Supplement to:

How income and food prices influence global dietary intakes by age and sex: evidence from 164 countries

Appendix A – Supplement Tables

Appendix B – Mapping Dietary Intake to Food Prices

Appendix C – Model and Estimation Results

Appendix A – Supplement Tables

Table S1   Global Dietary Database (GDD) and corresponding International Comparison Program (ICP) categories.

GDD food category	ICP food price category
Fruit – Fresh, frozen, cooked, canned, or dried fruit (excludes fruit juices and salted or pickled fruits).	• *Fresh or chilled fruit* – All fresh or chilled fruit including melons and water melons; excludes vegetables grown for their fruit such as cucumbers and tomatoes. • *Frozen, preserved or processed fruit and fruit* – Includes based products dried fruit, fruit peel, fruit kernels, nuts and edible seeds; other preserved fruit; processed fruit; fruit-based products; excludes jams, marmalades, compotes, jellies, fruit purees and pastes.
Vegetables – Total vegetables, including fresh, frozen, cooked, canned, or dried vegetables (excludes salted or pickled vegetables, vegetable juices, starchy vegetables (e.g., potatoes, corn), legumes, nuts and seeds).	• *Fresh or chilled vegetables other than potatoes* – Fresh or chilled vegetables cultivated for their leaves or stalks, for their fruit, and for their roots; includes olives; garlic; pulses; sweetcorn; sea fennel and other edible seaweed; mushrooms and other edible fungi. • *Frozen, preserved or processed vegetables and vegetable-based products* – Frozen vegetables; dried vegetables; other preserved vegetables; processed vegetables; vegetable-based products; includes frozen preparations such as chipped potatoes; lentils; products of potatoes and other tuber vegetables such as flours, meals, flakes, purees, chips, crisps, etc.; excludes potato starch, tapioca, sago and other starches.
Beans/legumes – Total beans and legumes, including tofu; excluding soy milk.	• *Frozen, preserved or processed vegetables and vegetable-based products* – (Defined above).
Nuts/seeds – Total nuts and seeds (can include peanuts, peanut butter).	• *Other edible oils and fats* - Edible oils (olive oil, corn oil, sunflower-seed oil, cotton-seed oil, soybean oil, groundnut oil, walnut oil, etc.); edible animal fats (lard, etc.); edible vegetable fats (peanut butter, etc.); excludes cod or halibut liver oil.
Whole grains – Total intake of whole grain foods, including from breakfast cereals, bread, rice, pasta, biscuits, muffins, tortillas, etc.	• *Bread* – Fresh and preserved bread. • *Rice* – Rice in all forms except flour.
Unprocessed red meat – Total red meat, including beef, pork, lamb, both domesticated and game; excluding poultry, fish, eggs all processed meats (may include offal).	• *Beef and veal* – Fresh, chilled or frozen meat of bovine animals, excludes edible offal. • *Pork* – Fresh, chilled or frozen meat of swine; excludes edible offal. • *Lamb, mutton and goat* – Fresh, chilled or frozen meat of sheep and goat; excludes edible offal.
Processed meat – Meat processed with sodium or other preservatives, including processed deli or luncheon meats, bacon, salami, sausages, bratwursts, frankfurters, hot dogs, etc.	• *Beef and veal* – (Defined above). • *Pork* – (Defined above).
Fish – Total seafood, including fish and shellfish.	• *Fresh, chilled or frozen fish and seafood* – Fresh, chilled or frozen fish and seafood (crustaceans, molluscs and other shellfish, sea snails); includes land crabs, land snails and frogs; fish and seafood purchased live for consumption as food.
Milk – Total milk, including nonfat, low-fat, and full-fat milk (excluding soya milk or other plant-derived alternatives).	• *Fresh milk* – Raw milk; pasteurised or sterilised milk; includes whole and low fat milk; recombined or reconstituted milk; soya milk.
Sugar-sweetened beverages – Total sugar-sweetened beverages, including any beverage with added sugar and ≥ 50 kcal per 8 oz., such as carbonated beverages, sodas, energy drinks, fruit drinks, etc. (excluding 100% fruit and vegetable juices)	• *Sugar* – Cane or beet sugar, unrefined or refined, powdered, crystallised or in lumps; includes artificial sugar substitutes.
Fruit juice – Total fruit juice, 100% fruit juice only	• *Fresh or chilled fruit* – (Defined above).

Note: ICP price indexes account for differences in currencies and purchasing power for economies around the world. For fruits and vegetables, we used a simple average of the two ICP categories. For whole grains, unprocessed red meat, and processed meat, we used an expenditure-weighted average of the ICP categories due to significant differences in expenditures across countries (e.g., negligible pork demand in Islamic vs. Western countries).

Table S2   Population, income, and food share statistics by region

Variable	Sub-Saharan Africa N=45	Latin America/ Caribbean N=30	FCP N=27	Asia N=13	MENA/ South Asia N=23	High Income/ Western N=26
Total adult population, age ≥ 16 (millions)	479	398	311	1,650	1,395	646
Mean per capita GDP (thousand $US)	4.2 (1 - 34)	12.1 (2 - 29)	14.8 (2 - 28)	21.9 (3 - 72)	24.4 (2 - 127)	38.8 (7 - 89)
Mean food share of GDP (%)	33 (5 - 64)	18 (7 - 66)	21 (8 - 51)	15 (3 - 39)	19 (2 - 45)	8 (3 - 24)
Mean food share of total consumption (%)	43 (18 - 66)	23 (9 - 58)	26 (13 - 55)	25 (6 - 51)	29 (11 - 56)	12 (6 - 40)

Sources: Adult population and per capita GDP (purchasing power parity (PPP) adjusted), World Bank Development Indicators; Food shares are derived using World Bank, International Comparison Program data. Note: All estimates are based on the number of countries (N) within each region. (Min – Max) values are in parentheses.

Sub-Saharan Africa (Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo, Côte d'Ivoire, Djibouti, DR Congo, Equatorial Guinea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mozambique, Namibia, Niger, Nigeria, Rwanda, São Tomé and Principe, Senegal, Sierra Leone, South Africa, Sudan, Swaziland, Tanzania, Togo, Uganda, Zambia, and Zimbabwe).

Latin America and the Caribbean (Antigua and Barbuda, Bahamas, Barbados, Belize, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Dominica, Dominican Republic, Ecuador, El Salvador, Grenada, Guatemala, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, St. Lucia, St. Vincent and Grenadines, Suriname, Trinidad and Tobago, Uruguay, and Venezuela).

Former Centrally Planned (FCP) economies of Central and Eastern Europe and Central Asia (Albania, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Estonia, Georgia, Hungary, Kazakhstan, Kyrgyz Republic, Latvia, Lithuania, Macedonia, Moldova, Mongolia, Montenegro, Poland, Romania, Russia, Serbia, Slovak Republic, Slovenia, Tajikistan, and Ukraine).

Asia (Brunei Darussalam, Cambodia, China, Indonesia, Japan, South Korea, Laos, Malaysia, Maldives, Philippines, Singapore, Thailand, and Vietnam).

Middle East and North Africa (MENA)/South Asia (Algeria, Bahrain, Bangladesh, Bhutan, Egypt, India, Iran, Iraq, Israel, Jordan, Kuwait, Morocco, Nepal, Oman, Pakistan, Qatar, Saudi Arabia, Sri Lanka, Tunisia, Turkey, United Arab Emirates, West Bank and Gaza, and Yemen).

High-Income/Western Countries (Australia, Austria, Belgium, Canada, Cyprus, Denmark, Fiji, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, New Zealand, Norway, Portugal, Seychelles, Spain, Sweden, Switzerland, United Kingdom, and United States).

Table S3   Income and own-price elasticities by food category and region

Food Category	Sub-Saharan Africa	Latin America and Caribbean	FCP	Asia	MENA/South Asia	High Income/ Western
			Income elasticities			
Fruit	0.22 (0.05)***	0.15 (0.03)***	0.22 (0.05)***	0.16 (0.04)***	0.20 (0.05)***	0.15 (0.05)***
Vegetables	0.01 (0.05)	-0.01 (0.07)	-0.01 (0.05)	-0.02 (0.04)	-0.02 (0.04)	-0.03 (0.06)
Beans and legumes	0.01 (0.08)	-0.11 (0.09)	-0.98 (0.62)	-0.35 (0.16)**	-0.35 (0.16)**	-1.05 (0.53)**
Nuts and seeds	-0.14 (0.20)	-0.60 (0.27)**	-0.83 (0.36)**	-0.14 (0.07)**	-0.58 (0.27)**	-1.91 (0.80)**
Whole grains	0.12 (0.09)	-0.02 (0.17)	-0.18 (0.32)	-0.10 (0.10)	-0.27 (0.22)	-0.25 (0.22)
Unprocessed red meat	0.27 (0.06)***	0.23 (0.04)***	0.21 (0.04)***	0.35 (0.09)***	0.22 (0.06)***	0.18 (0.07)***
Processed meat	0.38 (0.10)***	0.05 (0.03)*	0.05 (0.03)*	0.06 (0.07)	0.09 (0.15)	-0.01 (0.04)
Fish	0.07 (0.06)	0.07 (0.04)*	0.09 (0.07)	0.05 (0.04)	0.11 (0.08)	0.05 (0.05)
Milk	0.39 (0.07)***	0.13 (0.03)***	0.12 (0.03)***	0.13 (0.08)	0.07 (0.06)	0.02 (0.06)
Sugar-sweet. beverages	0.17 (0.04)***	0.02 (0.02)	0.11 (0.08)	0.02 (0.09)	0.03 (0.06)	-0.05 (0.09)
Fruit juice	0.81 (0.25)***	0.17 (0.04)***	0.42 (0.09)***	0.51 (0.13)***	0.38 (0.11)***	0.19 (0.07)***
			Own-price elasticities			
Fruit	-0.85 (0.22)**	-0.34 (0.14)**	-0.53 (0.25)*	-0.33 (0.21)	-0.37 (0.25)	-0.24 (0.23)
Vegetables	-0.12 (0.19)	-0.09 (0.27)	-0.08 (0.25)	-0.04 (0.19)	-0.04 (0.19)	-0.04 (0.29)
Beans and legumes	0.07 (0.24)	-0.08 (0.29)	-1.08 (2.79)	-0.55 (0.98)	-0.52 (0.88)	-1.73 (2.49)
Nuts and seeds	-0.38 (0.96)	0.37 (1.18)	0.59 (1.41)	0.14 (0.23)	0.58 (0.89)	1.79 (2.20)
Whole grains	-0.78 (0.32)**	-1.79 (0.83)**	-3.11 (1.60)*	-0.69 (0.44)	-1.49 (1.01)	-0.97 (0.86)
Unprocessed red meat	-0.21 (0.22)	-0.20 (0.12)	-0.19 (0.11)*	-0.34 (0.19)*	-0.21 (0.12)*	-0.18 (0.12)
Processed meat	-1.06 (0.37)***	-0.28 (0.11)**	-0.28 (0.12)**	-0.63 (0.33)*	-1.29 (0.71)*	-0.26 (0.17)
Fish	-0.57 (0.18)***	-0.65 (0.22)***	-0.97 (0.34)***	-0.41 (0.16)***	-0.96 (0.37)**	-0.47 (0.20)**
Milk	-0.24 (0.15)	-0.21 (0.11)*	-0.23 (0.12)*	-0.50 (0.27)*	-0.36 (0.19)*	-0.29 (0.17)*
Sugar-sweet. beverages	-0.48 (0.17)***	-0.13 (0.04)***	-0.71 (0.23)***	-0.56 (0.19)***	-0.38 (0.13)***	-0.38 (0.17)**
Fruit juice	-1.33 (0.47)***	-0.31 (0.15)**	-0.78 (0.41)*	-0.99 (0.59)*	-0.72 (0.44)	-0.38 (0.27)

Note: Elasticity estimates (used to create figure 1) are averaged by sex and derived at age 40. Asymptotic standard errors are in parentheses and derived using the delta method. *** $p<0.01$, ** $p<0.05$, and *$p<0.10$. FCP = Former Centrally Planned economies of Central and Eastern Europe and Central Asia. MENA = Middle East and North Africa.

Table S4   Estimates for plant-based intake (full model)

Variable	Fruit	Vegetables	Beans and legumes	Nuts and seeds	Whole grains
Constant	5.11 (196.05)	-20.89 (163.20)	-366.51 (240.07)	-5.40 (40.31)	-488.53 (246.39)**
Women (W)	-26.05 (44.35)	28.68 (30.98)	1.02 (7.77)	0.47 (3.37)	-0.81 (8.78)
Age	4.73 (4.68)	4.23 (3.94)	1.73 (3.61)	-1.35 (1.90)	-0.28 (1.10)
Age^2	-0.05 (0.04)	-0.04 (0.03)	-0.02 (0.03)	0.01 (0.02)	0.00 (0.01)
Asia	14.92 (21.59)	27.72 (24.15)	0.85 (6.52)	28.21 (12.87)**	-8.81 (35.35)
FCP	-35.82 (13.25)***	-27.23 (20.90)	-12.46 (6.98)*	-7.06 (4.09)	-75.96 (25.51)***
LAC	47.77 (16.66)***	-43.76 (20.70)**	58.69 (15.37)***	-6.62 (4.41)	-56.92 (26.85)**
SSA	-12.90 (14.80)	-27.12 (20.13)	101.97 (25.77)***	-7.53 (5.05)	4.85 (33.45)
MENA/South Asia	-8.94 (14.12)	51.42 (19.07)***	13.62 (5.66)**	-0.91 (3.96)	-57.81 (26.79)**
log(Y)	25.39 (43.98)	31.25 (34.76)	78.01 (48.78)	5.06 (9.39)	119.73 (51.32)**
W × log(Y)	3.24 (9.96)	-3.59 (6.96)	0.12 (1.72)	0.30 (0.71)	-0.09 (1.90)
Age × log(Y)	-1.47 (1.07)	-0.65 (0.88)	-0.01 (0.79)	0.51 (0.44)	0.05 (0.24)
Age^2 × log(Y)	0.01 (0.01)	0.01 (0.01)	0.00 (0.01)	-0.01 (0.00)	0.00 (0.00)
log(P)	-361.95 (129.49)***	-28.63 (107.47)	34.33 (126.83)	-11.59 (20.79)	-6.81 (173.38)
W × log(P)	25.70 (30.24)	-8.57 (20.53)	2.39 (3.84)	-2.74 (1.65)*	-17.05 (6.13)***
Age × log(P)	5.06 (3.05)*	-0.34 (2.45)	3.29 (2.21)	-1.29 (0.80)	-2.12 (0.80)***
Age^2 × log(P)	-0.04 (0.02)	0.00 (0.02)	-0.03 (0.02)	0.01 (0.01)	-0.02 (0.01)***
log(P) × log(Y)	35.19 (14.72)**	5.96 (12.74)	-5.98 (13.53)	1.23 (2.59)	-3.57 (19.52)
W × log(P) × log(Y)	-3.68 (3.49)	-0.13 (2.36)	-0.20 (0.40)	0.33 (0.17)**	1.48 (0.64)**
Age × log(P) × log(Y)	-0.61 (0.36)*	-0.08 (0.28)	-0.29 (0.24)	0.15 (0.08)*	0.18 (0.09)**
Age^2 × log(P) × log(Y)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)*	0.00 (0.00)***
log(Y)^2	-1.79 (2.44)	-2.06 (1.88)	-4.06 (2.48)	-0.43 (0.55)	-6.46 (2.76)**
W × log(Y)^2	0.24 (0.55)	0.24 (0.39)	-0.02 (0.09)	-0.03 (0.04)	0.03 (0.10)
Age × log(Y)^2	0.12 (0.06)*	0.04 (0.05)	-0.01 (0.04)	-0.03 (0.02)	0.00 (0.01)
Age^2 × log(Y)^2	0.00 (0.00)*	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Adjusted R^2	0.47	0.32	0.40	0.31	0.29

Note: FCP = Former Centrally Planned economies of Central and Eastern Europe and Central Asia. LAC = Latin America and the Caribbean. SSA = Sub-Saharan Africa. MENA = Middle East and North Africa. *** p<0.01, ** p<0.05, and *p<0.10. Standard errors are in parentheses. Total observations = 4,264 (164 countries × 26 age and sex categories) for each food category.

Table S5   Estimates for meat, fish, and beverage intake (full model)

Variable	Unprocessed red meat	Processed meat	Fish	Milk	Sugar-sweetened beverages	Fruit juice
Constant	-47.38 (79.06)	-102.66 (35.20)***	-7.59 (36.72)	-1,043.46 (219.66)***	-1942.61 (670.75)***	-157.12 (203.67)
Women (W)	-0.09 (9.19)	26.52 (9.43)***	-1.98 (1.93)	-70.30 (19.70)***	65.43 (27.52)**	-36.62 (23.94)
Age	0.04 (0.57)	0.48 (0.14)***	1.52 (1.76)	13.44 (2.99)***	54.07 (20.00)***	5.24 (4.70)
Age²	0.00 (0.01)	0.01 (0.00)**	-0.01 (0.01)	-0.19 (0.04)***	-0.44 (0.17)**	-0.03 (0.04)
Asia	-19.89 (6.66)***	-13.96 (2.13)***	6.63 (5.66)	-58.64 (20.35)***	-49.79 (32.87)	-28.70 (9.80)***
FCP	1.09 (6.19)	0.45 (2.57)	-15.40 (3.13)***	2.76 (17.44)	-42.22 (28.14)	-30.04 (9.66)***
LAC	-4.08 (6.48)	-1.31 (3.22)	-9.66 (4.51)**	24.14 (20.38)	532.46 (68.16)***	10.34 (10.70)
SSA	4.72 (7.87)	-15.46 (2.46)***	-11.45 (5.29)**	19.69 (19.18)	107.41 (34.44)***	-30.28 (13.14)**
MENA/South Asia	-3.95 (6.33)	-19.25 (1.86)***	-16.68 (3.55)***	-16.38 (15.96)	23.69 (28.89)	-31.34 (9.46)***
log(Y)	10.98 (17.60)	26.47 (7.67)***	7.89 (7.84)	228.39 (48.80)***	488.55 (150.54)***	24.15 (44.83)
W × log(Y)	0.04 (2.11)	-5.61 (2.18)***	0.51 (0.43)	16.28 (4.40)***	-17.89 (6.25)***	5.99 (5.42)
Age × log(Y)	-0.03 (0.13)	-0.11 (0.03)***	-0.36 (0.39)	-2.92 (0.67)***	-14.09 (4.51)***	-0.73 (1.07)
Age² × log(Y)	0.00 (0.00)	0.00 (0.00)*	0.00 (0.00)	0.04 (0.01)***	0.12 (0.04)***	0.00 (0.01)
log(P)	7.15 (47.99)	-20.89 (21.27)	16.19 (13.26)	176.69 (111.09)	-635.80 (397.70)	-23.77 (112.88)
W × log(P)	4.18 (5.81)	5.59 (4.46)	0.69 (0.66)	9.66 (8.74)	33.39 (17.77)*	-7.56 (13.26)
Age × log(P)	-0.41 (0.32)	-0.06 (0.08)	-0.73 (0.66)	-5.00 (1.81)***	19.17 (11.70)	1.07 (2.56)
Age² × log(P)	0.00 (0.00)	0.00 (0.00)	0.01 (0.01)	0.05 (0.02)**	-0.17 (0.10)*	-0.01 (0.02)
log(P) × log(Y)	-1.80 (4.94)	1.16 (2.37)	-2.03 (1.63)	-25.18 (13.28)*	37.09 (40.92)	-2.17 (13.59)
W × log(P) × log(Y)	-0.28 (0.60)	-0.47 (0.51)	-0.04 (0.08)	-1.66 (1.03)	-2.35 (1.84)	0.37 (1.58)
Age × log(P) × log(Y)	0.04 (0.03)	0.01 (0.01)	0.03 (0.08)	0.68 (0.22)***	-1.07 (1.21)	-0.02 (0.31)
Age² × log(P) × log(Y)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	-0.01 (0.00)***	0.01 (0.01)	0.00 (0.00)
log(Y)²	-0.06 (0.96)	-1.29 (0.42)***	-0.58 (0.42)	-10.35 (2.69)***	-25.60 (8.36)***	0.24 (2.45)
W × log(Y)²	-0.07 (0.12)	0.26 (0.12)**	-0.04 (0.02)	-0.77 (0.24)***	1.00 (0.35)***	-0.13 (0.30)
Age × log(Y)²	0.01 (0.01)	0.01 (0.00)***	0.04 (0.02)	0.13 (0.04)***	0.77 (0.25)***	0.00 (0.06)
Age² × log(Y)²	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)***	-0.01 (0.00)***	0.00 (0.00)
Adjusted R²	0.29	0.55	0.42	0.42	0.77	0.47

Note: FCP = Former Centrally Planned economies of Central and Eastern Europe and Central Asia. LAC = Latin America and the Caribbean. SSA = Sub-Saharan Africa. MENA = Middle East and North Africa. *** p<0.01, ** p<0.05, and *p<0.10. Standard errors are in parentheses. The sugar-sweetened beverages model contained *Region* and *Age* interaction terms as explanatory variables. Total observations = 4,264 (164 countries × 26 age and sex categories) for each food category.

Table S6   Estimates for plant-based intake (base model)

Variable	Fruit	Vegetables	Beans and legumes	Nuts and seeds	Whole grains
Constant	-94.33 (39.32)**	102.83 (52.08)**	17.86 (61.92)	30.63 (15.45)**	8.27 (67.20)
Women (W)	22.83 (1.05)***	15.00 (0.57)***	0.77 (0.15)***	0.74 (0.07)***	2.31 (0.21)***
Age	1.15 (0.09)***	1.89 (0.07)***	0.78 (0.07)***	0.38 (0.05)***	0.30 (0.03)***
Age²	-0.01 (0.00)***	-0.02 (0.00)***	-0.01 (0.00)***	0.00 (0.00)***	0.00 (0.00)***
Asia	15.64 (20.60)	29.57 (23.73)	2.49 (7.85)	31.74 (13.14)***	-8.34 (34.01)
FCP	-35.67 (12.29)***	-24.21 (17.70)	-9.62 (9.93)	-2.38 (2.75)	-71.70 (19.12)***
LAC	49.26 (15.61)***	-40.24 (16.50)**	61.70 (17.53)***	-1.68 (3.06)	-51.67 (19.90)**
SSA	-10.72 (14.70)	-26.61 (19.23)	100.93 (26.76)***	-5.59 (4.51)	0.65 (31.13)
MENA/South Asia	-7.35 (13.82)	52.27 (17.31)***	13.91 (7.51)*	2.86 (2.71)	-58.39 (22.23)***
log(Y)	19.80 (3.65)***	-1.17 (4.99)	-2.15 (5.82)	-3.22 (1.46)**	3.64 (6.23)
log(P)	-63.09 (20.65)***	-11.38 (22.68)	3.09 (27.41)	-1.13 (7.08)	-78.01 (31.54)**
Adjusted R²	0.46	0.32	0.40	0.30	0.28

Note: FCP = Former Centrally Planned economies of Central and Eastern Europe and Central Asia. LAC = Latin America and the Caribbean. SSA = Sub-Saharan Africa. MENA = Middle East and North Africa. *** p<0.01, ** p<0.05, and *p<0.10. Standard errors are in parentheses. Total observations = 4,264 (164 countries × 26 age and sex categories) for each food category.

Table S7   Estimates for meat, fish, and beverage intake (base model)

Variable	Unprocessed red meat	Processed meat	Fish	Milk	Sugar-sweetened beverages	Fruit juice
Constant	-54.85 (19.43)***	13.36 (7.00)*	-8.55 (10.35)	-92.51 (51.87)	280.25 (47.59)***	-18.27 (29.82)
Women (W)	-5.57 (0.21)***	-2.91 (0.18)***	-0.69 (0.04)***	12.43 (0.58)***	-13.36 (0.82)***	7.76 (0.59)***
Age	0.35 (0.01)***	-0.05 (0.00)***	0.81 (0.03)***	-2.28 (0.11)***	-10.87 (0.74)***	-1.46 (0.11)***
Age²	0.00 (0.00)***	0.00 (0.00)***	-0.01 (0.00)***	0.03 (0.00)***	0.08 (0.01)***	0.01 (0.00)***
Asia	-19.73 (6.47)***	-13.37 (2.21)***	7.29 (5.59)	-53.54 (20.17)	-10.63 (15.21)	-29.12 (9.76)***
FCP	1.35 (5.67)	1.33 (2.44)	-15.36 (2.96)***	14.26 (17.56)	-4.32 (11.53)	-30.34 (9.50)***
LAC	-3.87 (6.20)	-0.26 (3.18)	-9.32 (4.17)**	35.64 (18.89)*	263.13 (30.50)***	9.79 (10.55)
SSA	4.85 (7.91)	-15.58 (2.50)***	-10.97 (5.08)**	17.80 (20.64)	54.52 (15.10)***	-30.28 (13.13)**
MENA/South Asia	-3.53 (5.96)	-18.88 (1.83)***	-16.16 (3.21)***	-14.03 (16.77)	25.29 (12.49)**	-31.36 (9.35)***
log(Y)	11.18 (1.79)***	1.77 (0.68)***	1.78 (0.96)*	27.79 (4.73)***	13.96 (4.48)***	11.73 (2.73)***
log(P)	-9.82 (6.26)	-6.96 (2.77)**	-15.18 (4.81)***	-36.71 (16.90)**	-53.61 (15.15)***	-20.28 (8.00)**
Adjusted R²	0.29	0.54	0.42	0.39	0.67	0.46

Note: FCP = Former Centrally Planned economies of Central and Eastern Europe and Central Asia. LAC = Latin America and the Caribbean. SSA = Sub-Saharan Africa. MENA = Middle East and North Africa. *** p<0.01, ** p<0.05, and *p<0.10. Standard errors are in parentheses. Total observations = 4,264 (164 countries × 26 age and sex categories) for each food category.

Table S8 Estimates for select categories with High-Income Asian Pacific (APC), South Asia (SA), and Other Islands as additional regions (base model)

Variable	Fruit	Processed meat	Fish	Milk	Sugar-sweetened beverages	Fruit juice
Constant	-67.12 (44.27)	7.09 (7.77)	4.28 (11.06)	-110.53 (61.02)*	249.46 (58.04)***	3.92 (36.09)
Women (W)	22.83 (1.05)***	-2.91 (0.18)***	-0.69 (0.04)***	12.43 (0.58)***	-13.36 (0.82)***	7.76 (0.59)***
Age	1.15 (0.09)***	-0.05 (0.00)***	0.81 (0.03)***	-2.28 (0.11)***	-10.87 (0.74)***	-1.46 (0.11)***
Age²	-0.01 (0.00)***	0.00 (0.00)***	-0.01 (0.00)***	0.03 (0.00)***	0.08 (0.01)***	0.01 (0.00)***
Asia (w/o APC)	25.08 (27.88)	-10.04 (2.76)***	-2.13 (5.31)	-45.12 (26.80)*	10.40 (17.83)	-34.11 (12.02)***
FCP	-40.05 (13.00)***	2.35 (2.56)	-16.44 (3.09)***	14.39 (18.38)	0.41 (11.92)	-34.02 (9.96)***
LAC	44.03 (16.29)***	1.26 (3.38)	-10.89 (4.47)**	36.03 (19.64)*	268.94 (32.06)***	5.84 (10.98)
SSA	-19.30 (16.16)	-13.09 (3.01)***	-14.81 (5.77)***	20.71 (22.76)	63.72 (17.36)***	-36.90 (14.70)**
MENA (w/o SA)	4.73 (14.56)	-19.38 (1.82)***	-17.06 (3.28)***	-18.86 (16.19)	32.17 (13.40)**	-30.89 (9.58)***
APC	-19.17 (26.26)	-18.14 (2.07)***	23.43 (7.51)***	-73.29 (20.65)***	-42.07 (16.46)**	-30.45 (10.82)***
SA	-57.98 (18.75)***	-14.31 (2.90)***	-18.51 (4.90)***	-0.50 (38.41)*	22.66 (17.81)	-46.39 (11.40)***
Other Islands	-38.92 (11.67)***	0.28 (2.17)	4.75 (4.31)	-46.68 (15.74)***	54.56 (15.13)***	-46.52 (9.96)***
log(Y)	17.34 (4.09)***	2.32 (0.72)***	0.51 (1.05)	29.68 (5.59)***	16.72 (5.63)***	9.80 (3.32)***
log(P)	-60.88 (20.55)***	-4.78 (3.23)	-16.25 (5.12)***	-36.06 (16.81)**	-52.29 (15.57)***	-18.75 (7.96)**
Adjusted R²	0.50	0.55	0.46	0.40	0.67	0.47

Note: FCP = Former Centrally Planned economies of Central and Eastern Europe and Central Asia. LAC = Latin America and the Caribbean. SSA = Sub-Saharan Africa. MENA = Middle East and North Africa. APC = High-Income Asian Pacific. SA = South Asia. *** $p<0.01$, ** $p<0.05$, and *$p<0.10$. Standard errors are in parentheses. Total observations = 4,264 (164 countries × 26 age and sex categories) for each food category.

Table S9 Regional share of income deciles

Income decile	Sub-Saharan Africa	Latin America/ Caribbean	FCP	Asia	MENA/ South Asia	High Income/ Western
1st	1.00	0.00	0.00	0.00	0.00	0.00
2nd	0.71	0.06	0.06	0.06	0.12	0.00
3rd	0.35	0.18	0.12	0.12	0.24	0.00
4th	0.24	0.18	0.24	0.12	0.18	0.06
5th	0.06	0.53	0.12	0.12	0.12	0.00
6th	0.18	0.29	0.24	0.06	0.18	0.00
7th	0.06	0.35	0.35	0.06	0.12	0.00
8th	0.00	0.18	0.47	0.00	0.06	0.24
9th	0.06	0.00	0.00	0.12	0.06	0.71
10th	0.00	0.00	0.00	0.12	0.29	0.53

Note: Each income decile is composed of 16 countries (except the 4 lowest deciles, which are each composed of 17 countries). Values are the share of countries in a given region that make the income decile. For instance, Sub-Saharan African countries are 100% of the lowest income decile; High-Income/Western countries are 71% of the 9th income decile. FCP = Former Centrally Planned economies of Central and Eastern Europe and Central Asia. MENA = Middle East and North Africa.

Appendix B – Mapping Dietary Intake to Food Prices

Fish and milk are categories with a one-to-one matching between the Global Dietary Database (GDD) and International Comparison Program (ICP) data. Proxies were used for beans/legumes, nuts/seeds, sugar-sweetened beverages, and fruit juice since they are not explicitly defined in the ICP data. For instance, the fish intake category from the GDD corresponded to the fish (fresh, chilled, and frozen) price index from the ICP, but the nuts/seeds category from the GDD was matched with the other edible oils and fats price index from the ICP, which is the closest food category and mostly includes oils derived from nuts and seeds. Preliminary results indicated that the sugar price index and fresh-fruit price index were considerably better predictors of sugar-sweetened beverage and fruit juice intake, respectively, compared to the broader price index for all-nonalcoholic beverages. This is plausible because sugar and fresh fruit are respectively primary inputs in the production of sugar-sweetened beverages and fruit juice.

The remaining GDD food categories corresponded to more than one ICP category. For instance, the ICP disaggregates fruits and vegetables into two groupings: fresh and frozen/preserved/processed. For fruits and vegetables, we used a simple average of the ICP categories. Simple averages were not appropriate for whole grains, unprocessed red meat, and processed meat due to significant differences in expenditures across countries (e.g., negligible pork demand in Islamic countries relative to Western countries). For these categories we used an expenditure-weighted average of the ICP categories. See table S1.

Appendix C – Model and Estimation Results

Let q_{giC} represent mean daily intake of the ith food category in country C by subgroup g (g: sex and age) and p_{iC} the price level index for the same food category and country. Let Y_C and P_C represent real per capita income and the food-price level index, respectively, in country C. The following semi-log quadratic form is used to estimate food-intake demand:

$$q_{giC} = \alpha_{0i}^* + \alpha_{1i}^* \log(Y_C) + \alpha_{2i}^* \log\left(\frac{p_{iC}}{P_C}\right) + \alpha_{3i}^* \left[\log(Y_C) \times \log\left(\frac{p_{iC}}{P_C}\right)\right] + \alpha_{4i}^* \log(Y_C)^2 + u_{giC}. \quad (1)$$

The α_{ni}^* terms [$n = \{0,1,2,3,4\}$] are parameters to be estimated and u_{giC} is a random error term.

      Our modeling framework accounts for differences across sex and age subgroups by allowing these factors to have a direct effect on food intake, as well as an additional effect through income and prices. Accordingly, the parameters in equation (1) were expanded to account for differences by sex and age. Global analyses of food demand behavior should also account for differences in preferences across countries due to cultural differences or other non-income or non-price related factors. We assumed these preferences are region specific and expanded the model parameters accordingly:

$$\alpha_{ni}^* = \alpha_{ni_0} + \alpha_{ni_1}W + \alpha_{ni_2}Age + \alpha_{ni_3}Age^2 + \alpha_{ni_{4k}} \sum_k Region_k \quad (2)$$

W is a binary variable (= 1 for women and 0 otherwise). Age is a continuous variable ranging from 20 to 80 in 5-year intervals. The Age^2 term is added to allow for nonlinear age effects and the possibility of optimal responsiveness between the youngest and oldest subgroups. We account for preferences across countries due to factors not related to income or prices by including regional binary variables ($Region$).

      Taking the derivative of equation (1) with respect to $\log(Y_C)$ or $\log(p_{iC})$, and then multiplying by $\frac{1}{q_{giC}}$, the income elasticity (ε) and own-price elasticity (η) are respectively derived as follows:

$$\varepsilon_{giC} = \frac{\%\Delta q_{giC}}{\%\Delta Y_C} = \frac{1}{q_{giC}}\left[\alpha_{1i}^* + \alpha_{3i}^* \log\left(\frac{p_{iC}}{P_C}\right) + \alpha_{4i}^* 2\log(Y_C)\right] \quad (3)$$

$$\eta_{giC} = \frac{\%\Delta q_{giC}}{\%\Delta p_{iC}} = \frac{1}{q_{giC}}[\alpha_{2i}^* + \alpha_{3i}^* \log(Y_C)]. \quad (4)$$

ε_{giC} is the percentage change in intake from a 1% change in income and is positive or negative depending on the food category, and η_{giC} is the percentage change in intake due to a 1% change in the price level; η_{giC} should be negative since an increase in price usually leads to a decrease in quantity demanded. Since α_{ni}^* can vary with sex, age, and region, depending on significance of the terms in equation (2), ε_{giC} and η_{giC} can also vary with sex, age, and region.

      Equation (1)—including the parameters from equation (2)—was estimated for each food category separately using a least-squares procedure that allowed for arbitrary correlations among observations within the same country (cluster robust standard errors at the country level). The coefficients from equation (1) and (2) were then used to derive estimates of ε_{giC} and η_{giC} for each food category, by country or region, and by age and sex. We also derived the standard errors for each ε_{giC} and η_{giC} estimate using the delta method. Note that the elasticities can be derived at the country level using national income and country-level prices and at the world-region level using average income and prices for a region.

Preliminary results indicated that while α_{0i}^* varied with sex, age, and region, the remaining estimates $(\alpha_{1i}^* - \alpha_{4i}^*)$ varied with sex and age only. Thus the parameters in the final model were specified as follows:

$$\alpha_{0i}^* = \alpha_{0i_0} + \alpha_{0i_1}W + \alpha_{0i_2}Age + \alpha_{0i_3}Age^2 + \alpha_{0i_{5k}}\sum_k Region_k.$$

$$\alpha_{1i}^* = \alpha_{1i_0} + \alpha_{1i_1}W + \alpha_{1i_2}Age + \alpha_{1i_3}Age^2$$

$$\alpha_{2i}^* = \alpha_{2i_0} + \alpha_{2i_1}W + \alpha_{2i_2}Age + \alpha_{2i_3}Age^2 \qquad (5)$$

$$\alpha_{3i}^* = \alpha_{3i_0} + \alpha_{3i_1}W + \alpha_{3i_2}Age + \alpha_{3i_3}Age^2$$

$$\alpha_{4i}^* = \alpha_{4i_0} + \alpha_{4i_1}W + \alpha_{4i_2}Age + \alpha_{4i_3}Age^2$$

Full-model and base-model estimates

The coefficients and standard errors used to derive the income and prices elasticities are examined. For comparison, we also provide estimation results from models without interaction terms (base models) (see tables S4–S8). Given the complexity of the full model, particularly the interaction terms, it is difficult to discuss the raw estimates in the context of dietary behavior. For instance, the estimate for the sex binary variable (W) is significant and negative in the fruit-intake model (full model). However, this is due to the interaction terms and is not an indication of a ceteris-paribus relationship. Note that the same estimate in the fruit-intake model without the interaction terms is positive and significant, reflecting the fact that women consume more fruit than men.

The base-model results show that fruit, processed meat, fish, sugar-sweetened beverages, and fruit juice are the only categories affected by both price and income. Interestingly, these are the only categories where the income and own-price elasticities derived from the full model were mostly significant. Even when a base-model estimate for a food category was significant for income or price (but not both), the corresponding income or price elasticities were also significant (e.g., nuts and seeds and whole grains). Note that the base-model price effect for unprocessed red meat was not highly insignificant, which is why the own-price elasticity was significant for at least one subgroup. In comparing these results, it is clear that the significance of the income and price estimates in the base models is indication of the significance of the corresponding elasticities derived using the full model, at least for some regions, countries, and demographic subgroups. It is important to note that when the base-model price and income estimates were significant, but the full-model estimates were mostly insignificant, (e.g., unprocessed red meat, fish, and fruit juice), there was little variation in the elasticities across subgroups, and differences across regions were mostly due to differences in relative consumption levels.

Our defined regions may not be completely representative of non-income and non-price factors across all countries within each region. For instance, it could be argued that high-income Asian countries such as Japan and South Korea (APC) are very different from other Asian countries such as China and the Philippines, South Asian (SA) countries such as India and Bangladesh are very different from North African and Middle Eastern countries, and the relatively few island economies included in HIC are very different from western economies. Here we present estimation results where APC, SA, *Other Islands* are removed from Asia, MENA, and HIC, respectively, and defined as additional regions. As noted, we aggregated these countries with other regions due to their small number. To illustrate how our estimates are fairly robust to different regional definitions, we report the base-model results with these added "regions" for comparison purposes (see table S8). Note that

when comparing these estimates to estimates in table S6 and S7, there are no significant differences. Most importantly, the effects of sex and age are almost identical for most food categories, and the income and price effects are statistically equal.