

APPENDICES

Global Educational Disparities in the Associations between Body Mass Index and Diabetes Mellitus in 49 Low- and Middle-Income Countries

Aolin Wang¹

Karien Stronks²

Onyebuchi A. Arah¹⁻³

¹Department of Epidemiology, The Fielding School of Public Health, University of California, Los Angeles (UCLA), Los Angeles, California, USA

²Department of Public Health, Academic Medical Center, Amsterdam, The Netherlands

³UCLA Center for Health Policy Research, Los Angeles, California, USA

Corresponding author:

Prof. Onyebuchi A. Arah, Department of Epidemiology, UCLA Fielding School of Public Health, 650 Charles E. Young Drive South, Los Angeles, CA 90095-1772, USA.

Email: arah@ucla.edu

Keywords: epidemiology of diabetes; obesity; education, inequalities; international health

Abbreviations

WHO: World Health Organization

DM: Diabetes Mellitus

BMI: Body Mass Index

NCDs: Noncommunicable Diseases

SES: Socioeconomic Status

WHS: World Health Survey

LICs: Low-Income Countries

MICs: Middle-Income Countries

GDP: Gross Domestic Product

OR(s): Odds Ratio(s)

CI(s): Confidence Interval(s)

The appendices have the following six sections:

1. Country-specific sample size and characteristics: **Table A1**
2. Characteristics of 77,991 participants excluded from the main analyses due to missing values in one of the variables in the model: **Table A2**
3. Joint associations of abnormal BMI and four-level educational attainment with diabetes mellitus (same information as Figure 1 in the main text): **Table A3**
4. Sensitivity analysis for joint associations of abnormal BMI and **four-level** educational attainment with DM(to be compared to Table A3):
 - a) Restrict sample to people with normal height and weight: **Table A4.1**
 - b) Leave out adjustment for smoking status, alcohol use and four chronic conditions: **Table A4.2**
 - c) Subgroup analysis for South East Asia and Western Pacific Region combined, and all other WHO regions: **Table A4.3**
5. Joint associations of abnormal BMI and six-level educational attainment with diabetes mellitus: **Table A5**
6. Sensitivity analysis for joint associations of abnormal BMI and **six-level** educational attainment with DM(to be compared to Table A5):
 - a) Restrict sample to people with normal height and weight: **Table A6.1**
 - b) Leave out adjustment for smoking status, alcohol use and four chronic conditions: **Table A6.2**
 - c) Subgroup analysis for South East Asia and Western Pacific Region combined, and all other WHO regions: **Table A6.3**
7. Alternative presentation of Figure 1, grouped by BMI status: **Figure A1**

Table A1 Country-specific sample size, mean age, percent female, and country's 2003 GDP per capita, World Health Surveys 2002-2003.

Country	Initial sample size	N missing diabetes status	N missing height or weight information	N missing education information	Final sample size	Female (%)	Mean age	GDP/c (current USD)
Low-income countries (n=22), classified by World Bank income group in 2003								
Bangladesh	5550	64	4723	1	816	15.9	34.8	379
Burkina Faso	4821	32	3082	0	1700	48.5	34.3	314
Chad	4640	274	935	1	3251	51	36.6	297
Comoros	1759	20	17	0	1678	55.4	42.1	533
Congo	2491	366	286	20	1801	55	35.9	1039
Côte d'Ivoire	3179	150	296	15	2627	40.6	35.2	787
Ethiopia	4934	310	3962	2	856	28	31.9	121
Georgia	2755	12	7	0	2567	57.8	48.3	873
Ghana	3926	35	260	48	3515	55.3	40.9	594
India	9988	493	2347	74	6903	47	38.5	535
Kenya	4409	43	386	0	3927	57.7	37.7	441
Lao People's Democratic Republic	4888	118	10	11	4579	52.7	38.1	364
Malawi	5230	27	276	1	4355	58.6	35.5	200
Mali	3766	352	1288	12	2097	40.2	41.2	341
Mauritania	3794	218	564	21	2600	61.5	38.5	542
Myanmar	5886	8	35	0	5830	56.4	41	217
Nepal	8686	521	5643	0	2781	33.7	34.8	247
Pakistan	6374	115	3042	1	2764	37.2	36.5	551
Senegal	3168	333	1406	12	1169	42.3	37.6	666
Viet Nam	3491	37	8	0	3314	54.6	40	486
Zambia	3802	25	1413	0	2343	53.7	35.4	394
Zimbabwe	4087	138	1295	0	2628	60.1	35.6	532
Lower middle-income countries (n=17), classified by World Bank income group in 2003								
Bosnia and Herzegovina	1028	15	3	0	973	57.8	46.5	2241

Country	Initial sample size	N missing diabetes status	N missing height or weight information	N missing education information	Final sample size	Female (%)	Mean age	GDP/c (current USD)
Brazil	5000	43	554	0	4238	53.9	41.1	3041
China	3993	33	4	0	3840	51	44.8	1299
Dominican Republic	4534	49	1458	1	3025	49.6	40.6	2228
Ecuador	4651	261	535	8	3339	55.7	40.5	2187
Guatemala	4752	61	1395	232	2909	55.5	39.5	1812
Kazakhstan	4495	11	372	0	4036	65.3	41.4	2061
Morocco	5000	4	2954	0	1978	36.5	38.3	1674
Namibia	4245	300	424	3	3573	59.8	37.6	2455
Paraguay	5142	71	444	0	4612	51.5	39.7	978
Philippines	10075	173	1885	0	7728	51.5	38.3	1020
Russian Federation	4420	68	907	22	3184	64.4	48.1	2970
South Africa	2344	70	759	2	1464	51	36.9	3607
Sri Lanka	6732	188	1570	0	4487	49.1	40.1	975
Swaziland	3078	1118	1183	10	1466	58.9	37.5	1712
Tunisia	5066	36	833	0	3663	48.3	40.4	2824
Ukraine	2847	29	1058	0	1546	64.9	47.3	1052
Upper middle-income countries(n=10), classified by World Bank income group in 2003								
Croatia	990	10	8	0	956	58.8	51.8	7661
Czech Republic	935	17	22	1	882	55.1	47.6	9343
Estonia	1010	5	5	0	975	63.5	49.5	7282
Hungary	1419	2	18	1	1390	57.9	49.2	8243
Latvia	855	7	120	0	685	65.5	49.5	4775
Malaysia	6039	59	1104	4	4862	53.5	39.9	4398
Mauritius	3888	25	1367	0	2485	38.7	40.8	4715
Mexico	38745	14600	15234	0	23387	57.8	41.2	6740
Slovakia	2486	707	709	695	1652	66.8	37.5	6151
Uruguay	2979	7	4	0	2945	51.3	45.9	3625

Table A2 Characteristics of 77,991 participants excluded from the main analyses due to missing values in one of the variables in the model by diabetes mellitus status in World Health Survey 2002-2003 data

Characteristics	Sample size	Low-income countries		Middle-income countries	
		No diabetes mellitus	Diabetes mellitus	No diabetes mellitus	Diabetes mellitus
Total, N	56331	33290	542	21490	1009
Age, mean (SD)	56331	38.8 (16.0)	50.6 (16.2)	43.5 (17.5)	56.7 (15.2)
Females, N (%)	56259	19479 (58.6)	325 (60.2)	14177 (66.0)	755 (74.8)
Married, N (%)	56022	24114 (72.8)	401 (74.3)	11563 (54.2)	540 (53.8)
Educational attainment, N (%)	55882				
No formal education		18615 (56.2)	275 (50.7)	5150 (24.3)	312 (31.3)
Some/completed primary school		9983 (30.1)	174 (32.1)	9353 (39.4)	429 (43.0)
Secondary/high school completed		3668 (11.1)	67 (12.4)	6018 (28.4)	220 (22.1)
College and beyond		850 (2.6)	26 (4.8)	1706 (8.0)	36 (3.6)
Urbanicity, N (%)	54993	9067 (27.6)	232 (43.5)	10308 (49.8)	566 (58.5)
Current smoker, N (%)	55337	7834 (23.8)	158 (29.5)	4069 (19.5)	144 (14.4)
Alcohol use, N (%)	53306	6874 (21.8)	76 (15.0)	7287 (36.0)	341 (34.8)
BMI, kg/m ² , N (%)	8731				
Underweight (<18.5)		679 (15.4)	14 (17.5)	343 (8.4)	11 (6.3)
Normal (18.5-24.9)		2500 (56.8)	39 (48.8)	2242 (55.0)	70 (39.8)
Overweight (25-29.9)		707 (16.1)	16 (20.0)	1054 (25.9)	54 (30.7)
Obese I (30-34.9)		164 (3.7)	6 (7.5)	283 (6.9)	29 (16.5)
Obese II&III (≥35)		348 (7.9)	5 (6.3)	155 (3.8)	12 (6.8)
Medical conditions, N (%)					
Angina pectoris	53283	2618 (8.3)	122 (23.9)	1538 (7.6)	197 (20.6)
Arthritis	54566	5231 (16.1)	187 (35.5)	2979 (14.4)	283 (29.3)
Asthma	55048	1323 (4.1)	73 (13.8)	1049 (5.0)	102 (10.5)
Depression	53595	2771 (8.8)	99 (19.2)	984 (4.8)	135 (14.3)

Table A3 Joint associations of abnormal BMI and four-level educational attainment with diabetes mellitus

BMI, kg/m ²	Educational attainment			
	No formal education OR (95% CI)	Some/completed primary school OR (95% CI)	Secondary/high school completed OR (95% CI)	College and beyond OR (95% CI)
Low-income countries				
Underweight (<18.5)	0.65 (0.43, 0.98)	1.51 (1.04, 2.21)	1.12 (0.65, 1.94)	3.03 (1.63, 5.63)
Normal (18.5-24.9)	1.00	1.62 (1.25, 2.09)	2.08 (1.58, 2.74)	2.75 (1.98, 3.81)
Overweight (25-29.9)	1.69 (1.22, 2.33)	2.48 (1.79, 3.44)	2.86 (2.03, 4.03)	3.53 (2.40, 5.18)
Obese I (30-34.9)	2.20 (1.28, 3.78)	3.42 (2.06, 5.67)	5.04 (3.07, 8.29)	7.28 (4.25, 12.48)
Obese II&III (≥35)	1.57 (0.92, 2.68)	3.30 (1.90, 5.75)	3.26 (1.54, 6.91)	2.45 (0.88, 6.86)
Middle-income countries				
Underweight (<18.5)	0.55 (0.33, 0.93)	0.92 (0.68, 1.24)	1.12 (0.80, 1.56)	1.16 (0.57, 2.37)
Normal (18.5-24.9)	1.00	1.24 (1.03, 1.50)	1.14 (0.93, 1.39)	1.08 (0.83, 1.40)
Overweight (25-29.9)	1.52 (1.18, 1.96)	1.70 (1.40, 2.06)	1.47 (1.21, 1.80)	1.28 (0.98, 1.68)
Obese I (30-34.9)	1.92 (1.35, 2.74)	2.29 (1.84, 2.85)	1.97 (1.59, 2.45)	1.94 (1.39, 2.71)
Obese II&III (≥35)	1.53 (0.98, 2.37)	2.43 (1.88, 3.14)	2.69 (2.10, 3.44)	1.55 (0.90, 2.68)

*Results obtained from multilevel logistic regression analysis of diabetes mellitus on BMI, four-level educational attainment, and BMI × educational attainment, adjusting for age, age squared, gender, marital status, smoking, alcohol use, urbanicity, country's 2003 GDP per capita and four chronic conditions: angina, asthma, arthritis, and depression, World Health Survey 2002-2003 data (N=160,381)

Table A4.1 Joint associations of abnormal BMI and four-level educational attainment with diabetes mellitus, excluding observations with extreme values on height or weight

BMI, kg/m ²	Educational attainment			
	No formal education OR (95% CI)	Some/completed primary school OR (95% CI)	Secondary/high school completed OR (95% CI)	College and beyond OR (95% CI)
Low-income countries				
Underweight (<18.5)	0.70 (0.43, 1.14)	1.72 (1.14, 2.60)	1.44 (0.82, 2.53)	3.83 (2.01, 7.30)
Normal (18.5-24.9)	1.00	1.71 (1.31, 2.21)	2.22 (1.67, 2.93)	2.90 (2.08, 4.03)
Overweight (25-29.9)	1.78 (1.29, 2.47)	2.52 (1.80, 3.51)	3.00 (2.12, 4.24)	3.66 (2.48, 5.40)
Obese I (30-34.9)	2.41 (1.4, 4.15)	3.42 (2.04, 5.75)	5.45 (3.30, 8.98)	7.42 (4.28, 12.89)
Obese II&III (≥35)	1.33 (0.43, 4.11)	5.68 (2.79, 11.58)	2.33 (0.68, 7.97)	2.24 (0.47, 10.73)
Middle-income countries				
Underweight (<18.5)	0.59 (0.32, 1.11)	0.94 (0.67, 1.32)	1.09 (0.75, 1.60)	1.05 (0.47, 2.36)
Normal (18.5-24.9)	1.00	1.23 (1.02, 1.48)	1.12 (0.92, 1.36)	1.06 (0.82, 1.37)
Overweight (25-29.9)	1.49 (1.15, 1.92)	1.66 (1.37, 2.02)	1.45 (1.19, 1.77)	1.26 (0.96, 1.65)
Obese I (30-34.9)	1.88 (1.32, 2.69)	2.25 (1.81, 2.80)	1.96 (1.58, 2.44)	1.96 (1.40, 2.74)
Obese II&III (≥35)	1.28 (0.67, 2.42)	2.23 (1.66, 3.01)	2.65 (2.03, 3.47)	1.08 (0.50, 2.32)

*Results obtained from multilevel logistic regression analysis of diabetes mellitus on BMI, four-level educational attainment, and BMI × educational attainment, adjusting for age, age squared, gender, marital status, smoking, alcohol use, urbanicity, country's 2003 GDP per capita and four chronic conditions: angina, asthma, arthritis, and depression, World Health Survey 2002-2003 data (N=151,141)

Table A4.2 Joint associations of abnormal BMI and four-level educational attainment with diabetes mellitus, without adjustment for smoking, alcohol use, and four chronic conditions

BMI, kg/m ²	Educational attainment			
	No formal education OR (95% CI)	Some/completed primary school OR (95% CI)	Secondary/high school completed OR (95% CI)	College and beyond OR (95% CI)
Low-income countries				
Underweight (<18.5)	0.72 (0.49, 1.08)	1.59 (1.10, 2.32)	1.23 (0.72, 2.11)	3.33 (1.83, 6.05)
Normal (18.5-24.9)	1.00	1.64 (1.27, 2.11)	2.14 (1.63, 2.81)	2.65 (1.92, 3.66)
Overweight (25-29.9)	1.72 (1.25, 2.38)	2.61 (1.89, 3.61)	2.93 (2.09, 4.11)	3.57 (2.45, 5.20)
Obese I (30-34.9)	2.17 (1.27, 3.72)	4.02 (2.46, 6.56)	5.04 (3.09, 8.21)	7.44 (4.38, 12.62)
Obese II&III (≥35)	1.69 (1.00, 2.87)	3.57 (2.06, 6.19)	3.77 (1.79, 7.93)	2.66 (0.97, 7.24)
Middle-income countries				
Underweight (<18.5)	0.50 (0.30, 0.84)	0.91 (0.67, 1.23)	1.11 (0.79, 1.55)	1.10 (0.54, 2.24)
Normal (18.5-24.9)	1.00	1.21 (1.01, 1.46)	1.13 (0.92, 1.37)	1.04 (0.80, 1.34)
Overweight (25-29.9)	1.58 (1.23, 2.03)	1.72 (1.42, 2.08)	1.50 (1.23, 1.82)	1.26 (0.97, 1.65)
Obese I (30-34.9)	2.13 (1.50, 3.01)	2.41 (1.95, 2.99)	2.09 (1.69, 2.59)	2.06 (1.49, 2.87)
Obese II&III (≥35)	1.68 (1.09, 2.59)	2.60 (2.02, 3.36)	2.89 (2.27, 3.69)	1.70 (0.99, 2.91)

*Results obtained from multilevel logistic regression analysis of diabetes mellitus on BMI, four-level educational attainment, and BMI × educational attainment, adjusting for age, age squared, gender, marital status, urbanicity, and country's 2003 GDP per, World Health Survey 2002-2003 data (N=160,381)

Table A4.3 Subgroup analysis for joint associations of abnormal BMI and four-level educational attainment with diabetes mellitus: South-East Asian Region (SEAR) and Western Pacific Region (WPR) combined versus all other WHO regions*

BMI, kg/m ²	Educational attainment			
	No formal education OR (95% CI)	Some/completed primary school OR (95% CI)	Secondary/high school completed OR (95% CI)	College and beyond OR (95% CI)
SEAR + WPR				
Underweight (<18.5)	0.71 (0.45, 1.11)	1.42 (0.99, 2.03)	1.50 (0.99, 2.27)	1.39 (0.65, 2.98)
Normal (18.5-24.9)	1.00	1.58 (1.19, 2.11)	1.67 (1.24, 2.26)	2.00 (1.41, 2.85)
Overweight (25-29.9)	2.76 (1.77, 4.28)	2.84 (2.04, 3.95)	2.93 (2.10, 4.11)	3.01 (1.98, 4.56)
Obese I (30-34.9)	3.08 (1.45, 6.53)	5.19 (3.32, 8.09)	2.98 (1.74, 5.10)	5.09 (2.65, 9.78)
Obese II&III (≥35)	0.06 (0.00, 50.4)	4.02 (2.10, 7.67)	4.48 (2.37, 8.47)	1.58 (0.36, 6.96)
Other WHO regions				
Underweight (<18.5)	0.56 (0.36, 0.86)	1.07 (0.77, 1.49)	1.08 (0.71, 1.64)	2.74 (1.52, 4.93)
Normal (18.5-24.9)	1.00	1.43 (1.20, 1.70)	1.29 (1.07, 1.56)	1.39 (1.08, 1.78)
Overweight (25-29.9)	1.43 (1.15, 1.79)	1.90 (1.59, 2.27)	1.60 (1.33, 1.92)	1.50 (1.16, 1.93)
Obese I (30-34.9)	1.99 (1.45, 2.73)	2.54 (2.06, 3.12)	2.27 (1.85, 2.78)	2.37 (1.73, 3.25)
Obese II&III (≥35)	1.37 (0.96, 1.96)	2.78 (2.19, 3.55)	2.98 (2.35, 3.77)	2.02 (1.24, 3.32)

*Results obtained from multilevel logistic regression analysis of diabetes mellitus on BMI, six-level educational attainment, and BMI × educational attainment, adjusting for age, age squared, gender, marital status, smoking, alcohol use, urbanicity, country's 2003 GDP per capita and four chronic conditions: angina, asthma, arthritis, and depression, World Health Survey 2002-2003 data (N=160,381)

Table A5 Joint associations of abnormal BMI and six-level educational attainment with diabetes mellitus obtained from multilevel model: World Health Survey 2002-2003*

BMI, kg/m ²	Educational attainment					
	No formal education OR (95% CI)	Less than primary OR (95% CI)	Primary school completed OR (95% CI)	Secondary school completed OR (95% CI)	High school completed OR (95% CI)	College and beyond OR (95% CI)
Low-income countries						
Underweight (<18.5)	0.66 (0.44, 0.99)	1.04 (0.58, 1.88)	1.96 (1.26, 3.06)	0.90 (0.45, 1.83)	1.64 (0.74, 3.66)	3.07 (1.66, 5.69)
Normal (18.5-24.9)	1.00	1.51 (1.10, 2.08)	1.69 (1.25, 2.28)	2.07 (1.52, 2.83)	2.07 (1.44, 2.98)	2.77 (1.99, 3.83)
Overweight (25-29.9)	1.69 (1.23, 2.34)	2.40 (1.53, 3.76)	2.55 (1.71, 3.80)	3.76 (2.53, 5.58)	1.94 (1.16, 3.22)	3.47 (2.36, 5.12)
Obese I (30-34.9)	2.25 (1.32, 3.85)	3.13 (1.45, 6.75)	3.70 (1.97, 6.95)	4.23 (2.05, 8.71)	5.93 (3.16, 11.1)	7.17 (4.17, 12.31)
Obese II&III (≥35)	1.52 (0.89, 2.62)	3.61 (1.76, 7.41)	3.12 (1.42, 6.85)	2.48 (0.79, 7.77)	4.43 (1.72, 11.42)	2.34 (0.82, 6.66)
Middle-income countries						
Underweight (<18.5)	0.55 (0.33, 0.92)	0.67 (0.42, 1.09)	1.05 (0.74, 1.48)	1.17 (0.81, 1.70)	0.96 (0.53, 1.73)	1.12 (0.55, 2.30)
Normal (18.5-24.9)	1.00	1.22 (0.98, 1.52)	1.25 (1.02, 1.52)	1.16 (0.95, 1.43)	1.06 (0.84, 1.33)	1.06 (0.82, 1.38)
Overweight (25-29.9)	1.51 (1.17, 1.94)	1.63 (1.29, 2.05)	1.71 (1.39, 2.09)	1.56 (1.27, 1.91)	1.20 (0.94, 1.52)	1.24 (0.95, 1.63)
Obese I (30-34.9)	1.93 (1.36, 2.74)	2.79 (2.10, 3.72)	2.08 (1.63, 2.64)	1.98 (1.57, 2.49)	1.95 (1.48, 2.56)	1.92 (1.38, 2.67)
Obese II&III (≥35)	1.52 (0.98, 2.36)	2.44 (1.70, 3.50)	2.40 (1.79, 3.23)	3.03 (2.32, 3.95)	1.92 (1.32, 2.80)	1.53 (0.89, 2.63)

*Results obtained from multilevel logistic regression analysis of diabetes mellitus on BMI, six-level educational attainment, and BMI × educational attainment, adjusting for age, age squared, gender, marital status, smoking, alcohol use, urbanicity, country's 2003 GDP per capita and four chronic conditions: angina, asthma, arthritis, and depression, World Health Survey 2002-2003 data (N=160,381)

Table A6.1 Joint associations of abnormal BMI and six-level educational attainment with diabetes mellitus, excluding observations with extreme values on height and weight

BMI, kg/m ²	Educational attainment					
	No formal education OR (95% CI)	Less than primary OR (95% CI)	Primary school completed OR (95% CI)	Secondary school completed OR (95% CI)	High school completed OR (95% CI)	College and beyond OR (95% CI)
Low-income countries						
Underweight (<18.5)	0.70 (0.43, 1.14)	1.07 (0.55, 2.10)	2.34 (1.44, 3.78)	1.21 (0.60, 2.45)	2.06 (0.87, 4.86)	3.90 (2.05, 7.40)
Normal (18.5-24.9)	1.00	1.59 (1.15, 2.19)	1.84 (1.36, 2.49)	2.23 (1.63, 3.05)	2.25 (1.56, 3.25)	2.91 (2.09, 4.06)
Overweight (25-29.9)	1.76 (1.27, 2.45)	2.47 (1.57, 3.88)	2.61 (1.74, 3.91)	3.91 (2.62, 5.84)	2.08 (1.25, 3.46)	3.62 (2.44, 5.36)
Obese I (30-34.9)	2.42 (1.41, 4.17)	3.14 (1.44, 6.86)	3.49 (1.80, 6.80)	4.41 (2.12, 9.18)	6.29 (3.33, 11.88)	7.66 (4.42, 13.25)
Obese II&III (≥35)	1.37 (0.45, 4.17)	5.29 (1.90, 14.75)	5.77 (2.20, 15.18)	2.79 (0.63, 12.40)	1.83 (0.22, 15.00)	2.26 (0.47, 10.81)
Middle-income countries						
Underweight (<18.5)	0.61 (0.34, 1.10)	0.65 (0.37, 1.11)	0.91 (0.61, 1.35)	1.07 (0.70, 1.62)	0.73 (0.37, 1.47)	0.86 (0.38, 1.95)
Normal (18.5-24.9)	1.00	1.04 (0.84, 1.30)	1.04 (0.86, 1.27)	0.96 (0.78, 1.18)	0.88 (0.70, 1.10)	0.84 (0.65, 1.09)
Overweight (25-29.9)	1.57 (1.23, 2.00)	1.34 (1.07, 1.69)	1.42 (1.16, 1.73)	1.32 (1.08, 1.62)	1.01 (0.79, 1.27)	1.00 (0.76, 1.31)
Obese I (30-34.9)	1.94 (1.38, 2.72)	2.41 (1.81, 3.19)	1.72 (1.36, 2.19)	1.68 (1.34, 2.11)	1.60 (1.21, 2.10)	1.53 (1.09, 2.14)
Obese II&III (≥35)	1.29 (0.70, 2.38)	1.65 (1.03, 2.65)	2.10 (1.50, 2.93)	2.59 (1.95, 3.45)	1.29 (0.81, 2.07)	0.86 (0.40, 1.87)

*Results obtained from multilevel logistic regression analysis of diabetes mellitus on BMI, six-level educational attainment, and BMI × educational attainment, adjusting for age, age squared, gender, marital status, smoking, alcohol use, urbanicity, country's 2003 GDP per capita and four chronic conditions: angina, asthma, arthritis, and depression, World Health Survey 2002-2003 data (N=151,141)

Table A6.2 Joint associations of abnormal BMI and six-level educational attainment with diabetes mellitus, without adjustment for smoking, alcohol use, and four chronic conditions

BMI, kg/m ²	Educational attainment					
	No formal education OR (95% CI)	Less than primary OR (95% CI)	Primary school completed OR (95% CI)	Secondary school completed OR (95% CI)	High school completed OR (95% CI)	College and beyond OR (95% CI)
Low-income countries						
Underweight (<18.5)	0.72 (0.48, 1.07)	1.17 (0.65, 2.10)	1.97 (1.27, 3.06)	1.00 (0.50, 2.01)	1.74 (0.79, 3.80)	3.30 (1.81, 6.02)
Normal (18.5-24.9)	1.00	1.56 (1.14, 2.13)	1.71 (1.27, 2.30)	2.24 (1.65, 3.04)	2.04 (1.42, 2.93)	2.72 (1.97, 3.75)
Overweight (25-29.9)	1.72 (1.24, 2.37)	2.53 (1.62, 3.94)	2.72 (1.84, 4.02)	3.92 (2.66, 5.78)	1.94 (1.17, 3.21)	3.53 (2.42, 5.15)
Obese I (30-34.9)	2.17 (1.26, 3.71)	3.55 (1.68, 7.51)	4.22 (2.27, 7.85)	4.18 (2.04, 8.53)	5.81 (3.13, 10.80)	7.12 (4.17, 12.15)
Obese II&III (≥35)	1.60 (0.94, 2.74)	3.93 (1.93, 7.99)	3.31 (1.51, 7.25)	2.88 (0.93, 8.94)	5.13 (2.02, 13.05)	2.52 (0.91, 7.02)
Middle-income countries						
Underweight (<18.5)	0.51 (0.31, 0.86)	0.70 (0.44, 1.12)	1.12 (0.80, 1.58)	1.21 (0.83, 1.75)	0.98 (0.54, 1.75)	1.11 (0.55, 2.25)
Normal (18.5-24.9)	1.00	1.21 (0.97, 1.51)	1.23 (1.01, 1.50)	1.17 (0.95, 1.44)	1.04 (0.83, 1.31)	1.04 (0.80, 1.34)
Overweight (25-29.9)	1.56 (1.21, 2.01)	1.65 (1.31, 2.08)	1.74 (1.42, 2.13)	1.64 (1.34, 2.02)	1.24 (0.98, 1.57)	1.24 (0.95, 1.62)
Obese I (30-34.9)	2.06 (1.45, 2.92)	2.93 (2.21, 3.89)	2.16 (1.70, 2.74)	2.07 (1.65, 2.61)	2.08 (1.58, 2.73)	2.02 (1.46, 2.81)
Obese II&III (≥35)	1.67 (1.08, 2.57)	2.61 (1.83, 3.73)	2.70 (2.02, 3.61)	3.21 (2.46, 4.18)	2.21 (1.53, 3.21)	1.72 (1.01, 2.94)

*Results obtained from multilevel logistic regression analysis of diabetes mellitus on BMI, four-level educational attainment, and BMI × educational attainment, adjusting for age, age squared, gender, marital status, urbanicity, and country's 2003 GDP per, World Health Survey 2002-2003 data (N=160,381)

Table A6.3 Subgroup analysis for joint associations of abnormal BMI and six-level educational attainment with diabetes mellitus: South-East Asian Region (SEAR) and Western Pacific Region (WPR) combined versus all other WHO regions*

BMI, kg/m ²	Educational attainment					
	No formal education OR (95% CI)	Less than primary OR (95% CI)	Primary school completed OR (95% CI)	Secondary school completed OR (95% CI)	High school completed OR (95% CI)	College and beyond OR (95% CI)
SEAR + WPR						
Underweight (<18.5)	0.66 (0.41-1.06)	0.94 (0.53-1.67)	2.20 (1.48-3.26)	1.59 (0.99-2.56)	2.22 (1.19-4.14)	1.65 (0.77-3.55)
Normal (18.5-24.9)	1.00	1.76 (1.25-2.48)	1.87 (1.37-2.56)	1.89 (1.37-2.62)	2.25 (1.58-3.20)	2.29 (1.60-3.27)
Overweight (25-29.9)	2.74 (1.74-4.30)	3.12 (1.98-4.90)	3.01 (2.07-4.38)	4.38 (3.04-6.33)	2.34 (1.48-3.72)	3.26 (2.13-4.99)
Obese I (30-34.9)	2.83 (1.28-6.26)	6.34 (3.35-12.03)	4.58 (2.61-8.05)	4.53 (2.48-8.28)	2.00 (0.77-5.20)	5.61 (2.89-10.88)
Obese II&III (≥35)	0.05 (0.0-105.75)	3.23 (1.01-10.31)	4.04 (1.82-8.99)	6.08 (2.86-12.87)	3.25 (1.07-9.90)	1.60 (0.34-7.50)
Other WHO regions						
Underweight (<18.5)	0.57 (0.37-0.88)	0.97 (0.60-1.58)	1.15 (0.76-1.75)	1.24 (0.78-1.98)	0.76 (0.34-1.71)	2.56 (1.41-4.65)
Normal (18.5-24.9)	1.00	1.36 (1.10-1.67)	1.46 (1.21-1.76)	1.38 (1.13-1.68)	1.14 (0.91-1.44)	1.35 (1.05-1.74)
Overweight (25-29.9)	1.45 (1.17-1.81)	1.79 (1.44-2.24)	1.96 (1.61-2.37)	1.74 (1.43-2.11)	1.29 (1.03-1.63)	1.44 (1.12-1.86)
Obese I (30-34.9)	1.92 (1.40-2.64)	3.05 (2.30-4.03)	2.35 (1.87-2.96)	2.23 (1.79-2.78)	2.34 (1.81-3.04)	2.32 (1.70-3.18)
Obese II&III (≥35)	1.44 (1.02-2.05)	2.79 (2.00-3.91)	2.78 (2.09-3.69)	3.29 (2.54-4.26)	2.27 (1.58-3.28)	1.84 (1.11-3.06)

*Results obtained from multilevel logistic regression analysis of diabetes mellitus on BMI, six-level educational attainment, and BMI × educational attainment, adjusting for age, age squared, gender, marital status, smoking, alcohol use, urbanicity, country's 2003 GDP per capita and four chronic conditions: angina, asthma, arthritis, and depression, World Health Survey 2002-2003 data (N=160,381)

Figure

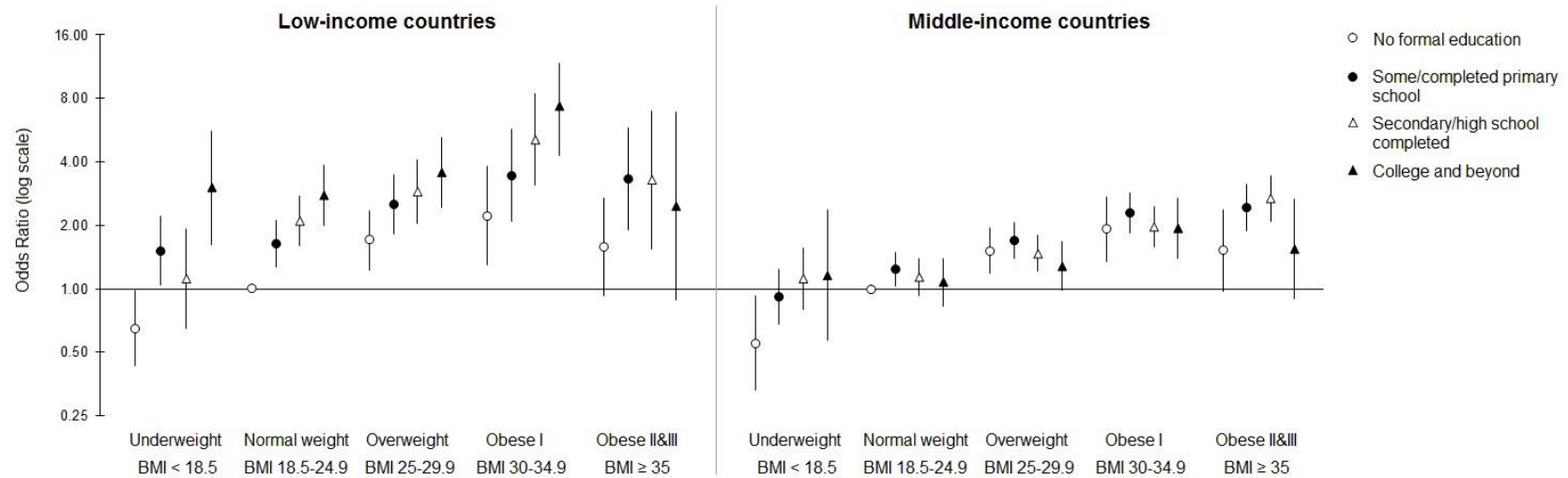


Figure A1 Alternative presentation of Figure 1 in the main text. Joint associations of abnormal BMI and educational attainment with DM in 22 low-income countries and 27 middle-income countries **grouped by BMI status**, obtained from the multilevel regression analysis of the World Health Survey 2002-2003 data (N=160,381). Symbols represent the point estimates (odds ratios) while vertical bars around the symbols are the corresponding 95% confidence intervals. Universal reference group: normal weight individuals with no formal education.