



Diet and Eating Practices among Adolescent Girls in Low and Middle Income Countries: A Systematic Review Results

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Stakeholders Consultation on Adolescent Girls' Nutrition: Evidence, Guidance, and Gaps

October 30–31, 2017



Presentation Overview

RESULTS

- Study selection and demographics
- BMI
- Macronutrient & energy intake
- Dietary intake
- Meal patterns
- Analysis of underlying determinants
- High-level summary of outcomes for older versus younger adolescents

STUDY LIMITATIONS

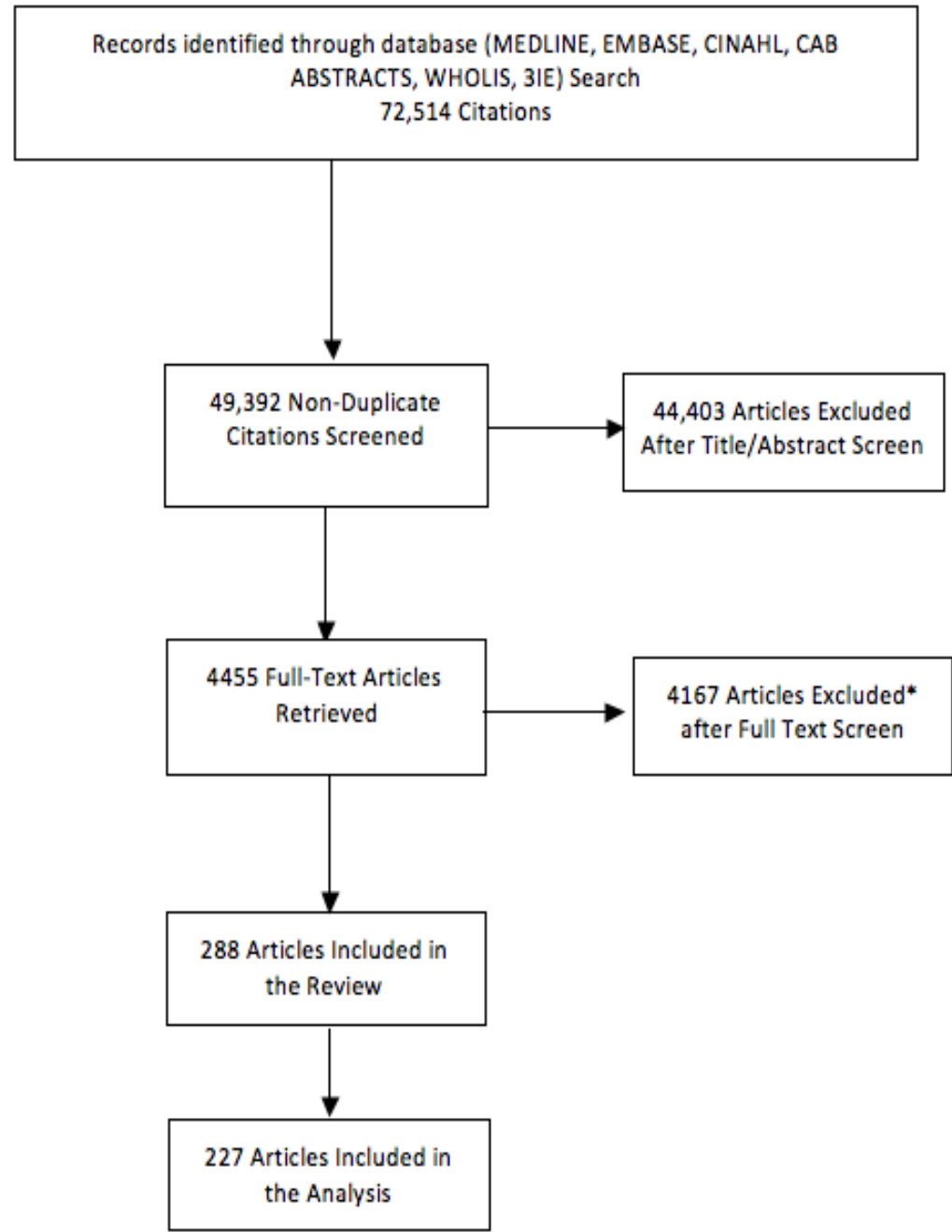
KEY FINDINGS

RECOMMENDATIONS

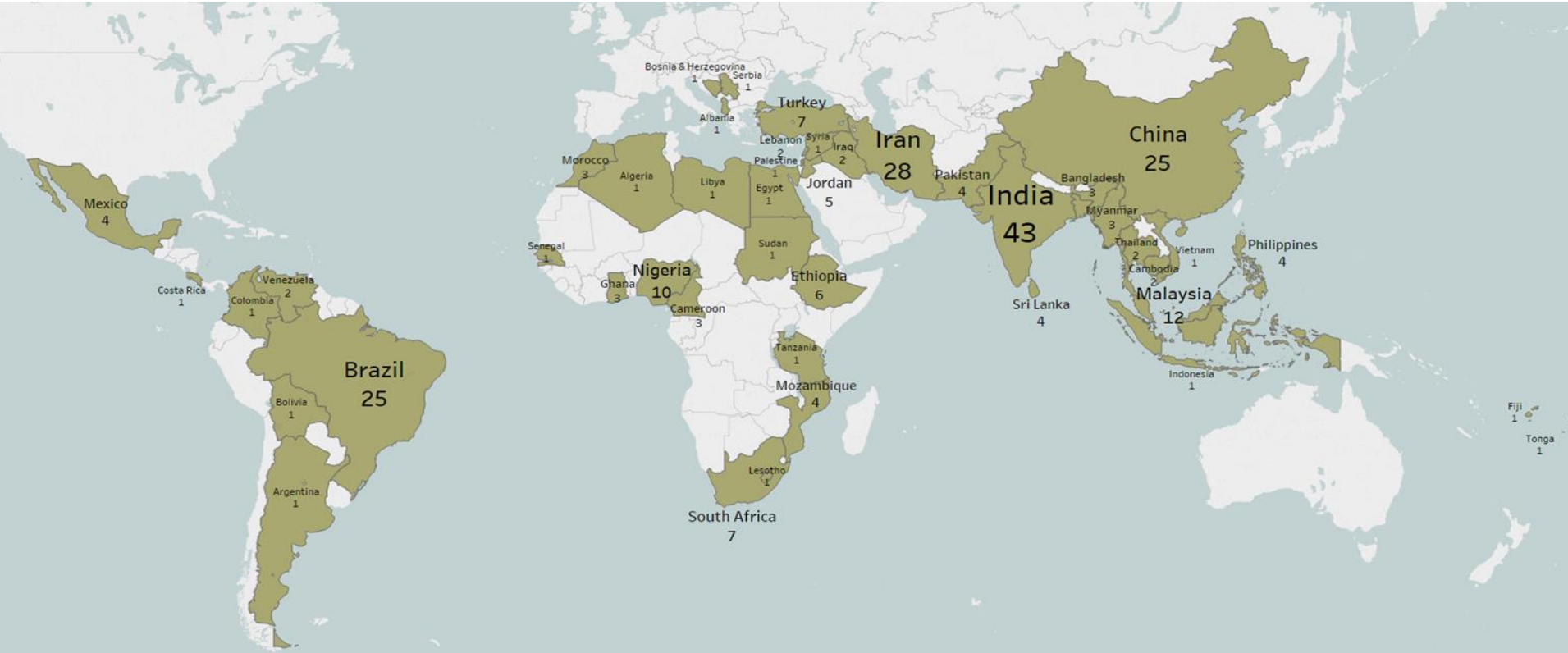
Study Selection

*Reasons for exclusion:

- Data unavailable for adolescent age group (N=1106)
- No outcome of interest (N=874)
- Irrelevant topic (N=519)
- Data collection before 2007 (N=498)
- Abstract only (N=342)
- Study setting not LMIC (N=282)
- Wrong study design (N=205)
- No adolescent population (N=224)
- Non-English study (N=79)
- Unhealthy participants (N=25)
- Duplicate article (N=13)



Represented Countries



Study Demographics

World Region	Study Setting			Study design	Sample size
	Country	Study setting	Urban/rural		
*AFRICA N=36	Ethiopia (n=6) Sudan (n=1) Mozambique (n=4) Nigeria (n=10) Tanzania (n=1) Cameroon (n=3) Ghana (n=3) Lesotho (n=1) South Africa (n=7) Senegal (n=1)	Community: n=7 Regional: n=4 School-based: n=25	Urban: n=16 Rural: n=6 Mixed: n=11 Semi-Urban: n=1 Not reported: n=2	Cross Sectional: n=33 Cohort: n=3	Total N: 15,433 Range: 47 to 2097
*EAST ASIA & PACIFIC N=47	Cambodia (n=2) Indonesia (n=1) Vietnam (n=1) Tonga (n=1) China (n=25) Malaysia (n=12) Thailand (n=2) Myanmar (n=3) Philippines (n=4) Fiji (n=1)	Community: n=2 National: n=4 Regional: n=4 School-based: n=37	Urban: n=24 Rural: n=6 Mixed: n=14 Semi-Urban: n = 1 Not reported: n=2	Cohort: n=5 Cross Sectional: n=39 Mixed Design: n=1 RCT: n=1 Twin Study: n=1	Total N: 57,820 Range: 10 to 15,430
*EUROPE & CENTRAL ASIA N=9	Turkey (n=7) Albania (n=1) Serbia (n=1) Bosnia & Herzegovina (n=1)	Community: n=1 School-based: n=8	Urban: n=8 Mixed: n=1	Cross Sectional: n=9	Total N: 4162 Range: 41 to 1121

Study Demographics

World Region	Study Setting			Study design	Sample size
	Country	Study setting	Urban/rural		
LATIN AMERICA & CARIBBEAN N=35	Bolivia (n=1) Brazil (n=25) Costa Rica (n=1) Mexico (n=4) Argentina (n=1) Venezuela (n=2) Colombia (n=1)	Community: n=2 National: n=5 Regional: n=4 School-based: n=24	Urban: n=18 Rural: n=1 Mixed: n=11 Peri-Urban: n=2 Not reported: n=3	Cohort: n=2 Case Study: n=1 Cross Sectional: n=26 Longitudinal: n=1 Qualitative: n=2 RCT: n=3	Total N: 119,112 Range: 6 to 57,089
MIDDLE EAST & NORTH AFRICA N=46	Iran (n=28) Gaza (n=1) Morocco (n=3) Syria (n=1) Iraq (n=2) Jordan (n=5) Algeria (n=1) Libya (n=1) Egypt (n=1) Lebanon (n=2) Palestine (n=1)	National: n=1 Regional: n=2 School-based: n=43	Urban: n=33 Rural: n=1 Mixed: n=10 Not reported: n=2	Cross Sectional: n=42 Qualitative: n=1 Quasi-Experimental: n=3	Total N: 46,470 Range: 26 to 6640
SOUTH ASIA N=54	India (n=43) Bangladesh (n=3) Pakistan (n=4) Sri Lanka (n=4)	Community: n=10 Regional: n=3 School-based: n=41	Urban: n=35 Rural: n=7 Mixed: n=8 Not reported: n=4	Case Control: n=2 Cross Sectional: n=50 RCT: n=2	Total N: 17,921 Range: 10 to 1446

BMI

77 studies (n=37,644) were included in the mean BMI analysis and 109 studies (n=37,660) were included in the BMI status analysis.

MIDDLE EAST & NORTH AFRICA	Iran (13 urban, 2 mixed), Iraq (1 urban), Jordan (3 urban), Algeria (1 urban), Palestine (1 rural, 1 NR), Lebanon (1 NR), Morocco (1 urban, 1 mixed)
LATIN AMERICA & CARRIBEAN	Argentina (1 mixed), Brazil (5 urban, 3 mixed), Columbia (1 NR), Mexico (1 urban, 1 rural, 1 NR)
AFRICA	Cameroon (1 urban), Ethiopia (1 urban, 1 rural, 2 mixed), Mozambique (2 mixed), Nigeria (1 urban, 2 rural, 1 mixed), South Africa (3 urban), Sudan (1 urban)
EUROPE & CENTRAL ASIA	Turkey (6 urban), Albania (1 urban), Serbia (1 urban)
SOUTH ASIA	Bangladesh (2 urban), India (12 urban, 2 urban slum, 2 rural, 2 mixed, 1 NR), Pakistan (2 urban), Sri Lanka (1 rural, 1 mixed, 1 NR)
EAST ASIA & PACIFIC	Cambodia (1 urban), China (11 urban, 2 rural, 2 mixed), Fiji (1 mixed), Malaysia (3 urban, 1 rural, 2 mixed, 1 NR), Myanmar (1 peri-urban), Philippines (2 urban), Thailand (1 urban), Tonga (1 mixed)

*These are not representative study populations; the following data are shown to indicate sample characteristics

Mean BMI

BMI Status (10-19 years)



10-14



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15-19



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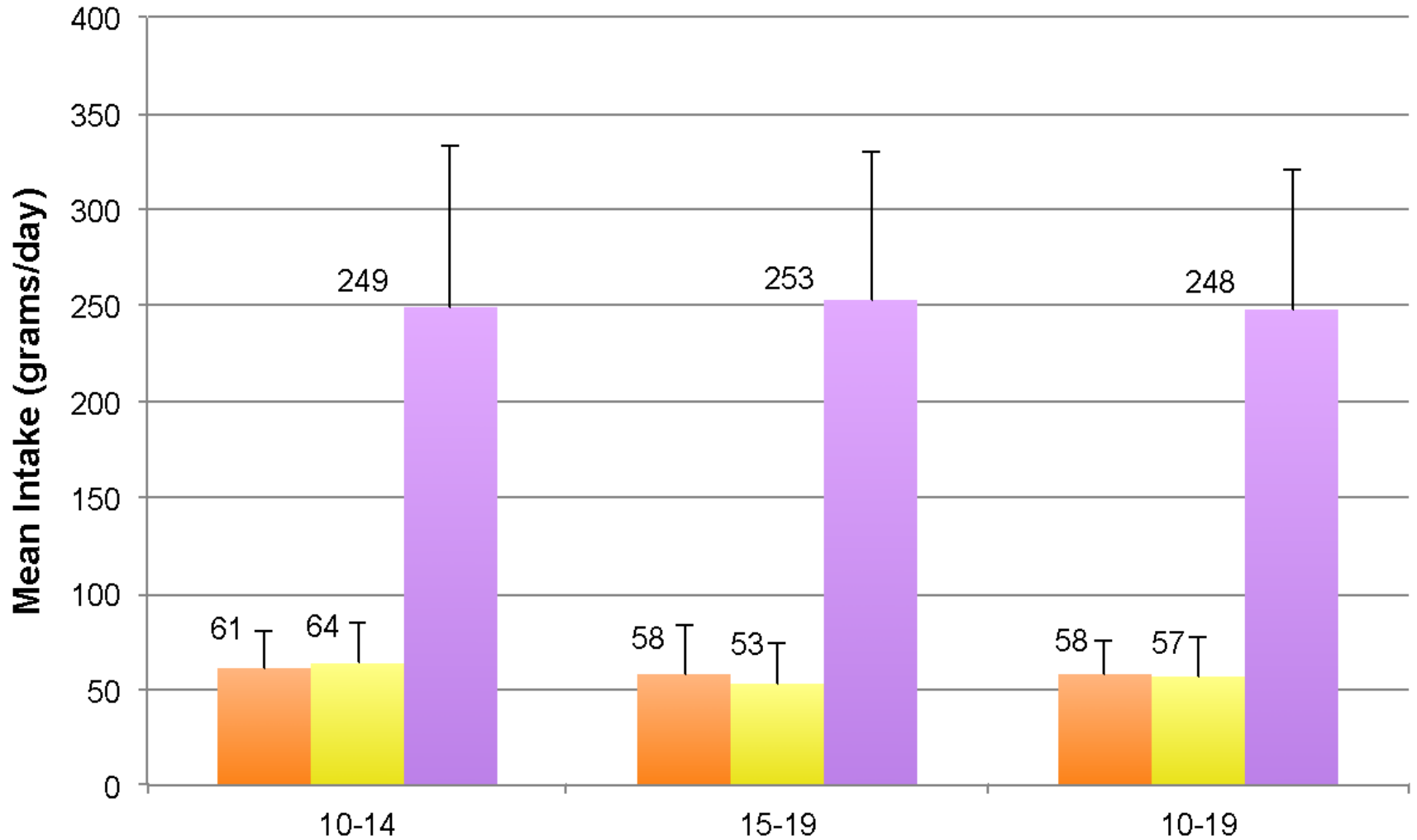
Macronutrient Intake

63 studies (n=19,911) reported on protein, 51 studies (n=16,179) reported on fat, and 45 studies (n=15,643) reported on carbohydrate intake in grams/day among adolescent girls.

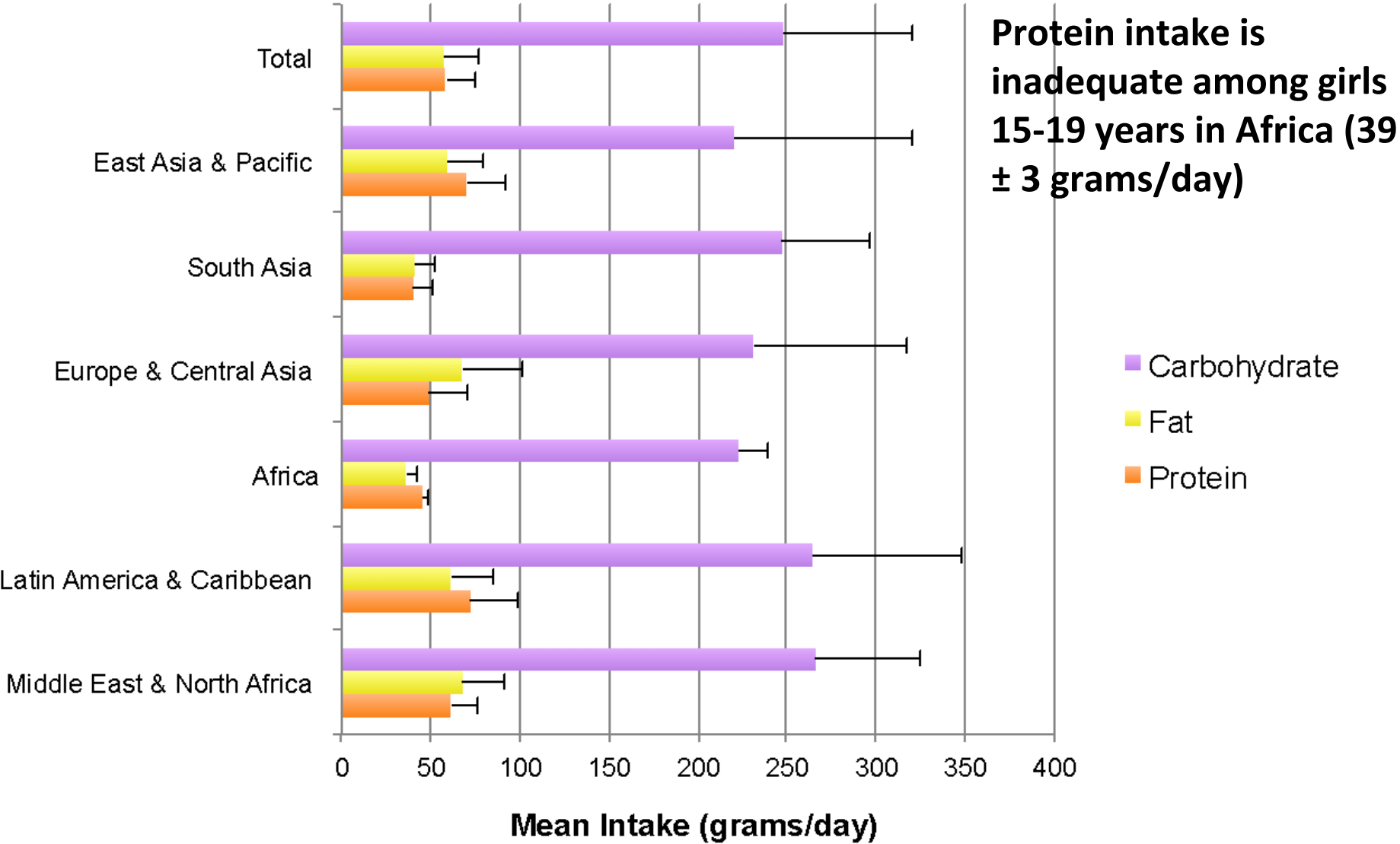
MIDDLE EAST & NORTH AFRICA	Protein	Algeria (1 urban), Iran (10 urban), Libya (1 urban), Morocco (1 urban, 1 mixed)
	Fat	Iran (10 urban), Libya (1 urban), Morocco (1 urban, 1 mixed)
	Carbohydrate	Algeria (1 urban), Iran (9 urban), Libya (1 urban), Morocco (1 urban, 1 mixed)
LATIN AMERICA & CARRIBEAN	Protein	Bolivia (1 urban), Brazil (1 urban), Mexico (1 urban, 1 rural, 1 mixed), Venezuela (1 peri-urban)
	Fat	Bolivia (1 urban), Brazil (1 urban), Mexico (1 urban, 1 rural, 1 mixed), Venezuela (1 peri-urban)
	Carbohydrate	Bolivia (1 urban), Brazil (1 urban), Mexico (1 urban, 1 rural, 1 mixed), Venezuela (1 peri-urban)
AFRICA	Protein	Cameroon (1 urban, 1 rural), Ethiopia (1 rural) Mozambique (3 mixed), Nigeria (1 rural), Senegal (1 urban), South Africa (2 urban)
	Fat	Cameroon (1 urban), Mozambique (3 mixed), Nigeria (1 rural), Senegal (1 urban), South Africa (1 urban)
	Carbohydrate	Cameroon (1 urban), Mozambique (3 mixed), Nigeria (1 Rural), Senegal (1 urban), South Africa (2 urban)
EUROPE & CENTRAL ASIA	Protein	Turkey (2 urban)
	Fat	Turkey (2 urban)
	Carbohydrate	Turkey (2 urban)
SOUTH ASIA	Protein	Bangladesh (1 urban, 1 mixed), India (8 urban, 2 rural, 2 urban slum, 1 mixed), Pakistan (3 urban), Sri Lanka (1 mixed)
	Fat	Bangladesh (1 urban, 1 mixed), India (3 urban, 2 urban slum, 1 rural, 1 mixed), Pakistan (2 urban)
	Carbohydrate	Bangladesh (1 urban, 1 mixed), India (1 urban), Pakistan (1 urban)
EAST ASIA & PACIFIC	Protein	China (4 urban, 1 mixed), Malaysia (1 urban, 3 mixed), Myanmar (1 peri-urban), Philippines (1 urban), Thailand (1 rural)
	Fat	China (4 urban, 2 mixed), Malaysia (1 urban, 3 mixed), Philippines (1 urban), Thailand (1 rural)
	Carbohydrate	China (4 urban, 2 mixed), Malaysia (1 urban, 3 mixed), Philippines (1 urban), Thailand (1 rural)

Macronutrient Intake

Protein Fat Carbohydrate



Macronutrient Intake by Region

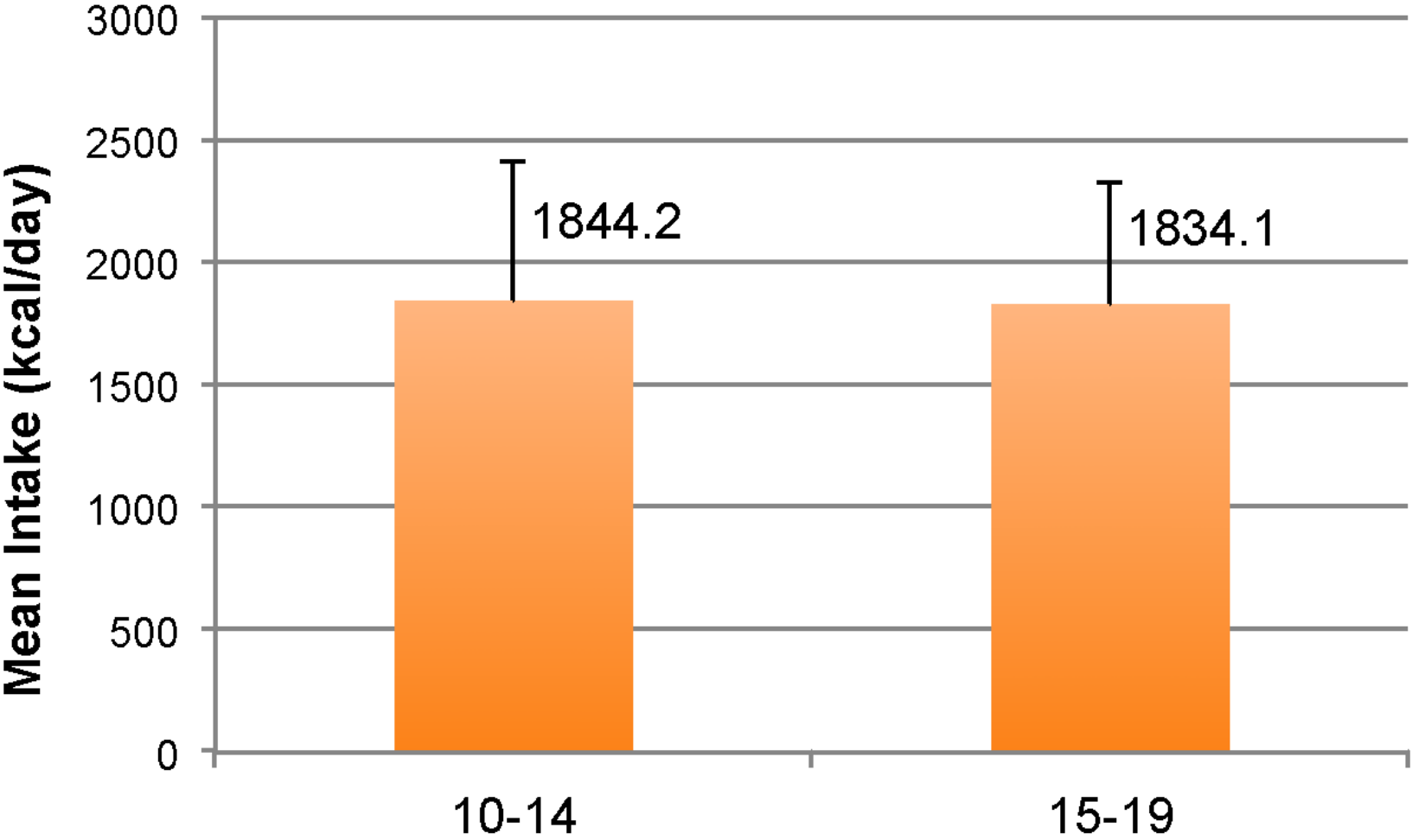


Energy Intake

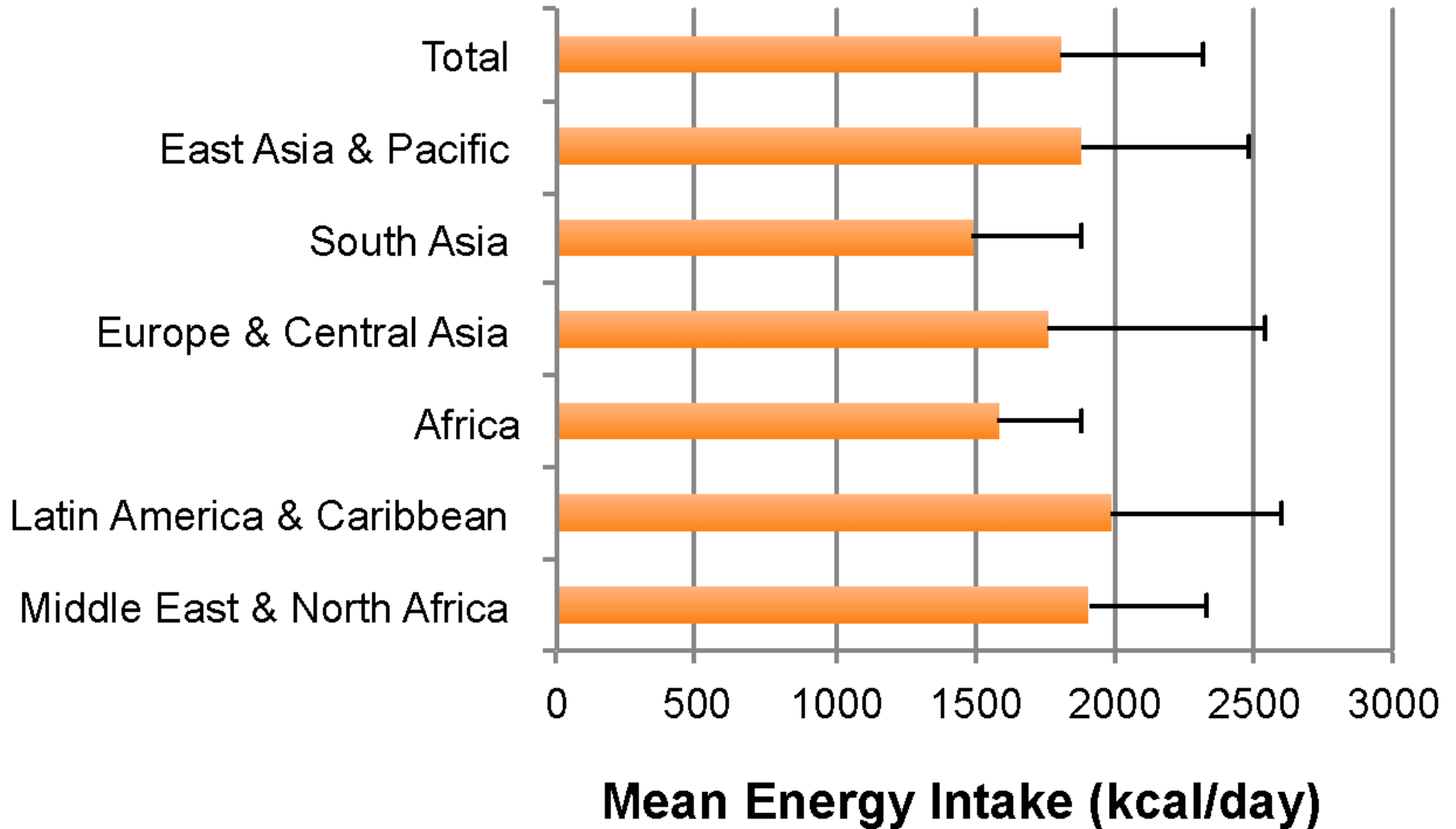
78 studies (n=24,785) reported on energy intake in kcal/day.

MIDDLE EAST & NORTH AFRICA	Algeria (1 urban), Iran (11 urban), Libya (1 urban) Morocco (1 urban, 1 mixed)
LATIN AMERICA & CARRIBEAN	Bolivia (1 urban), Brazil (3 urban, 1 mixed), Mexico (1 urban, 1 rural, 1 mixed, 1 NR), Venezuela (1 peri-urban)
AFRICA	Cameroon (1 urban, 1 rural), Ethiopia (1 rural), Mozambique (3 mixed), Nigeria (2 rural), South Africa (3 urban)
EUROPE & CENTRAL ASIA	Turkey (2 urban)
SOUTH ASIA	Bangladesh (2 urban), India (7 urban, 4 rural, 1 mixed, 1 urban slum), Pakistan (3 urban), Sri Lanka (1 mixed, 1 NR)
EAST ASIA & PACIFIC	Cambodia (1 urban), China (7 urban, 4 mixed), Malaysia (3 mixed, 1 urban, 1 rural), Myanmar (1 peri-urban), Philippines (1 urban), Thailand (1 rural)

Energy Intake by Age



Energy Intake by Region



Dietary Intake

Food group	General consumption	Frequency of consumption	N studies per region
Grains	31 studies (n=53,066)	13 studies (n=6644)	Middle East & North Africa (N=3), Latin America & Caribbean (N=3), Africa (N=8), Europe & Central Asia (N=3), South Asia (N=9), East Asia & Pacific (N=5)
Pulses	22 studies (n=105,987)	10 studies (n=5134)	Middle East & North Africa (N=0), Latin America & Caribbean (N=2), Africa (N=8), Europe & Central Asia (N=0), South Asia (N=7), East Asia & Pacific (N=5)
Nuts & seeds	4 studies (n=1549)	3 studies (n=818)	Middle East & North Africa (N=1), Latin America & Caribbean (N=0), Africa (N=2), Europe & Central Asia (N=0), South Asia (N=1), East Asia & Pacific (N=0)
Dairy	42 studies (n=127,709)	26 studies (n=38,540)	Middle East & North Africa (N=13), Latin America & Caribbean (N=3), Africa (N=7), Europe & Central Asia (N=3), South Asia (N=9), East Asia & Pacific (N=7)
Meat, poultry & fish	34 studies (n=55,782)	24 studies (n=12,673)	Middle East & North Africa (N=4), Latin America & Caribbean (N=1), Africa (N=10), Europe & Central Asia (N=4), South Asia (N=11), East Asia & Pacific (N=4)
Eggs	13 studies (n=5261)	3 studies (n=1194)	Middle East & North Africa (N=1), Latin America & Caribbean (N=0), Africa (N=5), Europe & Central Asia (N=1), South Asia (N=5), East Asia & Pacific (N=1)
Fats & oils	2 studies (n=40,100)	1 study (n=188)	Middle East & North Africa (N=0), Latin America & Caribbean (N=1), Africa (N=1), Europe & Central Asia (N=0), South Asia (N=0), East Asia & Pacific (N=0)

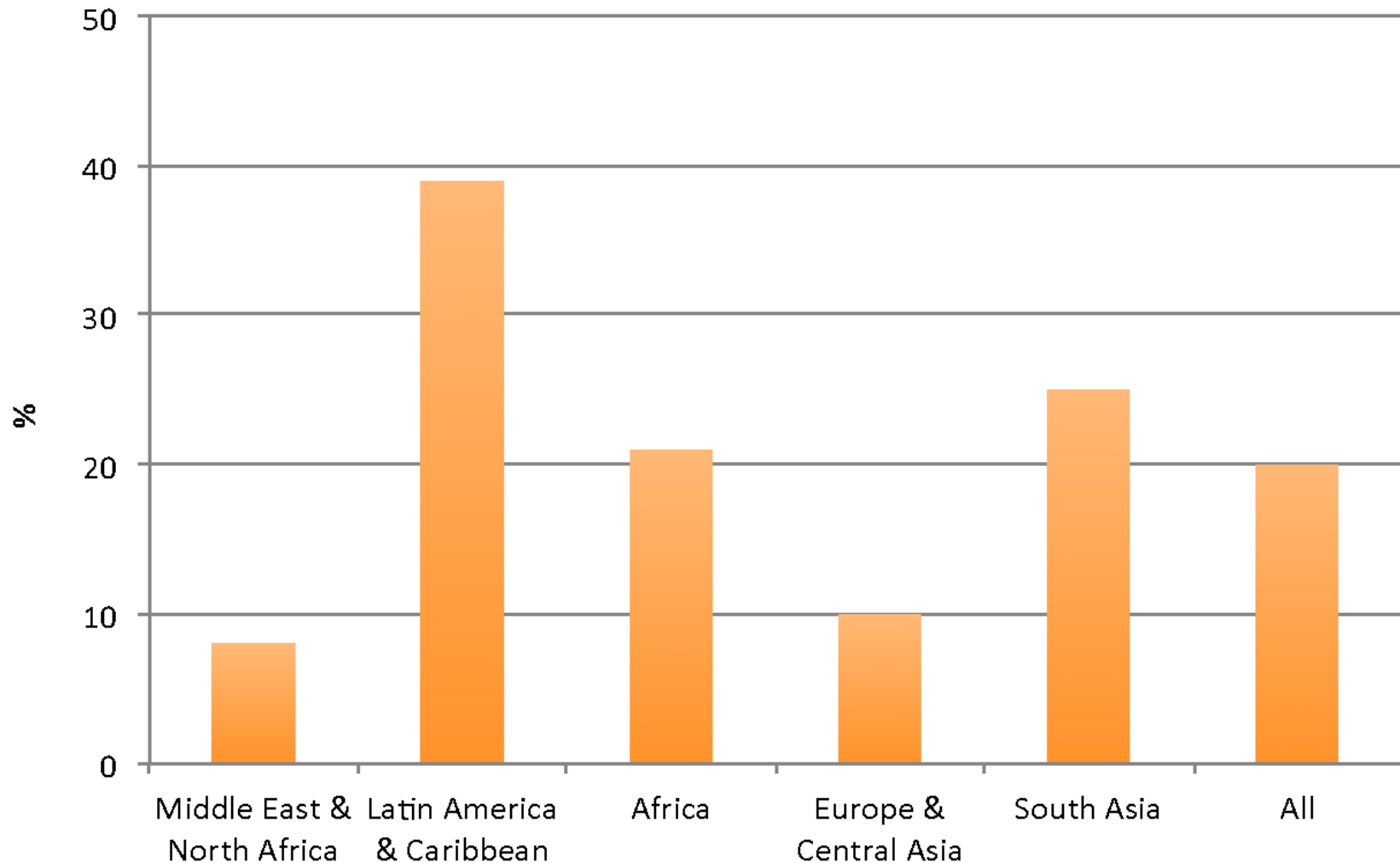
Dietary Intake

Fruit	48 studies (n=153,429)	36 studies (n=103,776)	Middle East & North Africa (N=11), Latin America & Caribbean (N=7), Africa (N=7), Europe & Central Asia (N=2), South Asia (N=11), East Asia & Pacific (N=10)
Vegetables	47 studies (n=151,407)	34 studies (n=100,563)	Middle East & North Africa (N=11), Latin America & Caribbean (N=6), Africa (N=8), Europe & Central Asia (N=3), South Asia (N=11), East Asia & Pacific (N=8)
Condiments & seasonings	1 study (n=193)	1 study (n=193)	Middle East & North Africa (N=0), Latin America & Caribbean (N=0), Africa (N=0), Europe & Central Asia (N=0), South Asia (N=1), East Asia & Pacific (N=0)
Sweet snacks	36 studies (n=187,580)	18 studies (n=132,424)	Middle East & North Africa (N=9), Latin America & Caribbean (N=5), Africa (N=9), Europe & Central Asia (N=2), South Asia (N=6), East Asia & Pacific (N=5)
Salty/fried snacks	20 studies (n=117,996)	9 studies (n=66,792)	Middle East & North Africa (N=7), Latin America & Caribbean (N=2), Africa (N=3), Europe & Central Asia (N=2), South Asia (N=3), East Asia & Pacific (N=3)
Fast/convenient foods	50 studies (n=152,424)	31 studies (n=39,215)	Middle East & North Africa (N=13), Latin America & Caribbean (N=7), Africa (N=9), Europe & Central Asia (N=4), South Asia (N=15), East Asia & Pacific (N=2)
Sugar-sweetened beverages	48 studies (n=206,411)	30 studies (n=140,640)	Middle East & North Africa (N=10), Latin America & Caribbean (N=9), Africa (N=7), Europe & Central Asia (N=5), South Asia (N=7), East Asia & Pacific (N=10)
Alcohol	15 studies (n=30,940)	NR	Middle East & North Africa (N=0), Latin America & Caribbean (N=5), Africa (N=2), Europe & Central Asia (N=1), South Asia (N=1), East Asia & Pacific (N=6)

Dietary Intake (10-19 years)

Inadequate Fruit & Vegetable Intake

Daily Consumption of Fast/Convenience Foods (10-19)



Daily Consumption of Energy-Dense Foods

Place of Consumption

15 studies (n=8373) had place of consumption data, which we synthesized to determine the proportion of adolescent girls who eat meals outside of the home.

MIDDLE EAST & NORTH AFRICA	NR
LATIN AMERICA & CARRIBEAN	Brazil (1 urban)
AFRICA	South Africa (2 urban)
EUROPE & CENTRAL ASIA	NR
SOUTH ASIA	India (5 urban, 1 rural, 1 mixed), Pakistan (1 mixed)
EAST ASIA & PACIFIC	China (1 urban), Malaysia (1 urban, 1 rural), Tonga (1 mixed)

Eating Outside the Home

Meal Patterns:

Number of Meals Consumed

22 studies (n=15,089) reported on the number of meals consumed per day.

MIDDLE EAST & NORTH AFRICA	Egypt (1 mixed), Palestine (1 NR), Iran (1 mixed), Jordan (1 urban)
LATIN AMERICA & CARRIBEAN	Brazil (1 urban)
AFRICA	Ethiopia (1 urban, 4 mixed), Ghana (1 urban), Nigeria (1 urban)
EUROPE & CENTRAL ASIA	Serbia (1 urban), Turkey (1 urban)
SOUTH ASIA	India (4 urban, 1 rural, 1 NR), Sri Lanka (1 rural)
EAST ASIA & PACIFIC	Malaysia (1 urban)

Meal Patterns:

Consumption of <3 meals per day

- Almost half (44%; n=6572) of all adolescent girls (10-19 years) sampled do not consume 3 full meals per day
- We found no differences between younger and older adolescents

Meal Patterns: Breakfast Skipping

42 studies (n=44,990) reported on breakfast skipping.

MIDDLE EAST & NORTH AFRICA	Egypt (1 mixed), Iran (2 mixed, 1 urban), Iraq (1 urban, 1 mixed), Gaza (1 NR), Jordan (2 urban), Palestine (1 rural)
LATIN AMERICA & CARRIBEAN	Brazil (4 urban)
AFRICA	Ghana (1 mixed, 1 NR), Nigeria (2 urban, 1 semi-urban)
EUROPE & CENTRAL ASIA	Bosnia & Herzegovina (1 mixed), Serbia (1 urban)
SOUTH ASIA	India (6 urban, 1 rural, 1 mixed)
EAST ASIA & PACIFIC	China (4 rural, 2 urban, 1 mixed), Fiji (1 mixed), Malaysia (2 urban, 1 rural, 1 NR), Tonga (1 mixed)

Meal Patterns: Breakfast Skipping

- 40% of all adolescent girls skip breakfast
- Breakfast skipping varies by region and by age
- E.g. in Brazil, only 11% (n=193) of younger adolescents skip breakfast compared to 55% (n=161) of older adolescents
- In Africa (Ghana and Nigeria), prevalence of breakfast skipping was 66% (n=1481) and 21% (n=79) for younger and older girls, respectively

Meal Patterns: Snacking

24 studies (n=12,737) reported on snacking behaviour.

MIDDLE EAST & NORTH AFRICA	Egypt (1 mixed), Iran (1 urban), Iraq (1 urban), Lebanon (1 NR), Syria (1 urban),
LATIN AMERICA & CARRIBEAN	Brazil (3 urban)
AFRICA	Nigeria (1 urban, 1 semi-urban), Tanzania (1 mixed)
EUROPE & CENTRAL ASIA	Turkey (1 urban)
SOUTH ASIA	India (5 urban, 1 NR)
EAST ASIA & PACIFIC	China (2 urban, 1 rural), Malaysia (1 urban), Myanmar (1 rural), Tonga (1 mixed)

Meal Patterns: Snacking

- Snacking = consuming food between meals
- Snacking is more common among older girls (59%; n=3135), when compared to younger girls (33%; n=1964)
- Snacking is more common in the morning (between breakfast and lunch; 64%) or afternoon (between lunch and dinner; 61%), when compared to the evening (26%)
- 26% (n=492) of adolescents reported snacking at least once daily

Meal Patterns: Vegetarian diets

17 studies (n=7181) reported on vegetarianism.

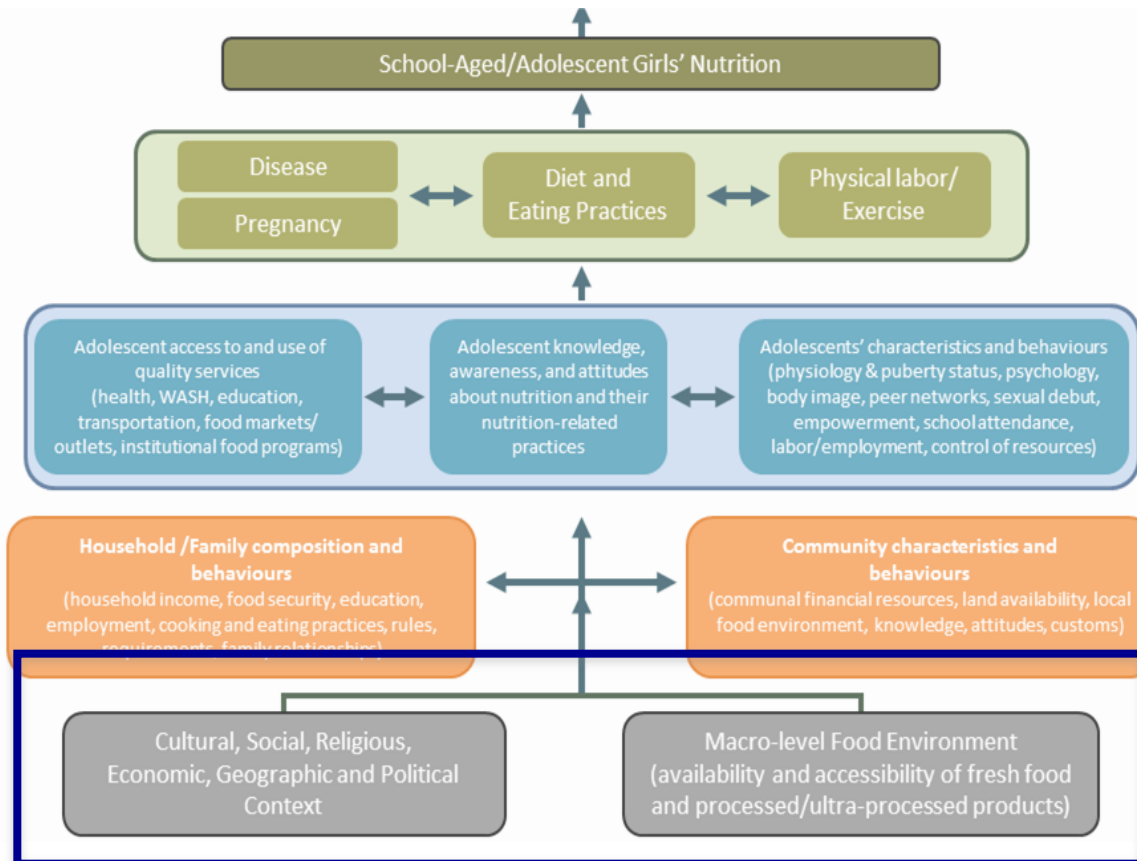
MIDDLE EAST & NORTH AFRICA	Iran (1 urban)
LATIN AMERICA & CARRIBEAN	Brazil (1 NR)
AFRICA	NR
EUROPE & CENTRAL ASIA	NR
SOUTH ASIA	India (11 urban, 2 rural, 1 mixed), Sri Lanka (1 rural)
EAST ASIA & PACIFIC	NR

Meal Patterns: Vegetarian diets

- Within South Asia, we found that the majority of girls eat meat (59% non-vegetarian; n=3676 versus 29% vegetarian; n=1823)
- Additionally, 68% (n=717) of younger adolescents are non-vegetarian compared to 62% (n=2165) of older adolescents
- Within Iran and Brazil, the vast majority of adolescents were non-vegetarian (88%; n=321 and 94%; n=535)

Underlying Determinants of Health/Nutrition

To explore some of the distal factors that could impact adolescent girls' dietary choices, we stratified macronutrient intake by country-level income status, urban/rural residence, and country-level ranking on UNDP's GII.



Macronutrient Intake stratified by Urban/Rural Residence

Protein and fat intake:

Carbohydrate intake:

Macronutrient Intake stratified by Income Level

Protein and fat intake:

Carbohydrate intake:

Macronutrient Intake stratified by GII

- GII ranges from 0-1; higher GII values indicate greater inequalities between genders in that country
- We disaggregated macronutrient intake based on GII quintiles (i.e. 0.100-0.199 to 0.5-0.599), because no country within the macronutrient analysis ranked higher than 0.6

GII Quintile	Countries Represented
0.100-0.199	China, Libya
0.200-0.299	Malaysia,
0.300-0.399	Mexico, Myanmar, Thailand, Turkey, South Africa, Sri Lanka
0.400-0.499	Algeria, Bolivia, Brazil, Ethiopia, Morocco, Philippines, Venezuela
0.500-0.599	Bangladesh, Cameroon, India, Iran, Mozambique, Pakistan, Senegal

Macronutrient Intake stratified by GII

Carbohydrates:

- There was no consistent pattern noted for carbohydrate intake, though the highest intakes were seen among those living in the most equitable countries with GII from 0.100-0.199

Protein:

- Protein intake was highest for adolescents who live in the most equitable countries (0.100-0.199) and protein intake was lowest for those in the most inequitable countries (0.5-0.599)

Fat:

- Fat intake ranged from 59 to 64 grams per day among quintiles 1 to 4 (0.100-0.499), and was less for quintile 5 (0.5-0.599)

Outcomes: 10-14 versus 15-19

	BMI	BMI status	Energy Intake	Carbohydrate	Protein	Fat	POC	Breakfast skipping	Snacking
10-14y	18.6 ± 2.9	Severely thin: 0.5% Thin: 11% Normal: 63% Overweight: 16% Obese: 9%	1844 kcal/d	249 g/d	61 g/d	64 g/d	33% eat outside the home 1-3 times/week	40%	33%
15-19y	20.1 ± 3.4	Severely thin: 0.3% Thin: 11% Normal: 70% Overweight: 16% Obese: 5%	1834 kcal/d	253 g/d	58 g/d	53 g/d	18% eat outside the home 1-3 times/week	41%	59%

	Pulses	Dairy	Flesh foods	Vegetables	Fruit	SSB	Snacks (sweet and salty)	Fast foods	Alcohol
10-14y	Consumption was lower for most regions	10% consumed dairy daily	In MENA, Africa, and SA, intake was higher	33% consumed vegetables daily	32% consumed fruit; of these, 42% consumed them daily	21% consumed SSBs	74% and 49% consumed sweet and salty snacks daily	24% consumed FF daily, and 20% consumed FF on ≥ 4 days/week	13% consumed alcohol
15-19y	Higher consumption (except in LAC)	60% consumed dairy daily	Intake was higher in EAP and EUR/CA	53% consumed vegetables daily	56% consumed fruit; of these, 49% consumed them daily	35% consumed SSBs	31% and 1% consumed sweet and salty snacks daily	8% consumed FF daily, and 29% consumed FF on ≥ 4 days/week	20% consumed alcohol

Limitations

- Difficult to interpret how representative the data are for different populations within a given region (certain countries are over- and under-represented)
- Primary methods used to collect data on consumption varied by study; we have pooled data from 24-hour recalls, food frequency questionnaires, food records, and other methods (though conducted a sensitivity analysis)
- We had to make some assumptions about foods because of lack of detailed information that was reported

Limitations, cont.

- The majority of studies did not report frequency of consumption; interpreting general consumption is challenging considering the varied methods for primary data collection
- It is also challenging to interpret the relevance of our results on protein, fat, and energy intake, as many of the studies did not report this in relation to body size and activity at an individual level
- Several studies reported mean BMI for the total study sample (10-19), therefore we could not disaggregate by smaller age bands

Limitations, cont.

- The measures used to report BMI status varied by study (CDC vs IOTF); some studies did not report which reference values they used to classify their participants into the various weight status categories
- Anthropometric measurements were not always taken for the total sample, limiting the units available for our analysis; in some cases, studies only reported on a single BMI outcome category (typically overweight), which may have led to overestimation
- Majority of included studies (~70%) were conducted in a school-setting, limiting their extrapolation to practices and patterns at household level and generalizability overall

Key Messages

- A higher proportion of younger adolescents (10-14 years) are overweight or obese when compared to older (15-19 years) adolescents in our sample
- Energy-dense foods, including sweet and salty snacks, sugar sweetened beverages, and fast foods, are widely consumed
- Significant differences exist among adolescent girls in different regions. For example:
 - 90% of adolescent girls in South Asia do not consume an adequate diet of fruits or vegetables
 - 40% of adolescent girls in Latin America and the Caribbean consume fast/convenient foods daily

Key Messages, cont.

- Protein intake is inadequate among older adolescents (15-19) in Africa
- 50% of adolescent girls in LMICs do not eat 3 meals per day; most skip breakfast
- Snack foods are consumed during school hours
- Lunch is consumed away from the home; compared to older adolescents, younger adolescents consume more meals away from home

Recommendations

1. Breakfast is skipped among almost half of adolescents; providing breakfast and/or a nutrient-rich, mid-morning snack at school would not only encourage attendance, but it would improve the nutrition, health, and performance of students
2. Snacking most frequently occurs during school hours, and lunch is taken away from the home by over 50% of adolescents; healthy school policies should be mandated for all public and private schools (e.g. to make healthy choices available at school, and limit the number of vendors or food stalls that sell cheap and unhealthy foods on school grounds)

Recommendations, cont.

3. Dietary intake appears to be affected by underlying socioeconomic determinants of health; through social safety nets, cash-transfer systems, or other such mechanisms, governments should ensure that vulnerable populations have better access to nutritious foods
4. Overweight and obesity are more prevalent among younger adolescents; school-based obesity prevention initiatives should be targeted towards this age group specifically

Recommendations, cont.

5. With the current focus on overweight/obesity, girls who are underweight should not be left behind; for example, South Asia requires global assistance to reduce the prevalence of thinness among adolescents (e.g. more investment and capacity building for nutrition supplementation programmes targeted at adolescent girls)

Acknowledgments

SickKids Centre for Global Child Health

Aviva Rappaport, Reena Jain, Shailja Shah, Christina Oh, and Bianca Carducci

USAID-supported SPRING project's technical advisory group (TAG)

Peggy Koniz-Booher, Luz Maria De-Regil, Chessa Lutter, Maria Pura Solon, Rafael Perez-Escamilla, Marcia Griffiths, Gilles Bergeron, Florencia Vasta, Jeniece Alvey, Laura Itzkowitz, Roland Kupka, Abigail Kaplan Ramage, Sascha Lamstein, Gwyneth Cotes, Ian Gorecki, and Andrew Cunningham





THANK YOU!

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Supplementary Slides



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Discussion Points

- Adolescent girls in LMICs have diets that do not meet global food-based dietary guidelines; our findings depict some “Westernized” patterns that include consumption of processed, sugary, and high-fat items
- Diets that are low in nutritious foods and high in processed and other energy-dense foods will have direct health implications for adolescent girls; GBD (2016) found that poor dietary habits are a leading risk factor for mortality, accounting for close to 1 in 5 deaths globally
- Within specific components of diet, low fruit consumption, low whole grain intake, and high sodium were among the most important contributors
- GBD has shown that diets high in red meat, SSB, and low in milk, respectively accounted for the greatest increase in attributable deaths and disability-adjusted life years between 1990 and 2016

Discussion Points

- The dual burden of malnutrition appears to be emphasized in urban areas where the food environment is more obesogenic
- Important implications for adolescent girls who will become pregnant: exacerbation of complications (that are already higher among adolescents) due to chronic diseases
- Potential link between skipping breakfast and snacking in the morning (needs further investigation); some evidence to support school breakfast programmes in LMICs

Dietary Intake – Countries

Food Group	# Studies and Participants (n)	Countries Represented by Region	
Grains	31 studies (n=53,066) for general consumption 13 studies (n=6644) for frequency of consumption	Middle East & North Africa	Iran (2 urban), Jordan (1 urban)
		Latin America & Caribbean	Brazil (1 urban, 1 mixed, 1 NR)
		Africa	Ethiopia (1 urban, 1 rural, 1 mixed), Nigeria (1 urban, 1 semi-urban, 1 rural), South Africa (2 urban)
		Europe & Central Asia	Bosnia & Herzegovina (1 mixed), Serbia (1 urban), Turkey (1 urban)
		South Asia	Bangladesh (1 urban, 1 mixed), India (6 urban), Sri Lanka (1 rural)
		East Asia & Pacific	China (1 urban, 1 rural), Malaysia (1 urban, 2 mixed)
Pulses	22 studies (n=105,987) for general consumption 10 studies (n=5134) for frequency of consumption	Middle East & North Africa	NR
		Latin America & Caribbean	Brazil (2 mixed)
		Africa	Ethiopia (1 urban, 1 rural, 1 mixed), Mozambique (1 mixed), Nigeria (1 semi-urban, 1 rural), South Africa (1 urban), 1 Sudan (1 urban)
		Europe & Central Asia	NR
		South Asia	Bangladesh (1 urban), India (5 urban), Sri Lanka (1 rural)
		East Asia & Pacific	China (4 urban, 1 rural)



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Food Group	# Studies and participants (n)	Countries Represented by Region	
Dairy products	42 studies (n=127,709) for general consumption	Middle East & North Africa	Egypt (1 mixed), Iran (4 urban, 1 mixed), Iraq (1 urban), Jordan (2 urban), Lebanon (1 NR), Morocco (1 urban), Palestine (1 rural), Syria (1 urban)
		Latin America & Caribbean	Brazil (2 mixed), Argentina (1 mixed)
	26 studies (n=38,540) for frequency of consumption	Africa	Ethiopia (1 urban, 1 rural, 1 mixed), Nigeria (1 urban, 1 rural), South Africa (1 urban), Sudan (1 urban)
		Europe & Central Asia	Bosnia & Herzegovina (1 mixed), Serbia (1 urban), Turkey (1 urban)
		South Asia	Bangladesh (2 urban, 1 mixed), India (3 urban, 1 mixed, 1 NR), Pakistan (1 urban)
		East Asia & Pacific	China (3 urban, 2 rural), Malaysia (1 urban, 1 rural)
Meat, poultry, and fish	34 studies (n=55,782) for general consumption	Middle East & North Africa	Iran (1 urban), Jordan (2 urban), Syria (1 urban)
		Latin America & Caribbean	Brazil (1 mixed)
	24 studies (n=12,673) for frequency of consumption	Africa	Ethiopia (1 urban, 1 rural, 1 mixed), Mozambique (1 mixed), Nigeria (1 urban, 1 semi-urban, 1 rural), South Africa (2 urban), Sudan (1 urban)
		Europe & Central Asia	Serbia (1 urban), Turkey (2 urban), multi-country (Turkey & Albania, 1 mixed)
		South Asia	Bangladesh (2 urban, 1 mixed), India (4 urban, 1 NR, 1 urban slum), Pakistan (1 urban), Sri Lanka (1 rural)
		East Asia & Pacific	China (3 urban, 1 rural)



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Food Group	# Studies and participants (n)	Countries Represented by Region	
Fruits	48 studies (n=153,429) for general consumption	Middle East & North Africa	Iran (2 mixed, 2 urban), Iraq (1 urban), Jordan (3 urban), Morocco (1 urban), Palestine (1 rural), Syria (1 urban)
		Latin America & Caribbean	Brazil (4 urban, 2 mixed, 1 NR)
	36 studies (n=103,776) for frequency of consumption	Africa	Ethiopia (1 rural), Ghana (1 urban, 1 mixed), Nigeria (1 urban, 1 semi-urban), South Africa (1 urban), Sudan (1 urban)
		Europe & Central Asia	Serbia (1 urban), Turkey (1 urban)
		South Asia	Bangladesh (2 urban, 1 mixed), India (5 urban, 1 urban slum), Pakistan (1 urban), Sri Lanka (1 rural)
		East Asia & Pacific	China (4 urban, 2 rural), Malaysia (1 urban), Philippines (1 mixed), Tonga (1 mixed), multi-country (Cambodia, Indonesia, Malaysia, Myanmar, Philippines & Vietnam = 1 mixed)
Vegetables	47 studies (n=151,407) for general consumption	Middle East & North Africa	Iran (2 mixed, 2 urban), Iraq (1 urban), Jordan (3 urban), Morocco (1 urban), Palestine (1 rural), Syria (1 urban)
		Latin America & Caribbean	Brazil (3 urban, 2 mixed, 1 NR)
	34 studies (n=100,563) for frequency of consumption	Africa	Ethiopia (2 mixed, 1 rural), Ghana (1 mixed), Mozambique (1 mixed), Nigeria (1 urban, 1 semi-urban), Sudan (1 urban)
		Europe & Central Asia	Serbia (1 urban), Turkey (1 urban), multi-country (Turkey & Albania= 1 mixed)
		South Asia	Bangladesh (2 urban, 1 mixed), India (6 urban, 1 mixed), Pakistan (1 urban)
		East Asia & Pacific	China (3 urban, 2 rural), Philippines (1 mixed), Tonga (1 mixed), multi-country (Cambodia, Indonesia, Malaysia, Myanmar, Philippines & Vietnam = 1 mixed)



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Food Group	# Studies and participants (n)	Countries Represented by Region	
Sweet snacks	36 studies (n=187,580) for general consumption	Middle East & North Africa	Iran (2 mixed), Iraq (1 urban), Jordan (3 urban), Lebanon (1 NR), Morocco (1 urban), Syria (1 urban)
	18 studies (n=132,424) for frequency of consumption	Latin America & Caribbean	Brazil (2 urban, 3 mixed)
		Africa	Ethiopia (1 rural, 1 mixed), Ghana (1 urban), Nigeria (2 urban), South Africa (3 urban), Sudan (1 urban)
		Europe & Central Asia	Serbia (1 urban), Turkey (1 urban)
		South Asia	India (5 urban), Pakistan (1 urban)
		East Asia & Pacific	China (1 urban, 1 rural), Malaysia (1 urban), Thailand (1 urban), Tonga (1 Mixed)
Salty/fried snacks	20 studies (n=117,996) for general consumption	Middle East & North Africa	Iran (1 urban, 2 mixed), Iraq (1 urban), Jordan (1 urban), Lebanon (1 NR), Morocco (1 urban)
	9 studies (n=66,792) for frequency of consumption	Latin America & Caribbean	Brazil (2 mixed)
		Africa	Ethiopia (1 mixed), South Africa (2 urban)
		Europe & Central Asia	Serbia (1 urban), Turkey (1 urban)
		South Asia	India (2 urban), Pakistan (1 urban)
		East Asia & Pacific	China (1 urban), Thailand (1 urban), Tonga (1 mixed)



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Food Group	# Studies and participants (n)	Countries Represented by Region	
Fast and convenience foods	50 studies (n=152,424) for general consumption	Middle East & North Africa	Iran (3 urban, 2 mixed), Iraq (1 mixed), Jordan (2 urban), Lebanon (1 NR), Morocco (1 urban)
	31 studies (n=39,215) for frequency of consumption	Latin America & Caribbean	Brazil (4 urban, 2 mixed), Costa Rica (1 mixed)
		Africa	Ethiopia (1 urban, 1 mixed), Nigeria (1 semi-urban, 1 rural), South Africa (4 urban), Sudan (1 urban)
		Europe & Central Asia	Turkey and Albania (1 urban), Turkey (2 urban), Serbia (1 urban)
		South Asia	India (12 urban, 2 mixed, 1 NR)
		East Asia & Pacific	Cambodia, (1 mixed), China (1 urban)
Sugar-sweetened beverages	48 studies (n=206,411) for general consumption	Middle East & North Africa	Iran (2 mixed), Iraq (1 urban), Jordan (3 urban), Lebanon (1 NR), Morocco (1 urban), Palestine (1 rural), Syria (1 urban)
	30 studies (n=140,650) for frequency of consumption	Latin America & Caribbean	Brazil (4 urban, 4 mixed), Columbia (1 NR)
		Africa	Ghana (1 urban), Nigeria (1 urban, 1 NR), South Africa (3 urban), Sudan (1 urban)
		Europe & Central Asia	Turkey and Albania (1 urban), Turkey (3 urban), Serbia (1 urban)
		South Asia	India (5 urban), Pakistan (1 urban), Sri Lanka (1 NR)
		East Asia & Pacific	Cambodia, (1 mixed), China (3 urban, 1 rural, 1 mixed), Malaysia (1 rural, 1 mixed),



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