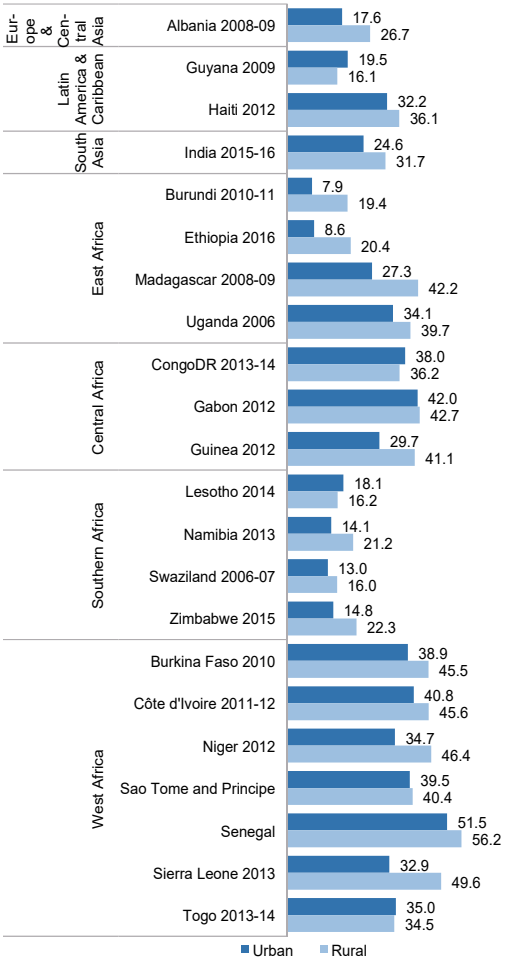
Note: For countries where the percentage is based on fewer than 25 unweighted cases, data is suppressed. For countries in parentheses, at least one percentage is based on 25-49 unweighted cases.

Figure 28(d) Percentage of anemic non-pregnant girls age 15-19, by employment status



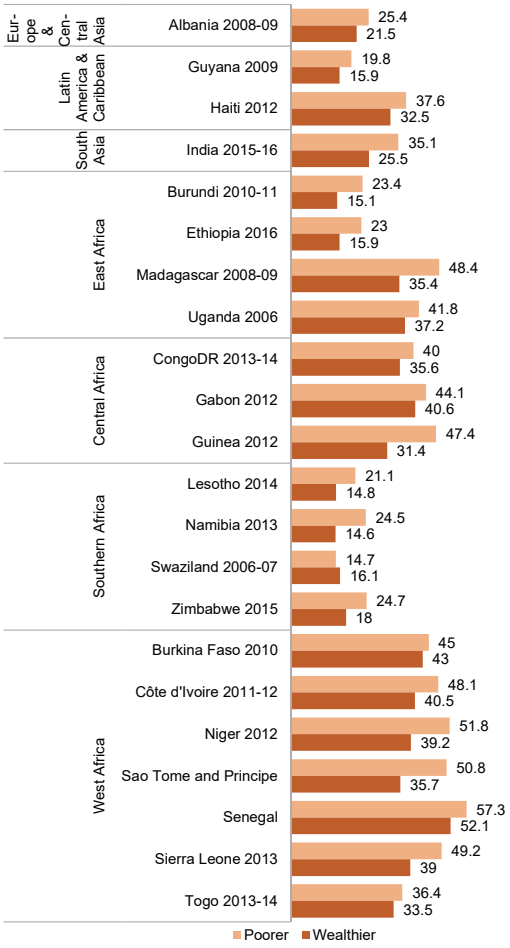
Note: For countries where the percentage is based on fewer than 25 unweighted cases, data is suppressed. For countries in parentheses, at least one percentage is based on 25-49 unweighted cases.

Figure 29(a) Percentage of anemic boys age 15-19, by residence



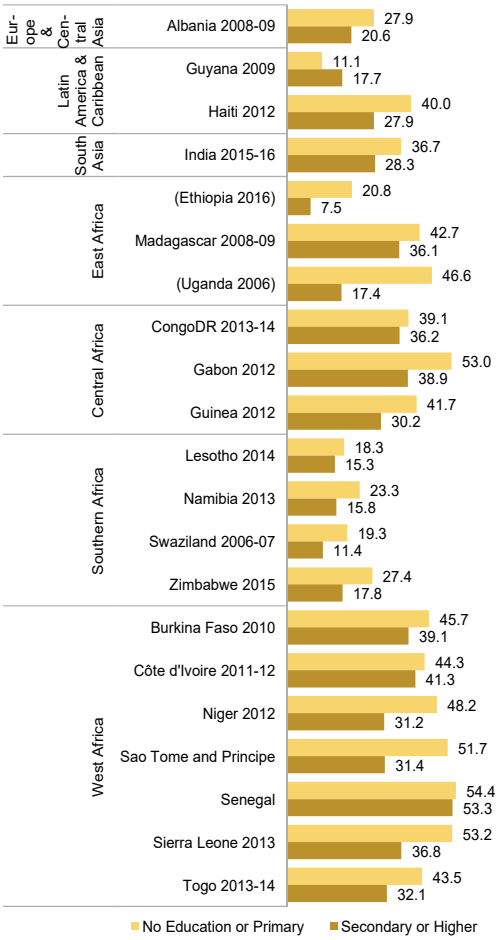
Note: For countries where the percentage is based on fewer than 25 unweighted cases, data is suppressed. For countries in parentheses, at least one percentage is based on 25-49 unweighted cases.

Figure 29(b) Percentage of anemic boys age 15-19, by wealth quintile



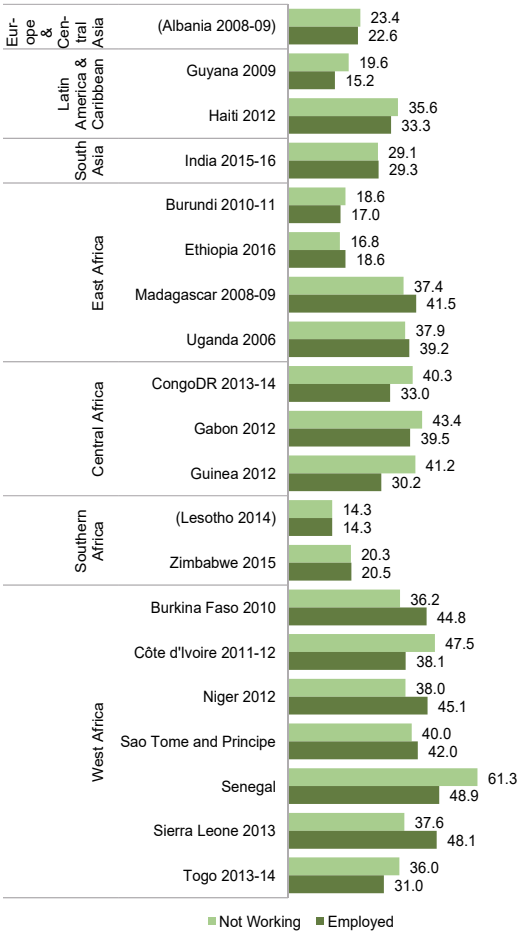
Note: For countries where the percentage is based on fewer than 25 unweighted cases, data is suppressed. For countries in parentheses, at least one percentage is based on 25-49 unweighted cases.

Figure 29(c) Percentage of anemic boys age 15-19, by education level



Note: For countries where the percentage is based on fewer than 25 unweighted cases, data is suppressed. For countries in parentheses, at least one percentage is based on 25-49 unweighted cases.

Figure 29(d) Percentage of anemic boys age 15-19, by employment status



Note: For countries where the percentage is based on fewer than 25 unweighted cases, data is suppressed. For countries in parentheses, at least one percentage is based on 25-49 unweighted cases.

Trend data

In total, 29 countries have multiple DHS surveys available for girls and nine countries have multiple surveys available for boys (Appendix A5.14-15). The three countries with the greatest change over time are noted.

Figures 30-34 show that the prevalence of any anemia in girls decreased in most countries, with the greatest declines in Zimbabwe (-46.0pp), Benin (-23.3pp), and Peru (-12.2pp). In a few countries, prevalence of any anemia increased—most in Armenia (+9.1pp), Bolivia (+6.4pp), and Nepal (+4.9pp).

Figure 35 shows that the prevalence of any anemia in boys decreased in most countries, with the greatest declines in Congo Democratic Republic (-21.0pp), Zimbabwe (-7.7pp), and Senegal (-6.0pp). In a few countries, prevalence of any anemia increased—most in Niger (+4.3pp), Lesotho (+3.7pp), and Ethiopia (+0.5pp).

Figure 30 Anemia country trends for non-pregnant girls age 15-19, East Asia and Pacific

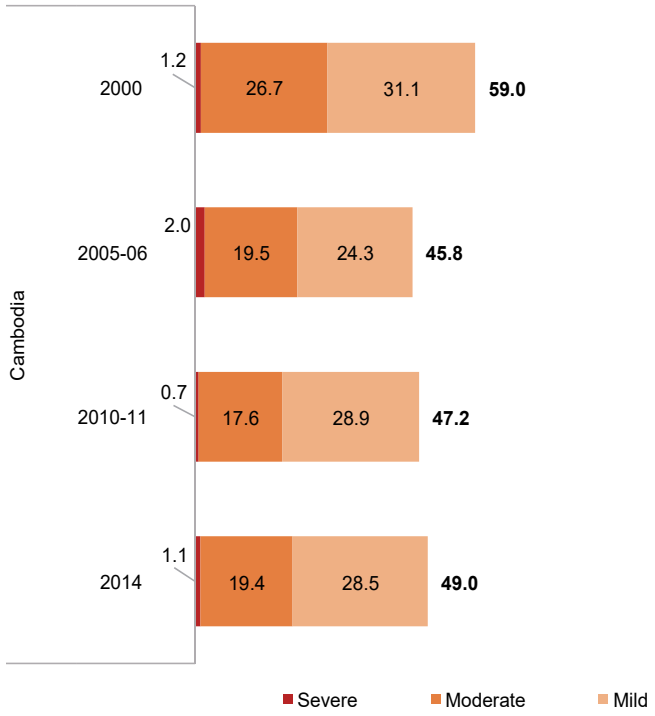


Figure 31 Anemia country trends for non-pregnant girls age 15-19, Europe and Central Asia

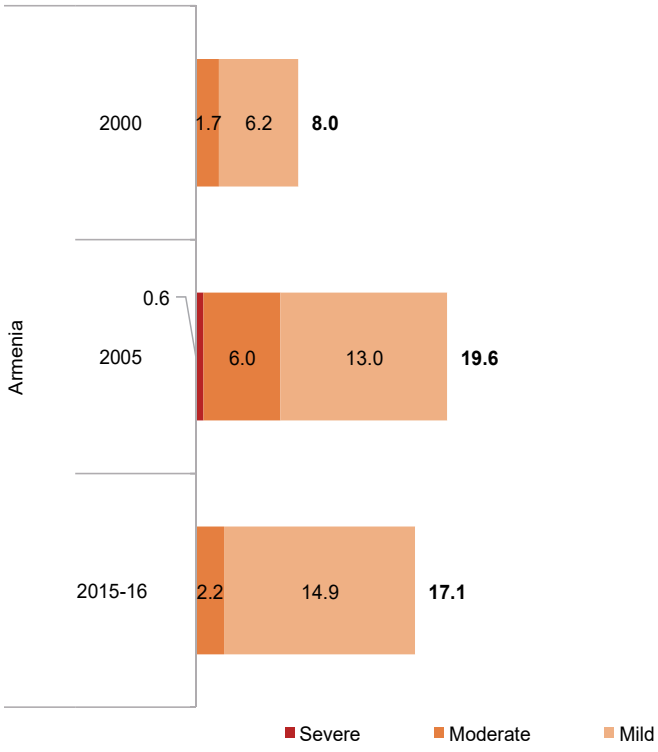


Figure 32 Anemia country trends for non-pregnant girls age 15-19, Latin America and Caribbean

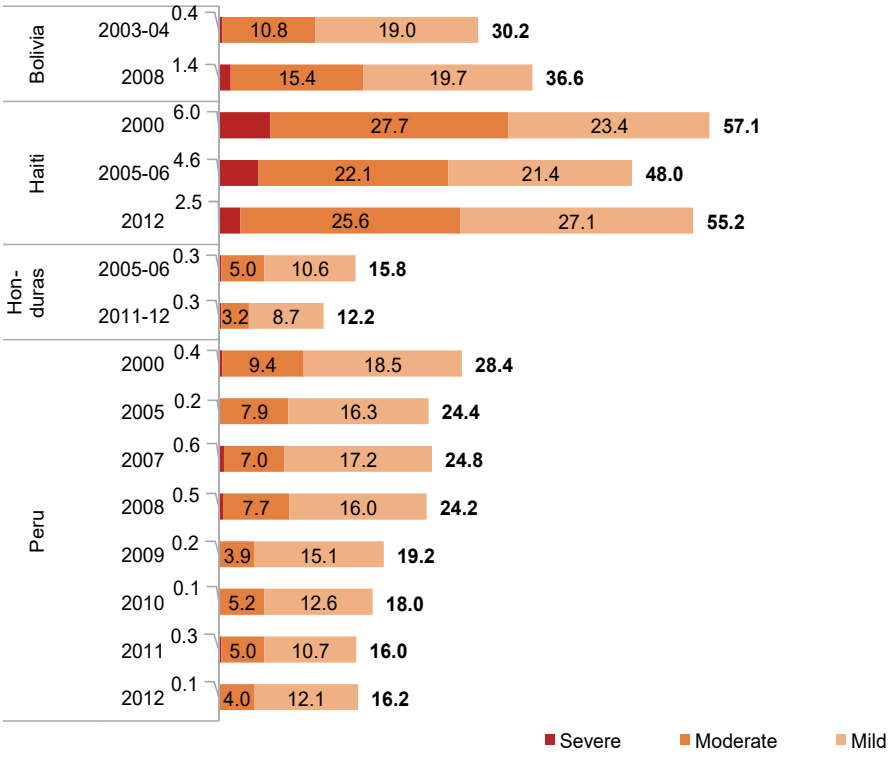


Figure 33 Anemia country trends for non-pregnant girls age 15-19, South Asia

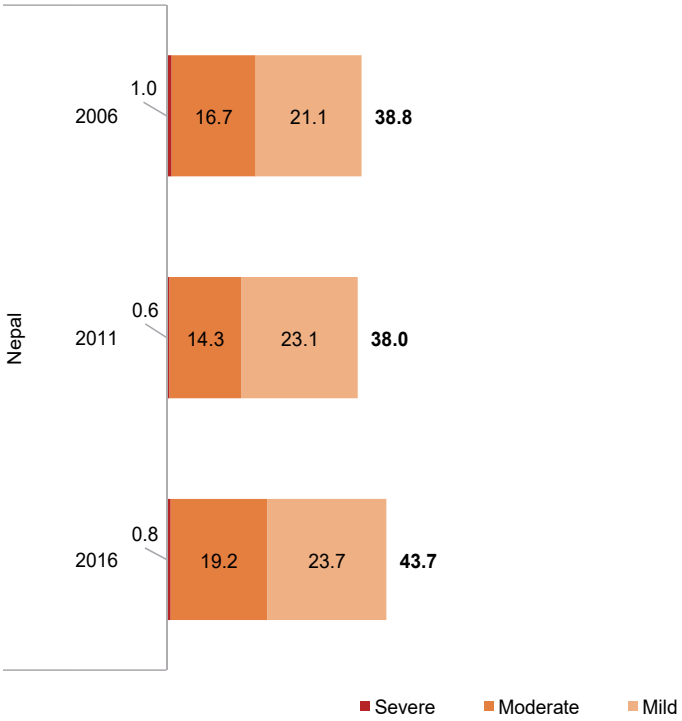


Figure 34 Anemia country trends for non-pregnant girls age 15-19, sub-Saharan Africa

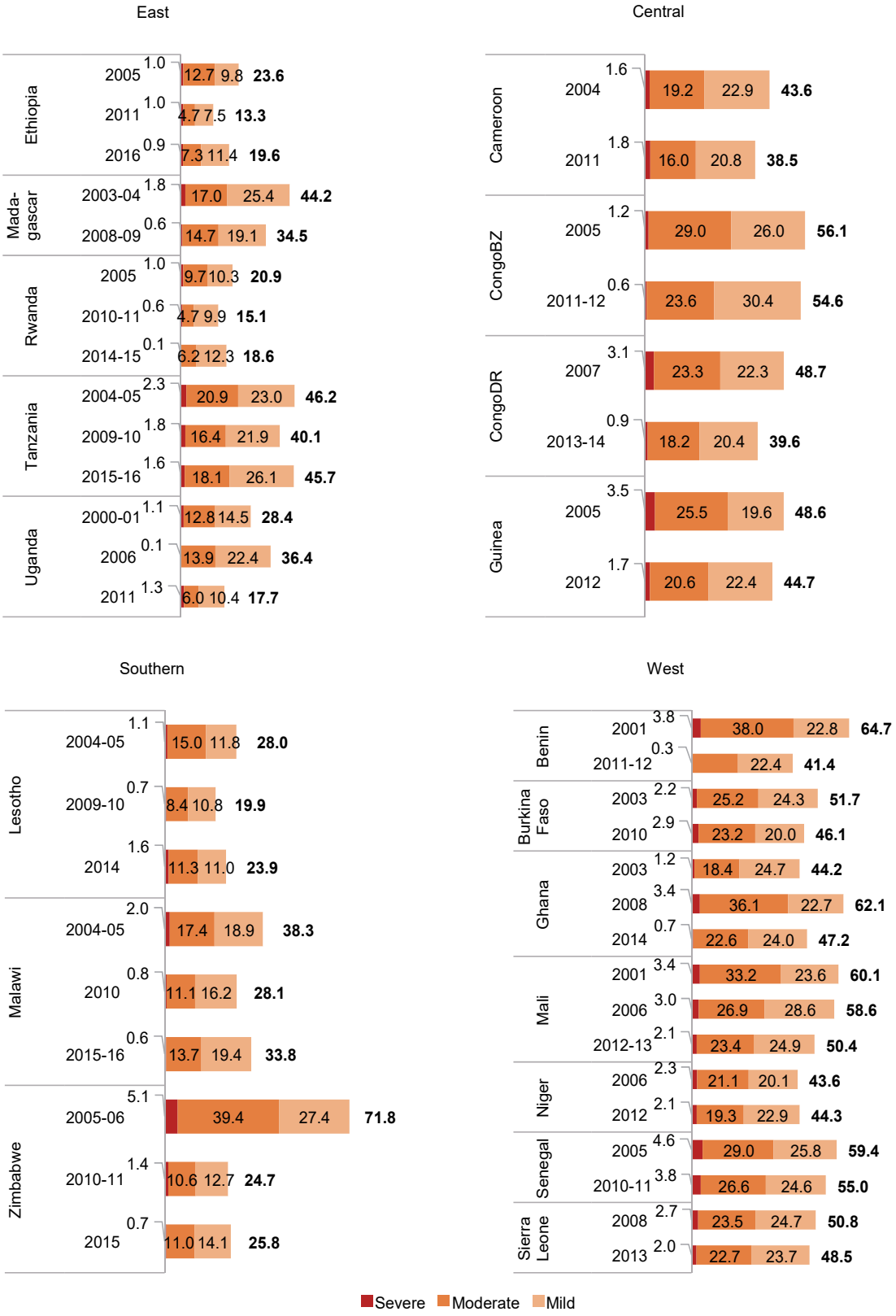
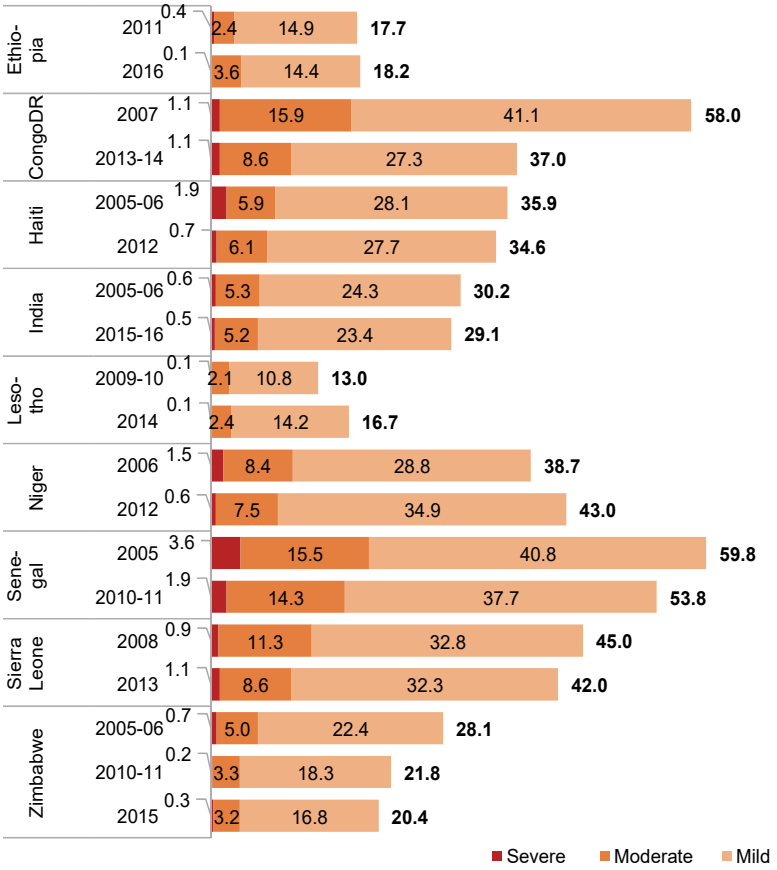


Figure 35 Anemia country trends for boys age 15-19, all world regions



3.5 Iron Supplementation

3.5.1 World region data

Data on iron supplementation among girls were available from 62 countries (Table 12). There were four surveys from East Asia and Pacific covering 27% of the region; six surveys from Europe and Central Asia covering 27% of the region; eight surveys from Latin America and Caribbean covering 21% of the region; four surveys from Middle East and North Africa covering 21% of the region; five surveys from South Asia covering 63% of the region; and 35 surveys from sub-Saharan Africa covering 74% of the region.

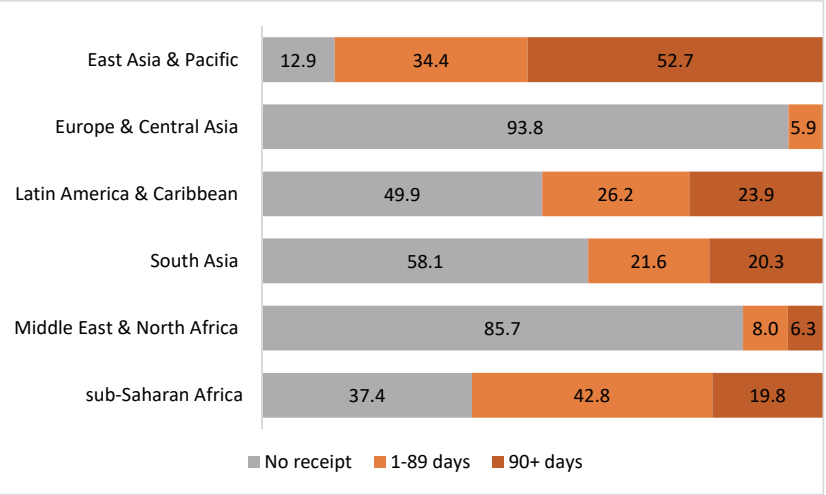
Table 12 List of countries by world region for iron supplementation among girls

World region	Countries
East Asia and Pacific	Cambodia, Myanmar, Philippines, Timor-Leste
Europe and Central Asia	Albania, Armenia, Azerbaijan, Kyrgyz Republic, Moldova, Tajikistan
Latin America and Caribbean	Bolivia, Dominican Republic, Guatemala, Guyana, Haiti, Honduras, Nicaragua, Peru
Middle East and North Africa	Egypt, Jordan, Morocco, Yemen
South Asia	Afghanistan, India, Maldives, Nepal, Pakistan
sub-Saharan Africa	Angola, Benin, Burkina Faso, Burundi, Cameroon, Chad, Comoros, Congo, Congo Democratic Republic, Côte d'Ivoire, Ethiopia, Gabon, Gambia, Ghana, Guinea, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mozambique, Namibia, Niger, Nigeria, Rwanda, São Tomé and Principe, Senegal, Sierra Leone, Swaziland, Tanzania, Togo, Uganda, Zambia, Zimbabwe

Prevalence of iron tablet receipt and consumption

Figure 36 shows the prevalence of iron tablet receipt and consumption during pregnancy among girls by world region. Non-receipt of iron tablets during the last pregnancy is most common in Europe and Central Asia (94%), followed by Middle East and North Africa (86%), South Asia (58%), Latin America and Caribbean (50%), sub-Saharan Africa (37%), and East Asia and Pacific (13%). Prevalence of any iron tablet consumption is over 50% in East Asia and Pacific, Latin America and Caribbean, and sub-Saharan Africa. Consumption of iron tablets for at least 90 days is most prevalent in East Asia and Pacific (53%), followed by Latin America and Caribbean (24%), South Asia (20%), and sub-Saharan Africa (20%).

Figure 36 Iron tablet receipt and consumption among childbearing girls age 15-19, by world region



Note: Iron supplementation during girls' last pregnancy within the last five years.

Comparisons between iron tablet receipt and consumption during last pregnancy in girls and women

As Table 13 shows, the absolute percentage point difference in non-receipt of iron tablets between girls and women is positive, indicating that adolescent girls are less likely than adult women to receive iron tablets in pregnancy. By region, the difference in non-receipt is greatest in Latin America and Caribbean (+4.3pp), followed by Europe and Central Asia (+2.6pp), East Asia and Pacific (+1.7pp), sub-Saharan Africa

(+1.1pp), and Middle East and North Africa (+1.3pp) (Table 13). South Asia is an exception, where non-receipt of iron tablets is more common among women than girls (-2.7pp). Country patterns for non-receipt of iron tablets vary (Appendix A6.1).

For consumption of iron tablets for at least 90 days, the absolute percentage point difference between girls and women is negative, indicating that adult women are more likely than adolescent girls to consume iron tablets for at least 90 days during pregnancy. By world region, these differences are: East Asia and Pacific (-10.8pp), Middle East and North Africa (-5.0pp), Latin America and Caribbean (-4.2pp), sub-Saharan Africa (-1.4pp), South Asia (-1.1pp), and Europe and Central Asia (-0.8pp). Country patterns vary for iron tablet consumption for at least 90 days (Appendix A6.1).

Table 13 Iron tablet receipt and consumption in girls age 15-19 and women age 20-49

World region	Consumption category	Prevalence 15-19 yrs				Prevalence 20-49 yrs				Difference (15-19 yrs – 20-49 yrs)
		N	%	LB	UB	N	%	LB	UB	
East Asia and Pacific	No Receipt	417	12.5	7.2	20.9	13,518	10.8	9.0	12.8	1.7
	1-89 Days		34.8	25.7	45.1		25.8	24.2	27.4	9.0
	90+ Days		52.7	43.1	62.2		63.5	61.3	65.6	-10.8
Europe and Central Asia	No Receipt	278	84.6	80.9	87.6	11,493	82.0	81.0	83.0	2.6
	1-89 Days		14.7	11.7	18.3		16.6	15.6	17.5	-1.9
	90+ Days		0.7	0.2	2.0		1.5	1.2	1.7	-0.8
Latin America and Caribbean	No Receipt	3,610	24.7	23.0	26.5	36,097	20.4	19.8	21.0	4.3
	1-89 Days		39.9	37.7	42.1		40.0	39.2	40.8	-0.1
	90+ Days		35.4	33.2	37.7		39.6	38.7	40.5	-4.2
Middle East and North Africa	No Receipt	838	42.7	37.9	47.6	27,568	41.4	40.4	42.4	1.3
	1-89 Days		32.6	28.2	37.4		28.9	28.0	29.9	3.7
	90+ Days		24.7	20.5	29.4		29.7	28.6	30.7	-5.0
South Asia	No Receipt	5,287	25.9	23.9	28.0	175,536	28.6	28.0	29.3	-2.7
	1-89 Days		38.6	36.5	40.8		34.8	34.2	35.3	3.8
	90+ Days		35.5	33.6	37.6		36.6	36.1	37.2	-1.1
sub-Saharan Africa	No Receipt	15,482	31.9	30.2	33.7	182,095	30.8	30	31.6	1.1
	1-89 Days		47.8	46.1	49.5		47.5	46.7	48.2	0.3
			20.3	19.2	21.4		21.7	21.2	22.2	-1.4

LB and UB refer to the lower and upper bounds of the 95% confidence interval.
ND, not displayed, when the percentage is based on fewer than 25 unweighted cases. Numbers in parenthesis are based on 25-49 unweighted cases.
Estimates for world regions were population-weighted. N includes the total number for all categories (no receipt, 1-89 days, 90+ days).

3.5.2 Country data

Trend data

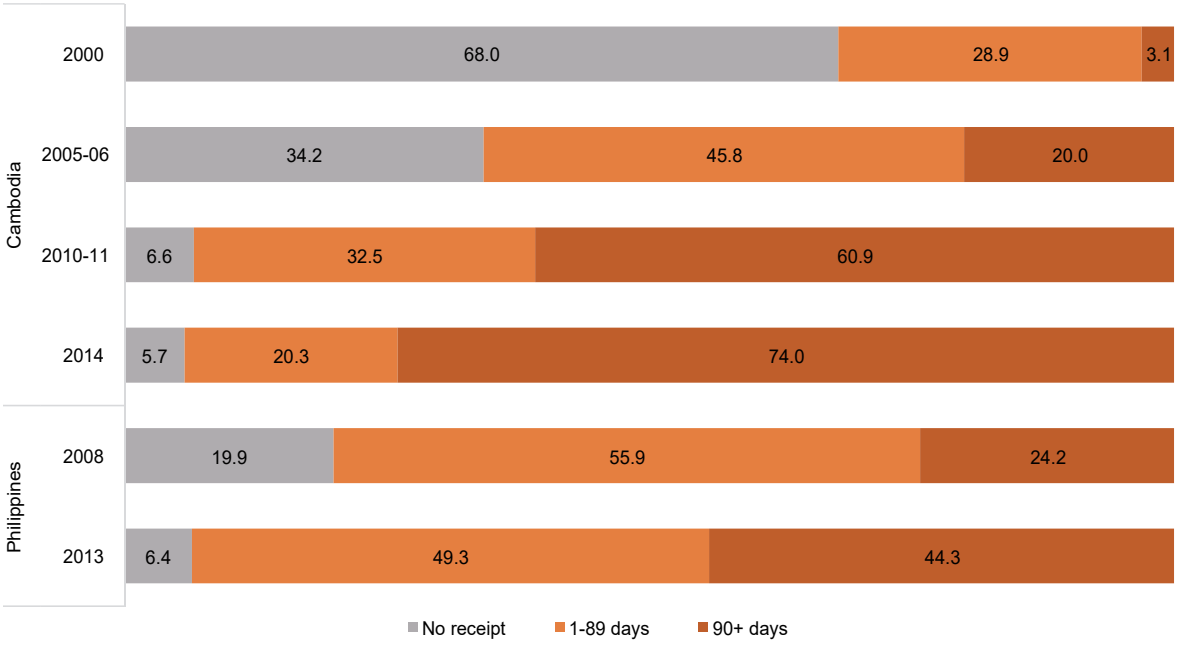
In total, 37 countries have multiple surveys available for girls (Appendix A6.2). The three countries with the greatest change over time are noted.

Figures 37-41 show that the prevalence of non-receipt of iron tablets declined in almost all countries between surveys. The countries with the greatest declines are Nepal (-62.4pp), Cambodia (-62.3pp), and

Rwanda (-59.4pp). One country, Honduras (+24.1pp), had increases in non-receipt of iron tablets between surveys.

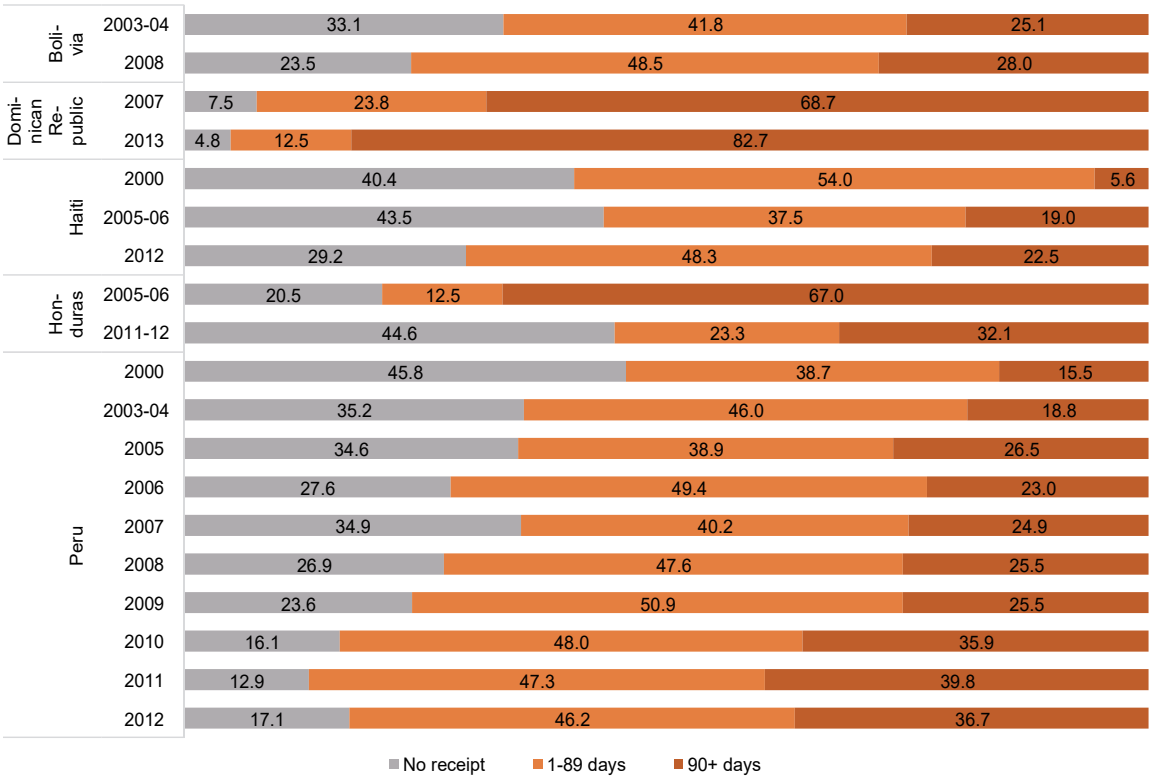
Figures 37-41 show that the prevalence of consumption of iron tablets for at least 90 days increased between surveys in almost all countries. Increases in prevalence of iron tablet consumption for at least 90 days was greatest in Cambodia (+70.9pp), Nepal (+62.5pp), and Lesotho (+45.2pp). Iron tablet consumption for at least 90 days declined in Honduras (-34.9pp) and Benin (-3.0pp).

Figure 37 Iron tablet receipt and consumption country trends for childbearing girls age 15-19, East Asia and Pacific



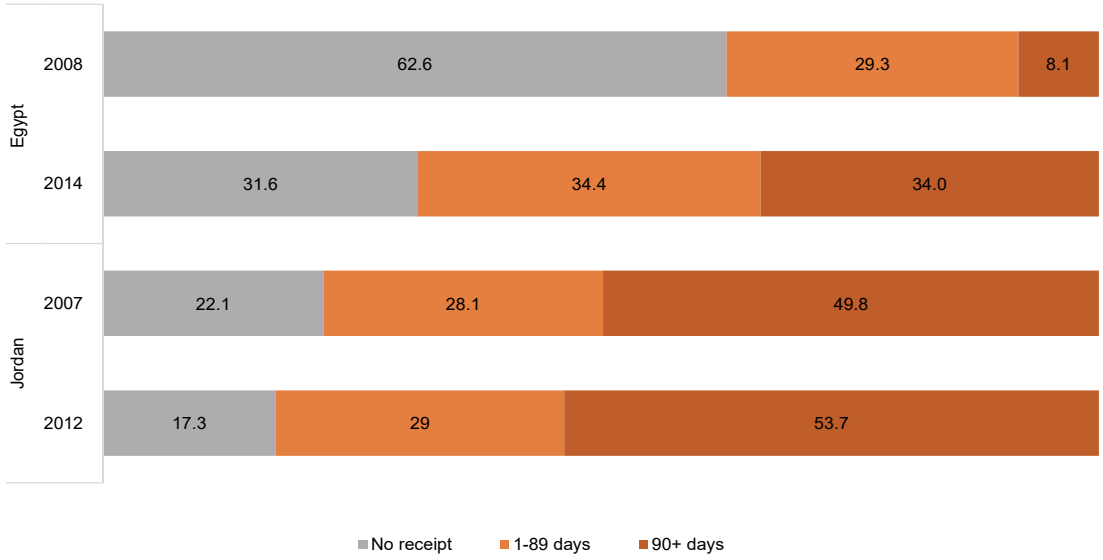
Note: Iron supplementation during girls' last pregnancy within the last five years.

Figure 38 Iron tablet receipt and consumption country trends for childbearing girls age 15-19, Latin America and Caribbean



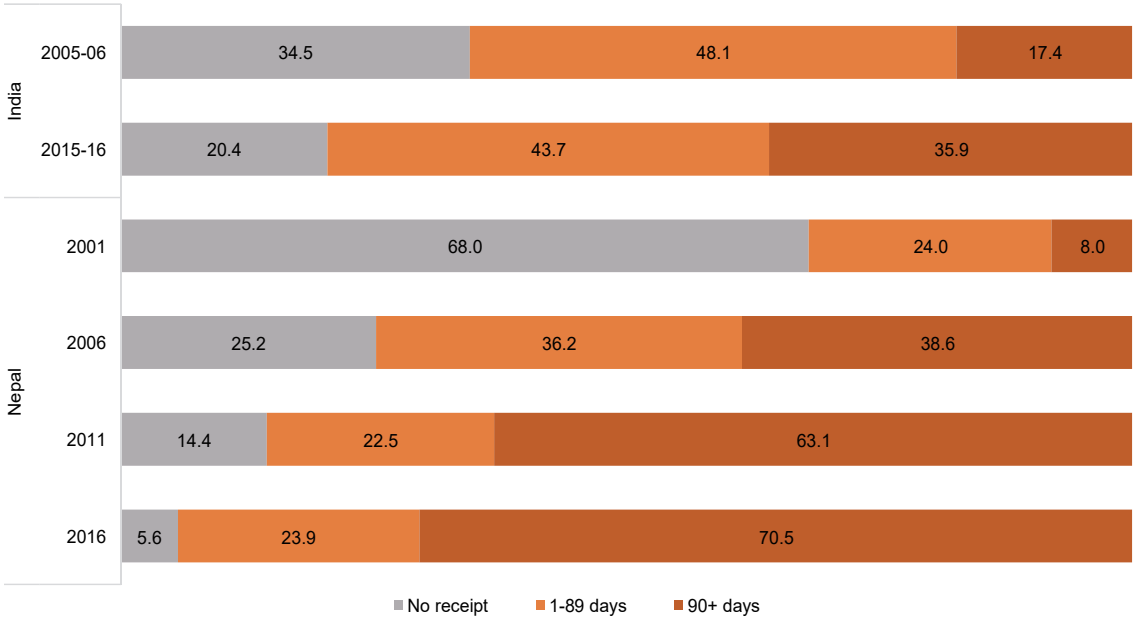
Note: Iron supplementation during girls' last pregnancy within the last five years.

Figure 39 Iron tablet receipt and consumption country trends for childbearing girls age 15-19, Middle East and North Africa



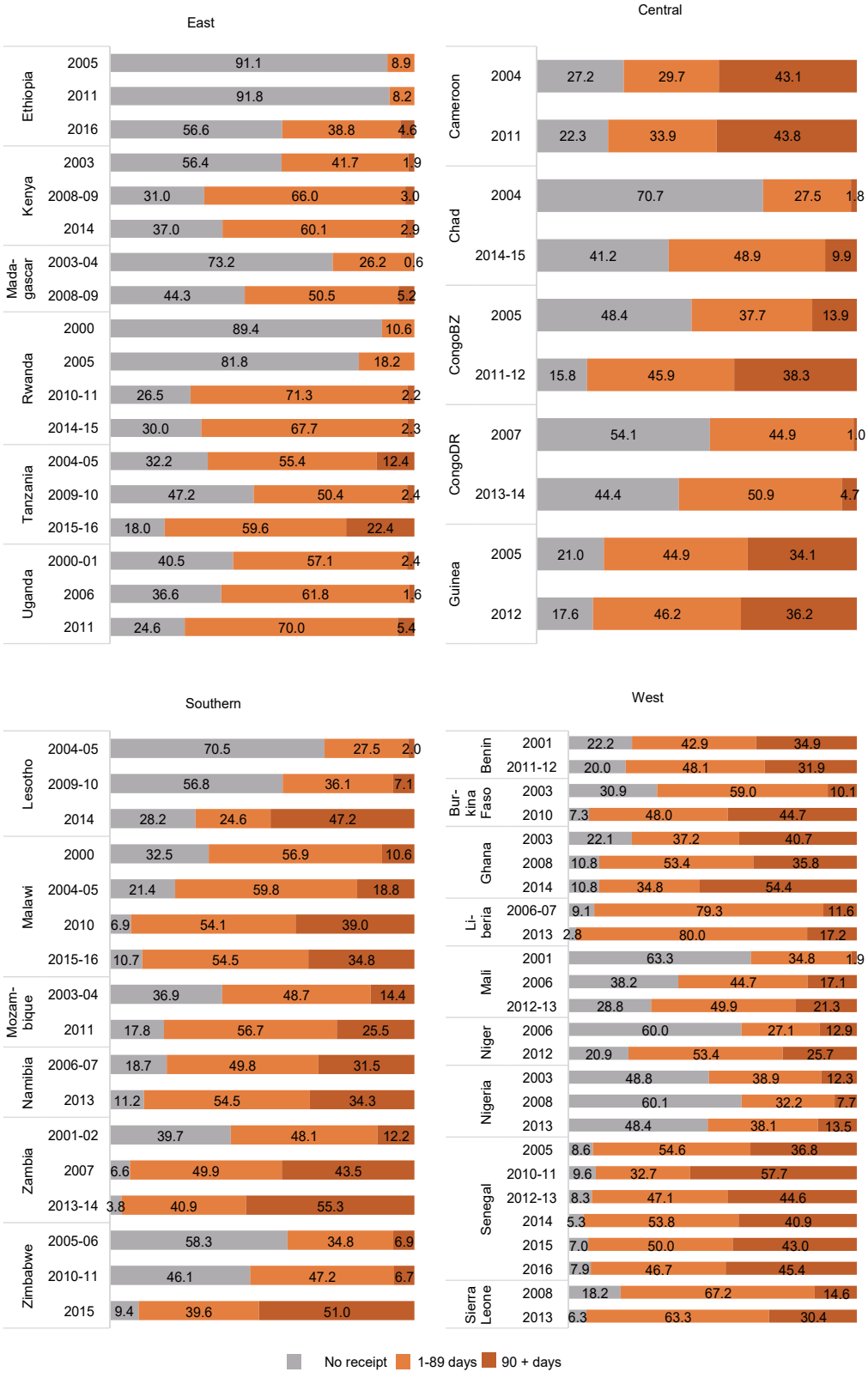
Note: Iron supplementation during girls' last pregnancy within the last five years.

Figure 40 Iron tablet receipt and consumption country trends for childbearing girls age 15-19, South Asia



Note: Iron supplementation during girls' last pregnancy within the last five years.

Figure 41 Iron tablet receipt and consumption country trends for childbearing girls age 15-19, sub-Saharan Africa



Note: Iron supplementation during girls' last pregnancy within the last five years.

3.6 Women's Dietary Diversity

3.6.1 Country data

Data on diet diversity among girls were available from 18 countries (Table 14). There were two surveys from East Asia and Pacific; two surveys from Europe and Central Asia; four surveys from Latin America and Caribbean; one survey from Middle East and North Africa; no surveys from South Asia; and nine surveys from sub-Saharan Africa.

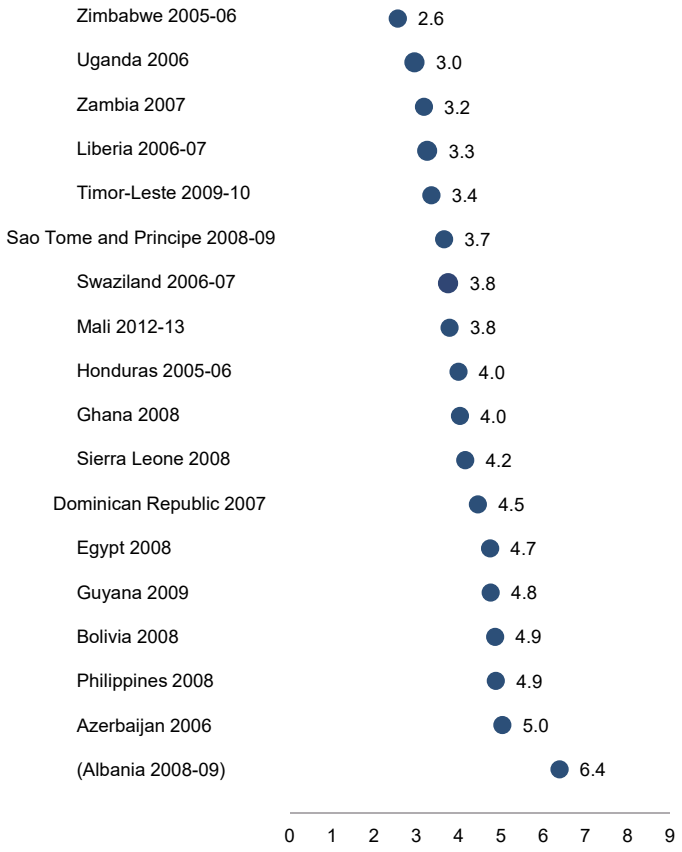
Table 14 List of countries by world region for women's dietary diversity

Region	Countries
East Asia and Pacific	Philippines, Timor-Leste
Europe and Central Asia	Albania, Azerbaijan
Latin America and Caribbean	Bolivia, Dominican Republic, Guyana, Honduras
Middle East and North Africa	Egypt
South Asia	None
sub-Saharan Africa	Ghana, Liberia, Mali, São Tomé and Principe, Sierra Leone, Swaziland, Uganda, Zambia, Zimbabwe

Women's diet diversity score

Figure 42 shows the mean diet diversity score from the nine food groups consumed. There are no countries where girls consumed all food groups, and mean diet diversity scores range from 2.6 in Zimbabwe to 6.4 in Albania.

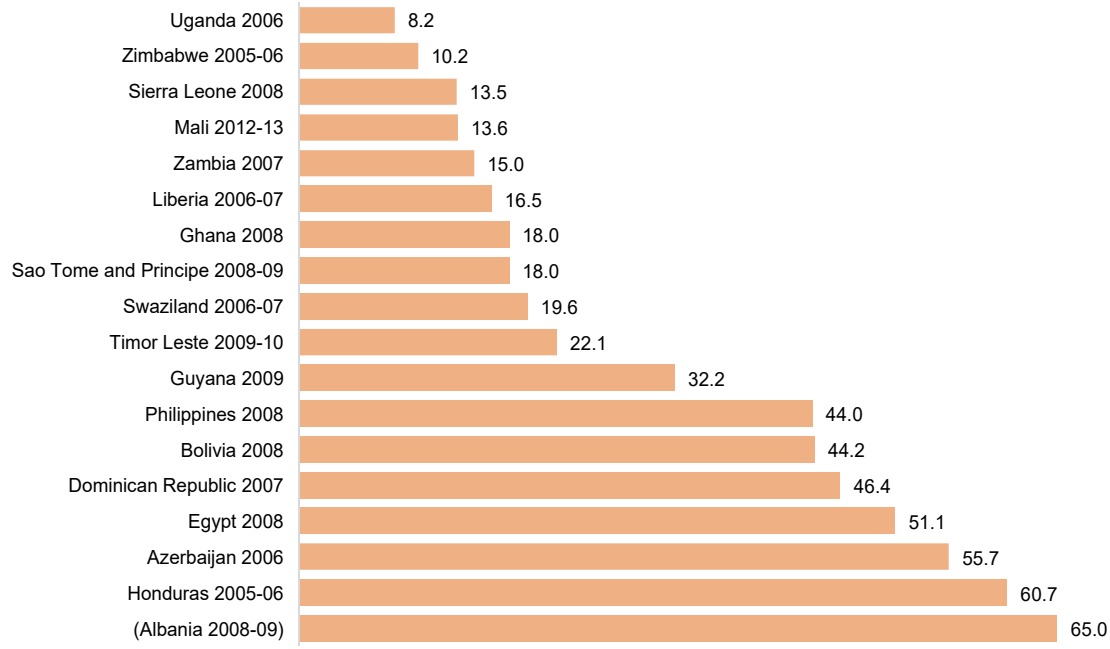
Figure 42 Mean diet diversity score among girls age 15-19



Note: Mean score is calculated from the nine food groups consumed in the 24 hours preceding the survey. Food groups included grains, roots and tubers; legumes, beans, nuts and seeds; dairy products; eggs; organ meat; flesh foods; Vitamin-A-rich dark green leafy vegetables; other vitamin A-rich vegetables and fruits; and other fruits.

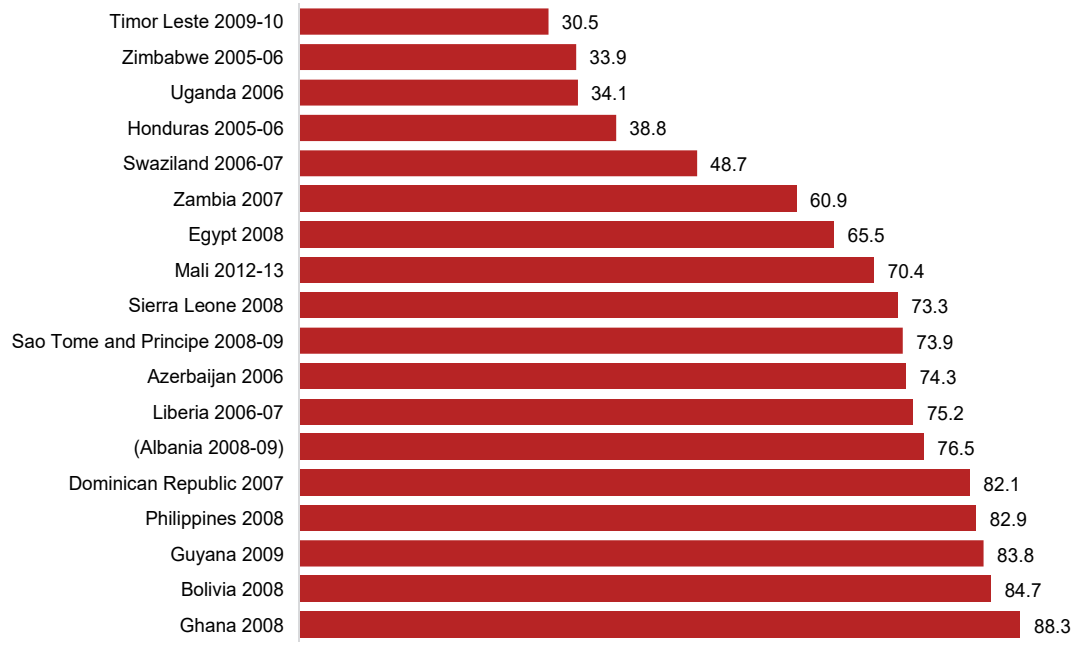
Patterns in animal source food consumption vary by country (Figure 43(a) and (b)). The three countries with the lowest egg consumption are Uganda (8%), Zimbabwe (10%) and Sierra Leone (14%), and the three highest are Albania (65%), Honduras (61%), and Azerbaijan (56%). Meat consumption is more prevalent than egg consumption in all countries. The three countries with the lowest levels of meat consumption are Timor-Leste (31%), Zimbabwe (34%), and Uganda (34%). The three countries with the highest levels are Ghana (88%), Bolivia (85%), and Guyana (84%).

Figure 43(a) Percentage of girls age 15-19 who consumed eggs



Note: Egg consumption is in the 24 hours preceding the survey. For countries where the percentage is based on fewer than 25 unweighted cases, data is suppressed. For countries in parentheses, percentage is based on 25-49 unweighted cases.

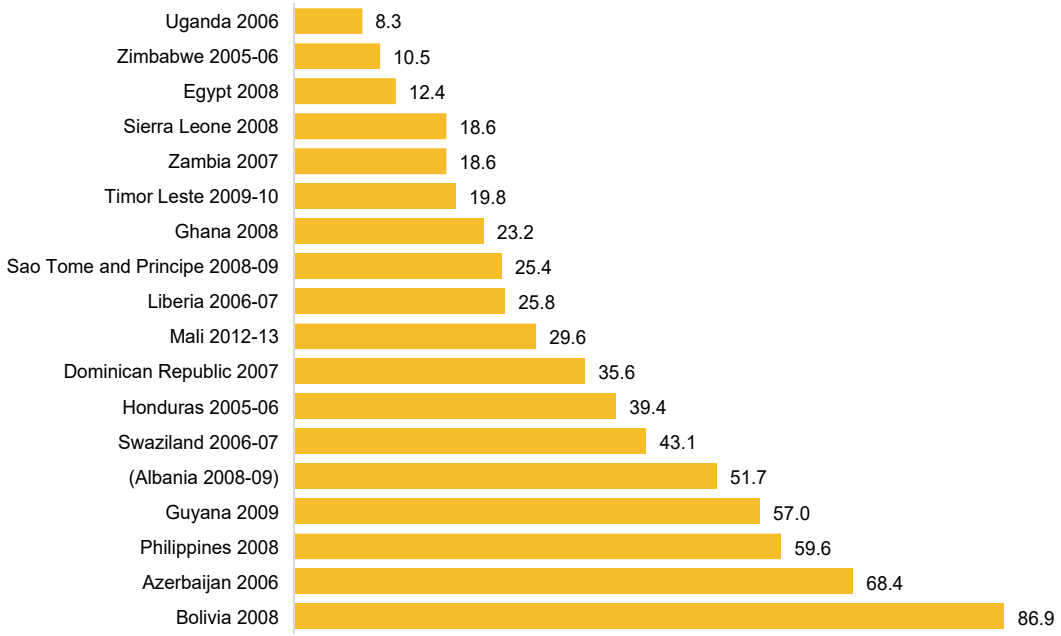
Figure 43(b) Percentage of girls age 15-19 who consumed meat, poultry, or fish



Note: Meat, poultry, or fish consumption is in the 24 hours preceding the survey. For countries where the percentage is based on fewer than 25 unweighted cases, data is suppressed. For countries in parentheses, percentage is based on 25-49 unweighted cases.

Figure 44 shows the consumption of sugary foods. The three countries with the lowest levels of sugary food consumption are Uganda (8%), Zimbabwe (11%), and Egypt (12%). The three countries with the highest levels of sugary food consumption are Bolivia (87%), Azerbaijan (69%), and Albania (52%).

Figure 44 Percentage of girls age 15-19 who consumed sugary foods



Note: Sugary food consumption, e.g., chocolates, sweets, candies, pastries, cakes/biscuits, is in the 24 hours preceding the survey. For countries where the percentage is based on fewer than 25 unweighted cases, data is suppressed. For countries in parentheses, percentage is based on 25-49 unweighted cases.

4 DISCUSSION AND CONCLUSION

This report summarizes nutrition in adolescent girls age 15-19 from 62 countries and boys age 15-19 from 22 countries. It describes anthropometric status, childbearing, anemia status, iron supplementation, and diet. This chapter discusses implications of the results.

Anthropometry

The study found a double burden of over-nutrition and undernutrition among adolescents. Across regions, overweight and obesity was the dominant nutrition problem for girls except in South Asia, where thinness was dominant, and East Asia and Pacific, where prevalence of thinness was similar to overweight and obesity. In Europe and Central Asia and in Latin America and Caribbean, overweight and obesity was the dominant problem for boys, while in sub-Saharan Africa and South Asia thinness was the dominant problem for boys. Thinness was generally more prevalent among boys than girls, possibly because boys experience a higher rate of growth than girls, gaining more bone and muscle mass during adolescence (Spear 2002). Trend data showed that prevalence of thinness was generally stagnant or had slightly decreased between surveys, whereas prevalence of overweight and obesity was generally stagnant or had increased. Effective strategies to reduce the burden of inadequate nutrition in adolescents will need to address factors influencing both thinness and overweight and obesity.

Our results showed a range of prevalence of short stature among girls among countries, from 5% in Europe and Central Asia to 36% in South Asia. Short stature during adolescence is largely related to delayed initiation of puberty and may reflect poor nutrition during the first 1,000 days of life and in later childhood, and inadequate nutrition during adolescence (Kurz 2007; Spear 2002; WHO 2018). Girls who are of short stature are also at higher risk of pregnancy-related mortality. Our data show that in almost a third of countries more than a quarter of adolescents have begun childbearing. Addressing adolescent pregnancy as well as nutrition in adolescents is important, given that complications during pregnancy and childbirth are the leading cause of death for girls age 15-19 globally (WHO 2017).

Comparisons in prevalence between adults and adolescents were in the expected directions for BMI and short stature across world regions, and the patterns mostly held by country survey. Adults had higher prevalence of overweight and obesity than adolescent girls and boys, and girls had a higher prevalence of short stature than adult women. Notably for both girls and boys, the differences were much larger for overweight and obesity compared with the differences for thinness—illustrating the opportunity to intervene in prevention of overweight and obesity during adolescence.

Anthropometric status by demographic covariates showed differences in prevalence in many countries. There was substantial heterogeneity between countries, however, with some showing higher prevalence and others lower prevalence by residence, wealth, education, and employment. Data stratified by covariates were not adjusted by other covariates, and samples sizes were small in some countries, limiting our ability to make inferences.

The need for action is clear to address the multiple problems of overweight and obesity, thinness, and short stature among adolescents. For both girls and boys, evidence is required on effective programs and policies that can address adolescent nutrition. Data on adolescents age 10-14 are also needed to guide programs and

policies. In DHS surveys, anthropometry data is not routinely collected for early adolescence, and it is likely that patterns and trends during this period could be different than for late adolescence. For example, girls' peak growth occurs during early adolescence, when nutritional needs are higher (Spear 2002). Further, more data are needed for boys in general, as seen by the difference in the number of surveys with data on girls and boys.

Anemia

Anemia was shown to be a mild-to-severe public health problem in all world regions for both girls and boys. Anemia prevalence was highest in South Asia for non-pregnant girls, and highest in sub-Saharan Africa for boys. For pregnant girls, anemia prevalence was higher than for non-pregnant girls in almost all world regions. Given the high prevalence of adolescent childbearing in many countries, adolescent girls are a population at high risk for anemia. While strategies to address anemia in adolescence should continue to focus on girls, our results also show a need to address anemia among adolescent boys, particularly in parts of sub-Saharan Africa and South Asia.

Comparisons in anemia prevalence between adults and non-pregnant girls and boys showed that anemia was more prevalent in boys compared with adult men in all world regions and all countries surveyed, but the findings were not consistent for girls. Anemia prevalence was higher among adult women compared with girls in Europe and Central Asia, Middle East and North Africa, and sub-Saharan Africa, and higher among girls than women in East Asia and Pacific and South Asia. Further research is needed to better understand differences in anemia patterns for adolescent boys and girls compared with adults.

Patterns of anemia status by demographic covariates were not consistent across countries. There were some differences in the prevalence of anemia by covariates, but estimates by covariate category went in both directions. As was the case for anthropometry, data stratified by covariates were not adjusted by other covariates.

A limitation of our data is that we only report on all-cause anemia. Kassebaum and colleagues highlighted the different causes of anemia among adolescents, showing that iron-deficiency anemia is a leading cause of anemia in this age group (Kassebaum et al. 2014). During adolescence, iron requirements increase to support growth in both girls and boys (Spear 2002). Additionally, girls have slightly higher requirements due to menstruation (Spear 2002; Steer 2000). Considering other non-diet-related causes of anemia such as infection, genetic, and environmental factors is also required to reduce adolescent anemia, especially taking into account sex and context. More country-level data on the different causes of anemia will facilitate the development of effective anemia policies and programs for adolescents.

Overall, the results illustrate the geographic variation in anemia and the extent of the problem among adolescent girls and boys. They reinforce the importance of addressing girls' anemia for their own wellbeing and that of their offspring. It also highlights the importance of addressing anemia for boys. In the future, more national data on adolescent boys' anemia are required to better understand the problem and ensure anemia prevention strategies encompass efforts to target boys.

Iron supplementation

Iron supplementation is an important nutrition intervention for adolescent girls where anemia is a public health problem, and even more so among pregnant adolescent girls (WHO 2016). The study results showed

that, compared with adult women, childbearing adolescent girls were more likely to receive iron supplements than women during their last pregnancy in all world regions except South Asia, but girls in all world regions were less likely to consume iron supplements compared with adult women. A possible reason for this is that girls are more likely to have had births more recently than women in the past five years. Thus, our finding that girls receive more iron tablets than women do may reflect general improvements in iron tablet availability during antenatal care, or may be a result of a shorter recall period. However, the low level of any consumption of iron tablets among adolescent girls warrants further attention. Effective implementation strategies are needed to ensure not only that girls receive iron tablets as early as possible during pregnancy but also that they are supported to consume the iron tablets for the duration of pregnancy, as per WHO guidelines (WHO 2012).

Our data do not include iron supplementation among non-childbearing girls and early adolescence; the WHO recommends iron supplementation among these groups but many countries have yet to adopt the recommendations (WHO 2018a, 2018b). Addressing these data gaps can facilitate improved iron supplementation programming among all groups in which it is recommended.

Dietary diversity

The study results on dietary diversity vary across countries but, in general, suggest that adolescent girls are at increased risk for overweight and obesity and for micronutrient deficiencies. Girls' diets lacked diversity in all countries. In addition, consumption of sugary foods was over 30% in almost half of the countries. Similarly, a recent systematic review of adolescent girls' diets reported that poor-quality diets were common, including consumption of sugary and salty snack foods, and in sub-Saharan Africa and South Asia there was low protein and fat intake (Keats et al. 2018).

Most important, there is a paucity of dietary data for adolescents, especially among boys. The DHS Program collected Women's Dietary Diversity Score data in Phase 5 (approximately 2003-08), but data on diet among adults was not part of the core questionnaire in other phases. Recently a new indicator, Minimum Dietary Diversity for Women, has been developed and is beginning to be used in some country surveys, including DHS surveys (FAO and FHI 360). Tracking girls' and boys' dietary data globally will enable countries to develop context-specific policies to address the nutritional problems of adolescents.

Conclusions

Continued advocacy for adolescent nutrition is required to ensure that adolescents receive optimal nutrition to support their growth and development. Adolescence provides an opportunity to address nutrition problems that occurred in childhood and to lay the foundation for good nutrition in adulthood. Thus, more data focused specifically on adolescents need to be collected. This report goes a long way to address data gaps for adolescent nutrition and to characterize anthropometry, anemia, iron supplementation, and diet among girls and boys. More information on micronutrient status, eating practices, food environments, and nutrition intervention coverage will help foster improved policies and programs for adolescents.

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