NIH Public Access
Author Manuscript
Int J Obes (Lond). Author manuscript; available in PMC 2012 December 06.

Published in final edited form as:
Int J Obes (Lond). 2012 August ; 36(8): 1114–1120. doi:10.1038/ijo.2011.179.

Is the burden of overweight shifting to the poor across the globe? Time trends among women in 39 low- and middle-income countries (1991–2008)

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Abstract

Background—Overweight prevalence has increased globally; however, current time trends of overweight by social class in lower income countries are unknown.

Methods—We used repeated cross-sectional, nationally representative data from the Demographic and Health Surveys on women aged 18–49 with young children (n=421,689) in 39 lower income countries. We present overweight (body mass index ≥25) prevalence at each survey wave, prevalence difference and prevalence growth rate for each country over time is presented separately by wealth quintile and educational attainment. We present the correlation between nation wealth and differential overweight prevalence growth by wealth and education was estimated.

Results—In the majority of countries the highest wealth and education groups still have the highest prevalence of overweight and obesity. However, in a substantial number of countries (31% when wealth is used as the indicator of SES and 54% for education) the estimated increases in overweight prevalence over time have been greater in the lowest compared to the highest wealth and education groups. Gross Domestic Product per capita was associated with a higher overweight prevalence growth rate for the lowest wealth group compared to the highest (Pearson's correlation coefficient: 0.45).

Conclusions—Higher (versus lower) wealth and education groups had higher overweight prevalence across most developing countries. However, some countries show a faster growth rates in overweight in the lowest (versus highest) wealth and education groups, indicative of an increasing burden of overweight among lower wealth and education groups in lower income countries.

Keywords

Overweight; Obese; Socioeconomic Factors; Developing Countries; Demographic Health Surveys; Health Status Disparities

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INTRODUCTION

The prevalence of overweight has increased dramatically in many low- and middle-income (henceforth, lower income) countries around the world over the last 5–15 years (1–3). Recent cross-sectional evidence suggests that, in the majority of lower income countries, wealthier groups have a higher odds of overweight compared to less wealthy groups (4). However, within-country time trends in overweight prevalence by socioeconomic status (SES) have not been fully explored. Changes in overweight prevalence among SES groups over time are important for anticipating emerging patterns of disease.

Several studies suggests that higher SES groups within lower income countries will continue to bear the largest burden of chronic disease. For instance, in India between the years of 1998 and 2006, the increase in overweight prevalence was higher among the wealthiest women compared to the poorest women (5). Additionally, low SES populations within lower income countries are vulnerable to economic shocks that can effect food security and can leave these populations more susceptible to inadequate nutrition, rather than overnutrition (6, 7).

On the other hand, based on observed relationships in higher income countries and on the persistent associations between low SES and the leading causes of disease in many contexts (8–10), some experts have hypothesized that the burden of chronic disease in lower income countries will eventually shift toward lower SES groups within these countries (11–13). Faster growth in overweight prevalence among low compared to high SES groups has been documented in Brazil (14) and among women in urban areas of sub-saharan Africa (15). Further, cross-sectional analysis suggests that among lower income countries, countries with higher national incomes tend to have a greater likelihood of an inverse relationship between SES and overweight (4, 16, 17).

Our study used repeated cross-sectional, nationally representative data on adult women with children from 39 lower-income countries assessed in the Demographic and Health Surveys to: 1) determine the prevalence of overweight and the overweight prevalence difference between low and high wealth and education groups in each survey year, 2) document within-country time trends for overweight prevalence growth rates between low and high wealth and education groups, and 3) test whether higher national wealth is correlated with a higher growth rate in overweight prevalence for the lowest compared to the highest wealth and education groups.

METHODS

Data Sources

Data came from the publically available Demographic and Health Surveys (DHS), which are nationally representative household surveys administered in lower income countries. The surveys entail repeated cross-sections and are standardized to enable cross-country comparisons (18).

Since our interest was in the time trends in overweight prevalence we included only countries that measured anthropometrics in at least two survey waves. Additionally, earlier years of the DHS survey only collected anthropometrics on women under 50 years old, who had children between ages of 0–5 years, therefore we limited our main analyses to this subgroup to keep the sample population comparable over time. We excluded pregnant women.

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Key Variables

Height and weight were measured by trained technicians using standard techniques (19, 20). Body mass index (BMI) (kg/m^2) was used to classify people as obese or overweight according to WHO guidelines (BMI≥25) (21). Overweight prevalence was determined for each country, in each survey year, and for each SES (wealth or education) group. For wealth, we used the DHS wealth index, which is derived from a principal components analysis (PCA) of assets (22). Asset-based wealth measures are considered superior to income in lower-income countries (22) and have been widely used to indicate SES in this context (5, 23). The wealth index was used to create country- and year-specific quintiles of wealth, which were used as categorical variables in the analyses. Education was categorized based on the educational milestones: <primary school completed, primary school completed, ≥secondary school completed. In Armenia and Kazakhstan, less than 1% of the population did not complete primary school, therefore only primary school and secondary school or more were consider in these countries.

To represent national income, we used gross domestic product (GDP) per capita adjusted for purchasing power parity (PPP) and inflated to the 2005 international dollar value (henceforth, GDP) (24) obtained from the World Bank Development Indicators Database (25). The log-transformed baseline survey year GDP for each country is used in the correlation analyses.

Outcomes

Analyses were conduced separately by: 1) wealth quintile, 2) education group. Our outcomes of interest were 1) overweight prevalence difference defined by the difference in overweight prevalence between the lowest and the highest wealth or education groups for each survey wave; and, 2) the annualized difference in the rate of overweight prevalence growth for the lowest and highest wealth or education groups between the first and last survey waves. Overweight prevalence difference in each survey wave in each country for wealth quintiles was calculated by: $\underline{\text{Overweight Prevalence}_{\text{lowest}}} - \underline{\text{Overweight Prevalence}_{\text{highest}}}$. A positive overweight prevalence difference indicated that the lower wealth quintile had a higher prevalence of overweight compared to the higher wealth quintile. To obtain the annualized difference in overweight prevalence growth rates between wealth quintiles, we took the difference between the change in overweight prevalence in the lowest group over the survey period and the change in the highest group over the survey period $((\underline{\text{Overweight}_{\text{lowest,lastwave}} - \text{Overweight}_{\text{lowest,firstwave}}}) - (\underline{\text{Overweight}_{\text{highest,lastwave}} - \text{Overweight}_{\text{highest,firstwave}}}))$. We annualized this result for each country. A positive difference in prevalence growth rates indicated the lowest wealth quintile had a higher rate of prevalence growth rate than did the highest quintile. We repeat these calculations for lowest and highest education group.

We utilize absolute rather than relative effect estimates because there were a number of countries with a very low overweight prevalence in the lowest SES group and a fairly high prevalence in the highest SES group; this meant that small absolute increases the low prevalence groups equate to large relative increases that could not be matched in the high prevalence groups except by tremendous absolute increases.

For sensitivity analyses, to assess whether the results would change substantially if we did not restrict to comparable samples (only women with children were measured at both surveys waves), we ran the analyses on the full sample, including women with and without children. We also ran the analyses on age-standardized rates of overweight to control for different age structures between countries (26). To assess sensitivity across the full distribution of wealth or education, we used the slope index of inequality (SII) and change in

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SII a regression-based measure that assumes a linear relationship between mean disease prevalence and social ranking (27). Additionally, within the Asian countries in our sample, we performed a sensitivity analysis using the alternative cut-point of BMI ≥23 for overweight (28).

To assess whether national income was correlated with faster overweight prevalence growth rates among the low compared to high wealth or education groups, we used Pearson's correlation coefficient to test whether GDP per capita and annualized difference in overweight prevalence growth rates are correlated.

Alpha was set at 0.10 for all analyses and all tests were 2-sided (29). Sample weights to account for complex survey design were employed. All analyses were performed with Stata (Version 11, 2009, Stata Corporation, College Station, TX)

RESULTS

Analyses included data from 421,689 women in 39 countries with 2 surveys per country between 1991 and 2008 (Table 1). Selected sample characteristics are listed in Table 1. There were four countries in which the DHS wealth index was not available.

Wealth results

Table 2 provides the 1) overweight prevalence for the highest and lowest wealth quintiles in the first and last survey waves; 2) the prevalence differences between the lowest and highest quintiles; and, 3) the annualized difference in prevalence growth rates, comparing the growth in overweight prevalence in the lowest quintile between the first and last survey wave to that in the highest wealth quintile. The vast majority of the prevalence differences are negative (31 out of 35 in the final survey year), indicating that the highest wealth quintile has a higher prevalence of overweight compared to the lowest wealth quintile overweight prevalence.

The annualized difference in the prevalence growth rates between the lowest and the highest wealth quintile assess whether the overweight prevalence increased more quickly for the lowest or highest SES group. Again, in the majority of cases (24 out of 35; 69%), the point estimate for the difference in the overweight prevalence growth rates between wealth groups was negative, indicating that the overweight growth rate in the highest wealth quintile exceeded that of the lowest wealth quintile. The remaining 11 out of 35 (31%) countries have a positive point estimate for the annualized difference in the prevalence growth rate, indicating that the overweight prevalence increased more quickly for the lowest wealth quintile in comparison to the highest. In both cases, the 90% confidence interval (CI) around these estimates crossed the null for approximately 50% of the estimates.

Education results

Table 3 displays the 1) overweight prevalence for the lowest (those with no formal schooling completed) and highest education group (those with secondary school or higher completed) for the first and last survey waves; 2) the prevalence differences between the lowest and the highest in both survey waves; and, 3) the annualized difference in the overweight prevalence growth rate for the lowest and highest education groups over the survey period for each country.

The overall findings for education are similar to those using wealth. As with wealth, the point estimate for the prevalence differences are negative in the majority of cases (35 out of 39 in the last survey year), indicating that the prevalence of overweight in the highest education group exceeds that of the lowest education group. In 21 out of 39 countries (54%),

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the point estimate for the difference in the prevalence growth rate between the lowest and highest education group was positive, indicating that the overweight prevalence had increased more quickly for the lowest education group than for the highest education group. In the remaining 18 countries (46%), the point estimate for the difference in overweight prevalence growth rates was negative, indicative of a faster rate of overweight prevalence growth among the group with the highest education. In approximately 50% of the estimates, the 90% CI included the null.

Comparing wealth and education results

Nearly all the countries that had higher overweight prevalence growth rates among the lowest wealth group (vs highest) also had higher overweight prevalence growth rates in the lowest education group (vs highest). Specifically, of the 11 countries with positive estimates for the difference in overweight prevalence growth rate between wealth groups, Armenia, Columbia, Egypt, Guinea, Haiti, Jordan, Kazahkstan, Morocco, Rwanda, Zimbabwe, Turkey, only Kazahstan did not also have a positive point estimate for the difference in overweight prevalence growth rates by education group. On the contrary, there were 10 countries in which lowest education group's growth rate surpassed that of the highest education group, but the lowest wealth group's estimated growth rate was lower than that of the highest wealth group. These countries were: Benin, Bolivia, Cote d'Ivoire, Ghana, Malawi, Mali, Mozambique, Namibia, Niger, Tanzania. In most of these countries, the prevalence of overweight for the highest education groups either decreased, was stable or increased only to a small degree, while that in the highest wealth groups in these same countries continued to increase, leading to the difference in the findings by wealth and education for these countries.

Sensitivity Analyses

Differences in prevalence gains by wealth and education for the full sample (which included women without children) were largely similar in direction and significance to those from the restricted sample (which was limited to only women with children), as were the results when age-standardization was employed (Supplementary Tables 1&2). In analyses using the SII and change in SII instead of the difference between the highest and lowest SES groups, the results are in the same direction in 99 out of 105 comparisons for wealth (Supplementary Table 3) and 109 out of 117 comparisons for education (Supplementary Table 4). Results using the Asian-specific BMI cutpoints (28) for overweight (BMI ≥23) Asian countries (India, Bangladesh, Nepal, Cambodia) were all consistent in direction with the results using a cut-off point of BMI ≥25 (results not shown).

Country-level economic development

Country-level GDP was positively correlated with faster prevalence growth of overweight for the lowest (vs highest) wealth quintile r=0.45, (Figure 1a) but not for the lowest education group (vs. highest) (r=−0.06) (Figure 1b).

DISCUSSION

We document time trends in overweight prevalence by SES in a multiregional sample of lower income countries. In the majority of countries the highest wealth and education groups still have the highest prevalence of overweight. However, a trend toward faster overweight prevalence growth rates for the lowest (vs highest) wealth and education groups is apparent in a substantial number of countries.

We observed a largely positive relationship between SES (wealth or education) with overweight prevalence which is consistent with a historical review (17) and with a more

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recent analysis by Subramanian et al (4), both of which use a single time point for each country. Our study contributes additional information by examining changes over time using the same source (DHS) used by Subramanian et al. (4) to obtain large sample of lower-income countries.

Examining the overweight prevalence growth rates over time, we find that overweight has increased more for the lowest wealth or education groups (vs highest) in a substantial portion of the sample countries. In 31% of the countries (or 14% if limited to only statistically significant differences), the estimated overweight prevalence growth rate was higher in the lowest (vs highest) wealth quintile. Also, in 54% of the countries (or 28% if limited to only statistically significant differences) the estimated growth rate was higher in the lowest (vs highest) education group. Several studies have examined the time trends in overweight in a single lower-income country or in a region, and both faster (14) (30) and slower (4) growth rates among the poor have been documented. Our findings offer a comparative perspective by analyzing multiple countries and in doing so highlight the heterogeneous patterns of change in the SES-obesity relationship between countries.

A number of factors might underlie the propensity for a higher growth rate of overweight prevalence among the lowest wealth and education groups in some lower-income countries. It is possible that low wealth/education groups are just more recently experiencing the same environmental changes (such as accessibility of energy-dense foods, labor-saving devices and sedentary occupations) that high wealth/education groups experienced 10–20+ years ago. If this is the case, the low wealth/education groups might be experiencing faster prevalence growth rates now, but these could slow when they approach the absolute prevalence of the high wealth/education group.

On the other hand, the differential prevalence growth rates could reflect a difference in SES-specific response to current conditions. Increased medical knowledge and concern about obesity and/or stigma around larger body sizes may lead higher SES groups to begin to respond to the changing conditions (31) to slow their overweight prevalence growth rate. To test whether the phenomenon is more likely a result of a difference in timing of exposure (i.e. rich gain overweight prevalence first, then poor catch up) or a difference in response (rich eventually use resources to adjust behavior while poor do not) would require future observations to see if the prevalence in low wealth/education groups eventually surpasses that in high wealth/education groups.

A few differences in our findings were noted according to whether wealth or education was used as the indicator of SES. Specifically, there were 10 countries in which the overweight prevalence growth was faster in the lowest (vs highest) education group, but was not faster in the lowest wealth quintile (vs. highest). In most of these countries, the prevalence of overweight for the highest education groups either decreased, was stable or increased only to a small degree, while that in the highest wealth groups in these same countries continued to increase. Differences in result might stem from a variety of sources, including the diffence in the type of measure, since wealth is a purely relative measure based on quintiles, while education is based on milestones. Since these are repeated cross-sectional surveys, a decrease in the overweight prevalence among the highest educated females over time in these countries could be due to a secular trend toward lower BMIs in higher educated women, (but not the wealthier women in these countries, possibly due to different implications of each dimension of SES on health outcomes), an unintentionally different sampling frame between surveys, and/or differential migration by BMI.

Additionally, across the countries, faster overweight prevalence growth rates among the lower wealth groups was positively correlated with GDP, which is consistent with reports of

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inverse relationships between SES and overweight among relatively higher income nations (16). However, we did not observe a similar association using education versus wealth. We further explored country-level correlates of disproportionate overweight prevalence growth by SES in a subsequent paper (32).

Limitations of our study should be noted. To maintain sample comparability over time, we limited our sample to women with children under 5 years old; however, we observed generally similar findings across the full sample. We used both income and education measures to maximize comparability with other studies. We focus on the difference in overweight between the highest and the lowest wealth quintile and education level for our primary analyses, which ignores changes in the middle of the distribution; however, we observed consistent findings using a more complex, regression-based measure of inequality, the slope index of inequality.

Conclusions

We observe that although the prevalence of overweight is still currently higher in highest wealth and education groups, the overweight prevalence growth rate in the lower wealth and less educated segments of the population has surpassed that of the higher wealth and education groups in many countries. These findings have important implications for future trends in the social distribution of risk factors for chronic disease in lower-income countries.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

FUNDING

This work was supported by the National Institute of Child Health and Human Development at the National Institutes of Health [NRSA T32 HD07168-30 and 31, R01-HD30880, DK056350, and R01-HD38700)].

We thank Phil Bardsley, Rick O'Hara, and Diane Kaczor for programming assistance and database development. We would also like to thank Frances Dancy for administrative support and Tom Swasey for graphical help.

References

1. Popkin, BM. The World Is Fat: The Fads, Trends, Policies, and Products That Are Fattening the Human Race. New York: Avery-Penguin Group; 2008.
2. Popkin BM. Global nutrition dynamics: the world is shifting rapidly toward a diet linked with noncommunicable diseases. Am J Clin Nutr. 2006 Aug; 84(2):289–98. [PubMed: 16895874]
3. Popkin BM, Conde W, Hou N, Monteiro C. Is there a lag globally in overweight trends for children compared with adults? Obesity (Silver Spring). 2006 Oct; 14(10):1846–53. [PubMed: 17062816]
4. Subramanian S, Perkins JM, Ozaltin E, Davey Smith G. Weight of nations: a socioeconomic analysis of women in low- to middle-income countries. The American Journal of Clinical Nutrition. Feb 1; 2011 93(2):413–21. [PubMed: 21068343]
5. Subramanian S, Perkins JM, Khan KT. Do burdens of underweight and overweight coexist among lower socioeconomic groups in India? The American Journal of Clinical Nutrition. 2009 Aug 1; 90(2):369–76. [PubMed: 19515733]
6. de Brauw, A. Food Policy. Migration and child development during the food price crisis in El Salvador. In Press, Corrected Proof
7. Sen, A. The rich get hungrier. The New York Times; 2008. p. 28

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8. Phelan JC, Link BG, Diez-Roux A, Kawachi I, Levin B. “Fundamental causes” of social inequalities in mortality: a test of the theory. Journal of health and social behavior. 2004 Sep; 45(3):265–85. [PubMed: 15595507]
9. Mackenbach JP, Stirbu I, Roskam A-JR, et al. Socioeconomic Inequalities in Health in 22 European Countries. New England Journal of Medicine. 2008; 358(23):2468–81. [PubMed: 18525043]
10. Link, BG.; Phelan, J. Journal of health and social behavior. 1995. Social conditions as fundamental causes of disease; p. 80-94.
11. Yach D, Hawkes C, Gould CL, Hofman KJ. The Global Burden of Chronic Diseases. JAMA: The Journal of the American Medical Association. 2004 Jun 2; 291(21):2616–22. [PubMed: 15173153]
12. Popkin BM. Will ChinaÂ’s Nutrition Transition Overwhelm Its Health Care System And Slow Economic Growth? Health Affairs. 2008 Jul 1; 27(4):1064–76. [PubMed: 18607042]
13. Ezzati M, Hoorn S, Lawes C, et al. Rethinking the diseases of affluence paradigm: global patterns of nutritional risks in relation to economic development. PLoS Med. 2005; 2(5):e133. [PubMed: 15916467]
14. Monteiro CA, Conde WL, Popkin BM. Income-specific trends in obesity in Brazil: 1975–2003. Am J Public Health. 2007 Oct; 97(10):1808–12. [PubMed: 17761560]
15. Ziraba A, Fotso J, Ochako R. Overweight and obesity in urban Africa: A problem of the rich or the poor? BMC Public Health. 2009; 9(1):465. [PubMed: 20003478]
16. Monteiro CA, Conde WL, Lu B, Popkin BM. Obesity and inequities in health in the developing world. Int J Obes Relat Metab Disord. 2004 Sep; 28(9):1181–6. [PubMed: 15211362]
17. Sobal J, Stunkard AJ. Socioeconomic status and obesity: a review of the literature. Psychol Bull. 1989 Mar; 105(2):260–75. [PubMed: 2648443]
18. DHS. DHS Model Questionnaires. [cited; Available from: http://www.measuredhs.com/aboutsurveys/dhs/questionnaires.cfm
19. DHS. DHS Guidelines for Interviewer Training. Measure DHS. Macro International; 2000.
20. Population RL. Indonesian Family Life Survey. [cited 2010 Janurary 10]; Available from: http://www.rand.org/labor/FLS/IFLS/hh.html
21. WHO/FAO. Expert Consultation on Diet, Nutrition and the Prevention of Chronic DiseasesReport of the joint WHO/FAO expert consultation. Geneva: World Health Organization; 2003.
22. Rutstein, SO.; Johnson, K.; Macro, O. The DHS wealth index. ORC Macro, MEASURE DHS; 2004.
23. Fernald LCH, Gertler PJ, Neufeld LM. Role of cash in conditional cash transfer programmes for child health, growth, and development: an analysis of Mexico’s Oportunidades. The Lancet. 2008; 371(9615):828–37.
24. WorldBank. EdStat Indicators. [cited 2010 January]; Available from: http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTEDUCATION/EXTDATASTATISTICS/EXTEDSTATS/0,,contentMDK:21272698~menuPK:4323930~pagePK:64168445~piPK:64168309~theSitePK:3232764,00.html
25. WorldBank. World Development Indicators. [cited 2010 January]; Available from: http://ddp-ext.worldbank.org/ext/DDPQQ/member.do?method=getMembers&userid=1&queryId=6
26. Ahmad, O.; Boschi-Pinto, C.; Lopez, A.; Murray, C. Age standardization of rates: a new WHO standard. Geneva: World Health Organization; 1999.
27. Wagstaff A, Paci P, van Doorslaer E. On the measurement of inequalities in health. Social Science & Medicine. 1991; 33(5):545–57. [PubMed: 1962226]
28. Appropriate body-mass index for Asian populations and its implications for policy and intervention strategies. The Lancet. 2004; 363(9403):157–63.
29. Sterne J, Smith G, Cox D. Sifting the evidence—what’s wrong with significance tests? Another comment on the role of statistical methods. BMJ. 2001; 322(7280):226. [PubMed: 11159626]
30. Ziraba AK, Fotso JC, Ochako R. Overweight and obesity in urban Africa: A problem of the rich or the poor? BMC Public Health. 2009; 9:465. [PubMed: 20003478]
31. Link BG, Phelan J. Social conditions as fundamental causes of disease. J Health Soc Behav. 1995; (Spec No):80–94. [PubMed: 7560851]

32. Jones-Smith JC, Gordon-Larsen P, Siddiqi A, Popkin BM. Cross-National Comparisons of Time Trends in Overweight Inequality by Socioeconomic Status Among Women Using Repeated Cross-Sectional Surveys From 37 Developing Countries, 1989–2007. American Journal of Epidemiology. 2011 Epub ahead of print. 10.1093/aje/kwq428

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Key Messages

Using the Demographic and Health Surveys, in 39 low- and middle-income countries, among a large sample of mothers aged 18–49, the highest wealth and education groups still have the highest prevalence of overweight in the majority of countries.

We find evidence that the prevalence of overweight has increased faster for the poorest quintile compared to the wealthiest in 31% of the countries. In 54% of the countries examined, the overweight prevalence increased faster for the least educated compared to the most educated groups.

Gross Domestic Product per capita (GDP) was positively correlated with faster overweight prevalence growth rates for the poorest compared to the wealthiest quintile. However, there was no evidence of a correlation between GDP and faster overweight prevalence growth for those with the lowest compared to those with the highest education.

Figure 1a

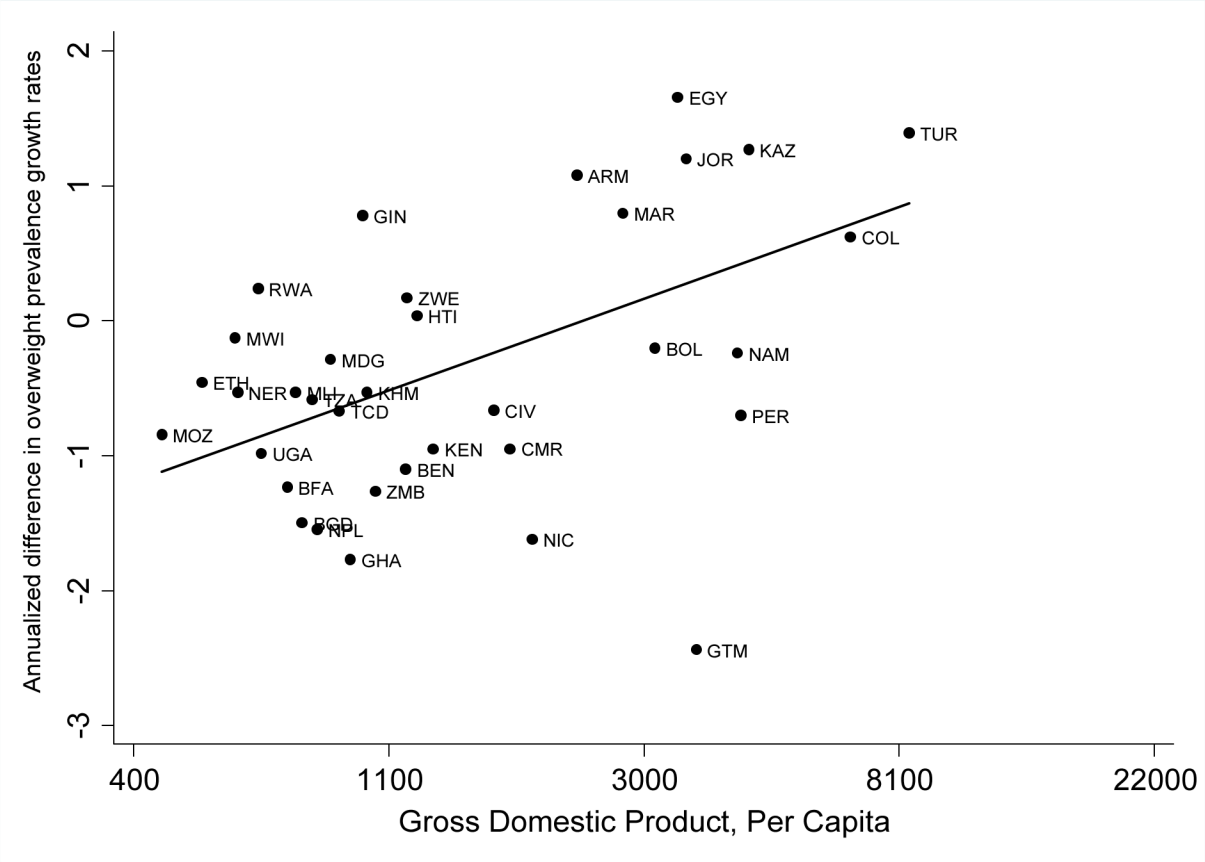

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Figure 1b

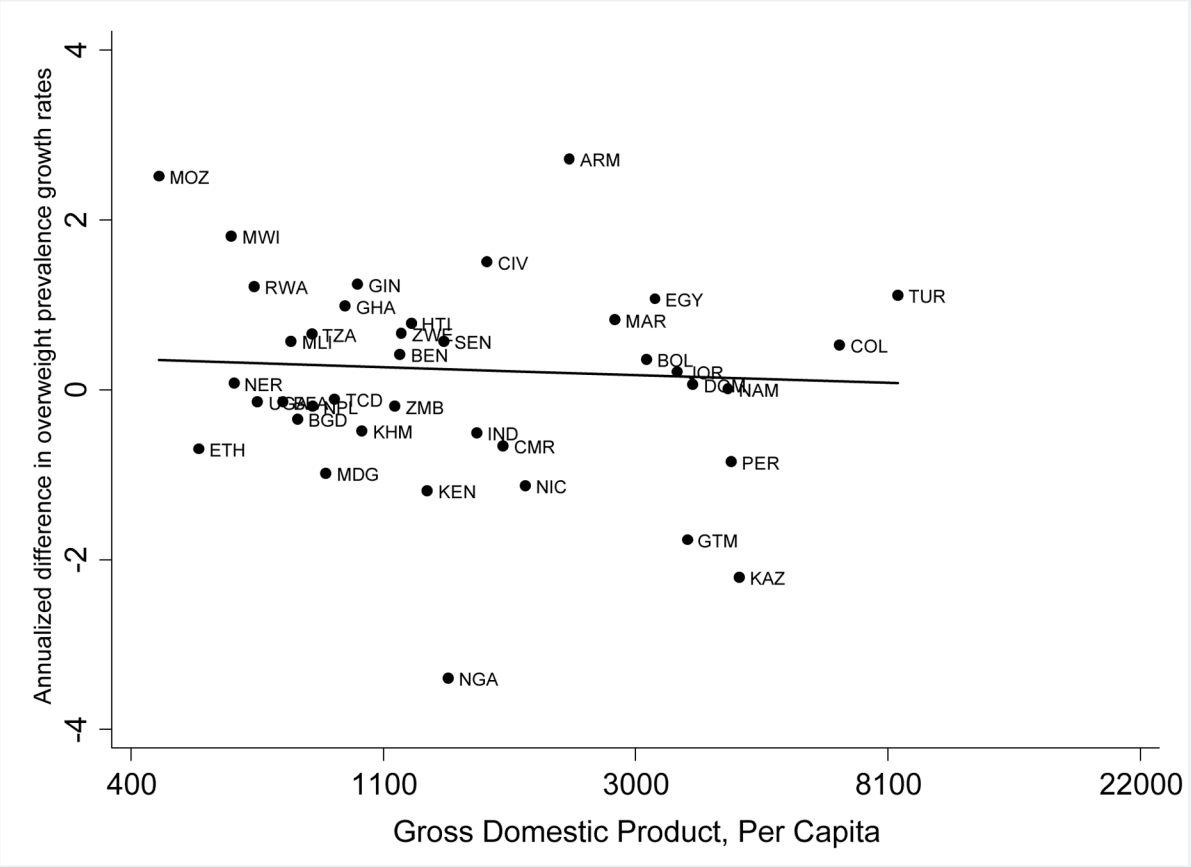

Figure 1.

Figure 1a. Correlation between annualized difference in overweight prevalence growth rate between lowest and highest wealth quintile and country-level GDP per capita

Figure 1b. Correlation between annualized difference in overweight prevalence growth rate between lowest and highest education group and country-level GDP per capita

ARM: Armenia; BGD: Bangladesh; BEN: Benin; BOL: Bolivia; BFA: Burkina Faso; KHM: Cambodia; CMR: Cameroon; TCD: Chad; COL: Colombia; CIV: Cote d'Ivoire; DOM: Dominican Republic; EGY: Egypt, Arab Rep.; ETH: Ethiopia; GHA: Ghana; GTM: Guatemala; GIN: Guinea; HTI: Haiti; IND: India; IDN: Indonesia; JOR: Jordan; KAZ: Kazakhstan; KEN: Kenya; MDG: Madagascar; MWI: Malawi; MLI: Mali; MEX: Mexico; MAR: Morocco; MOZ: Mozambique; NAM: Namibia; NPL: Nepal; NIC: Nicaragua; NER: Niger; NGA: Nigeria; PER: Peru; RWA: Rwanda; SEN: Senegal; TZA: Tanzania; TUR: Turkey; UGA: Uganda; ZMB: Zambia; ZWE: Zimbabwe

Pearson's correlation coefficient for relationship in Figure 1a = 0.45; p-value=0.007; for Figure 1b = −0.06; p-value 0.76.

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Int J Obes (Lond). Author manuscript; available in PMC 2012 December 06.

Table 1

Countries included, sample size, and selected sample characteristics

Country	Year	Sample Size	GDP per capita, PPP	Age (SD)	Mean Education Group (0:<primary, 4:≥tertiary) (SD)	Parity (SD)	BMI (SD)	Percent overweight or obese (SD)	Age-standardized percent overweight or obese (SD)	Percent Urban (SD)
Armenia	2005	1,433	4098	29.4 (0.2)	2.2 (0.02)	1.9 (0.04)	24.6 (0.2)	37.2 (1.8)	45.4 (2.1)	60.4 (2.3)
Armenia	2000	1,723	2294	30.0 (0.2)	2.2 (0.01)	2.1 (0.04)	24.6 (0.1)	38.3 (1.3)	43.8 (1.4)	56.0 (1.9)
Bangladesh	2007	5,320	1178	28.8 (0.1)	1.1 (0.03)	2.9 (0.04)	20.4 (0.1)	10.3 (0.7)	11.5 (0.8)	22.4 (2.2)
Bangladesh	1996	3,536	781	26.6 (0.1)	0.6 (0.02)	3.4 (0.04)	18.9 (0.1)	2.9 (0.3)	2.7 (0.4)	10.0 (0.5)
Benin	2006	10,089	1315	30.0 (0.1)	0.4 (0.01)	3.8 (0.04)	22.5 (0.1)	17.4 (0.6)	18.4 (0.6)	37.9 (1.0)
Benin	1996	2,222	1173	28.8 (0.1)	0.3 (0.02)	4.2 (0.06)	21.2 (0.1)	9.2 (0.7)	11.7 (1.1)	31.8 (1.5)
Bolivia	2003	8,142	3426	30.1 (0.1)	1.4 (0.01)	3.4 (0.04)	25.7 (0.1)	48.4 (1.0)	50.6 (1.1)	64.8 (0.9)
Bolivia	1994	2,183	3118	28.9 (0.2)	1.3 (0.02)	3.9 (0.07)	24.3 (0.1)	34.1 (1.2)	34.9 (1.7)	54.6 (1.5)
Burkina Faso	2003	7,737	982	30.8 (0.1)	0.2 (0.02)	4.1 (0.06)	21.0 (0.1)	8.6 (0.9)	8.8 (0.9)	17.0 (2.2)
Burkina Faso	1992	3,262	737	29.8 (0.2)	0.2 (0.01)	4.5 (0.05)	21.0 (0.1)	7.0 (0.4)	7.2 (0.5)	15.8 (0.9)
Cambodia	2005	3,649	1443	31.1 (0.2)	1.0 (0.02)	3.0 (0.05)	21.0 (0.1)	9.2 (0.6)	10.0 (0.7)	16.9 (0.9)
Cambodia	2000	3,231	1009	31.2 (0.1)	0.8 (0.02)	3.6 (0.06)	20.6 (0.1)	6.1 (0.5)	6.3 (0.6)	16.1 (0.7)
Cameroon	2004	2,826	1957	29.1 (0.2)	1.1 (0.02)	3.6 (0.07)	23.6 (0.1)	28.6 (1.0)	30.3 (1.1)	49.6 (1.5)
Cameroon	1998	1,498	1765	27.6 (0.2)	0.9 (0.03)	4.0 (0.08)	22.7 (0.1)	21.3 (1.3)	21.9 (2.1)	26.3 (1.7)
Cote d'Ivoire	1998	1,607	1871	29.7 (0.2)	0.5 (0.03)	3.5 (0.10)	22.6 (0.1)	19.4 (1.3)	21.1 (1.6)	37.7 (2.5)
Cote d'Ivoire	1994	2,867	1656	28.0 (0.1)	0.4 (0.02)	4.2 (0.05)	22.1 (0.1)	14.1 (0.8)	16.0 (1.3)	34.6 (1.4)
Chad	2004	2,714	1407	29.0 (0.2)	0.3 (0.02)	4.7 (0.07)	20.8 (0.1)	7.4 (0.6)	8.7 (0.7)	18.3 (1.3)
Chad	1996	3,430	904	28.2 (0.1)	0.2 (0.01)	4.4 (0.05)	20.5 (0.1)	5.1 (0.4)	5.2 (0.5)	21.2 (0.8)
Colombia	2005	14,618	7231	30.2 (0.1)	1.8 (0.01)	2.4 (0.02)	24.9 (0.1)	43.2 (0.6)	47.0 (0.6)	74.1 (0.6)
Colombia	1995	3,189	6700	28.6 (0.1)	1.6 (0.02)	2.7 (0.04)	24.5 (0.1)	41.0 (0.9)	46.6 (1.3)	67.5 (1.0)
Dominican Republic	1996	3,500	4675	29.2 (0.2)	1.5 (0.02)	2.8 (0.05)	24.4 (0.1)	39.9 (1.0)	43.5 (1.1)	63.6 (1.3)
Dominican Republic	1991	2,004	3744	28.0 (0.2)	1.5 (0.03)	3.0 (0.08)	23.3 (0.1)	26.3 (1.3)	24.6 (1.5)	61.7 (2.3)
Egypt	2005	10,085	4319	30.5 (0.0)	1.3 (0.00)	3.2 (0.01)	28.9 (0.0)	74.7 (0.1)	76.1 (0.1)	35.9 (0.3)
Egypt	1992	4,609	3221	30.1 (0.1)	0.8 (0.03)	4.1 (0.05)	26.8 (0.1)	57.4 (1.1)	56.7 (1.2)	40.2 (2.1)
Ethiopia	2005	3,326	633	29.4 (0.2)	0.3 (0.01)	4.1 (0.07)	20.2 (0.1)	3.4 (0.4)	3.6 (0.5)	11.7 (0.7)
Ethiopia	2000	7,265	528	29.8 (0.1)	0.3 (0.02)	4.0 (0.05)	19.9 (0.0)	2.5 (0.3)	2.5 (0.3)	13.5 (1.0)
Ghana	2003	2,826	1116	30.6 (1.5)	1.1 (0.02)	3.4 (0.05)	23.1 (0.1)	24.6 (1.1)	25.2 (1.2)	39.0 (1.3)

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Country	Year	Sample Size	GDP per capita, PPP	Age (SD)	Mean Education Group (0:<primary, 4:≥tertiary) (SD)	Parity (SD)	BMI (SD)	Percent overweight or obese (SD)	Age-standardized percent overweight or obese (SD)	Percent Urban (SD)
Ghana	1993	1,691	943	29.1 (1.7)	0.7 (0.02)	3.7 (0.05)	21.7 (0.1)	12.5 (0.9)	12.8 (1.2)	28.7 (1.5)
Guatemala	1998	2,288	3860	29.1 (0.2)	0.9 (0.04)	3.9 (0.12)	25.1 (0.2)	44.6 (2.2)	46.9 (2.1)	40.2 (2.9)
Guatemala	1995	4,778	3664	29.2 (0.1)	0.8 (0.02)	4.2 (0.05)	24.2 (0.1)	34.6 (0.9)	36.3 (1.1)	36.5 (1.3)
Guinea	2005	2,422	1056	31.0 (0.2)	0.3 (0.02)	4.1 (0.07)	21.7 (0.1)	13.2 (0.8)	13.5 (0.8)	27.9 (1.3)
Guinea	1999	3,133	990	29.5 (0.2)	0.2 (0.01)	4.3 (0.06)	21.7 (0.1)	12.1 (0.7)	12.5 (0.8)	26.2 (1.0)
Haiti	2005	2,492	1068	29.7 (0.2)	1.1 (0.03)	3.0 (0.07)	22.5 (0.1)	22.3 (1.1)	23.2 (1.2)	43.3 (1.8)
Haiti	1994	1,727	1226	30.6 (0.2)	0.7 (0.02)	4.1 (0.07)	21.2 (0.1)	11.5 (0.9)	11.3 (1.1)	35.0 (1.6)
India	2005	78,835	2234	32.7 (0.1)	1.2 (0.01)	2.9 (0.02)	20.5 (0.0)	11.3 (0.3)	11.1 (0.3)	30.0 (1.0)
India	1998	40,253	1591	29.1 (0.0)	0.8 (0.01)	3.2 (0.02)	20.0 (0.0)	8.7 (0.2)	9.8 (0.3)	23.8 (1.0)
Jordan	2007	2,915	4775	32.2 (0.2)	2.2 (0.02)	4.0 (0.07)	27.2 (0.2)	61.6 (1.4)	59.9 (1.5)	84.1 (1.9)
Jordan	1997	2,930	3520	30.9 (0.1)	2.0 (0.02)	4.6 (0.06)	27.3 (0.1)	62.0 (1.0)	65.0 (1.1)	82.7 (0.8)
Kazakhstan	1999	674	4909	29.8 (0.3)	2.2 (0.02)	2.3 (0.06)	23.5 (0.2)	26.0 (2.0)	31.3 (2.3)	46.0 (3.3)
Kazakhstan	1995	1,302	4499	29.8 (0.2)	2.2 (0.02)	2.4 (0.06)	24.2 (0.2)	32.5 (1.8)	38.5 (1.8)	47.4 (2.5)
Kenya	2003	3,986	1279	29.0 (0.1)	1.2 (0.02)	3.5 (0.06)	22.5 (0.1)	21.1 (0.9)	24.2 (1.1)	21.5 (1.1)
Kenya	1993	3,143	1307	28.9 (0.1)	1.1 (0.02)	4.3 (0.06)	22.0 (0.1)	14.1 (0.8)	15.7 (1.1)	13.2 (1.1)
Madagascar	2003	3,771	847	30.1 (0.2)	1.0 (0.04)	3.7 (0.08)	20.6 (0.1)	6.0 (0.5)	6.3 (0.5)	21.7 (1.2)
Madagascar	1997	2,419	873	28.1 (0.2)	1.0 (0.02)	4.3 (0.08)	20.4 (0.1)	3.9 (0.4)	4.2 (0.5)	20.0 (1.4)
Malawi	2004	6,521	648	28.7 (0.1)	0.9 (0.02)	3.7 (0.04)	22.1 (0.1)	13.3 (0.6)	15.0 (0.7)	15.5 (1.8)
Malawi	1992	2,100	601	29.6 (0.2)	0.5 (0.02)	4.6 (0.07)	21.6 (0.1)	9.3 (0.7)	10.0 (0.9)	11.2 (0.7)
Mali	2006	8,476	1025	30.0 (0.1)	0.3 (0.01)	4.4 (0.05)	22.2 (0.1)	17.4 (0.6)	18.9 (0.8)	31.5 (1.9)
Mali	1995	3,970	762	29.0 (0.1)	0.2 (0.01)	4.8 (0.05)	21.1 (0.1)	8.9 (0.6)	9.0 (0.7)	26.3 (1.2)
Morocco	2003	6,555	3395	30.9 (0.1)	0.7 (0.02)	2.7 (0.04)	24.7 (0.1)	40.6 (0.8)	42.3 (0.8)	53.5 (1.1)
Morocco	1992	2,795	2746	31.7 (0.2)	0.3 (0.02)	4.5 (0.08)	24.1 (0.1)	32.7 (1.3)	32.8 (1.3)	38.6 (1.6)
Mozambique	2003	6,736	606	29.5 (0.1)	0.6 (0.02)	3.8 (0.04)	22.2 (0.1)	13.9 (0.6)	15.5 (0.7)	34.1 (1.3)
Mozambique	1997	3,012	451	27.7 (0.2)	0.6 (0.04)	3.8 (0.08)	21.5 (0.2)	9.1 (1.1)	10.3 (1.3)	20.4 (2.8)
Namibia	2006	4,841	5669	29.8 (0.1)	1.6 (0.02)	2.5 (0.04)	23.4 (0.1)	29.3 (1.0)	32.5 (1.1)	42.9 (1.4)
Namibia	1992	2,029	4305	29.6 (0.2)	1.2 (0.03)	3.7 (0.06)	22.5 (0.1)	20.9 (1.1)	22.2 (1.2)	34.6 (1.9)
Nepal	2006	5,003	976	29.6 (0.2)	0.7 (0.03)	3.1 (0.05)	20.4 (0.1)	7.1 (0.7)	7.8 (0.7)	13.8 (1.1)
Nepal	1996	3,187	829	27.4 (0.2)	0.3 (0.03)	3.6 (0.06)	19.8 (0.1)	1.6 (0.2)	1.7 (0.4)	6.5 (1.2)
Nicaragua	2001	6,278	2145	29.4 (0.1)	1.3 (0.02)	3.2 (0.04)	25.8 (0.1)	50.0 (0.9)	54.3 (0.9)	59.1 (1.2)

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Country	Year	Sample Size	GDP per capita, PPP	Age (SD)	Mean Education Group (0:<primary, 4:≥tertiary) (SD)	Parity (SD)	BMI (SD)	Percent overweight or obese (SD)	Age-standardized percent overweight or obese (SD)	Percent Urban (SD)
Nicaragua	1997	6,887	1925	29.5 (0.1)	1.3 (0.02)	3.4 (0.04)	25.0 (0.1)	42.9 (0.7)	47.0 (0.8)	60.8 (1.1)
Niger	2006	2,909	597	30.0 (0.2)	0.2 (0.02)	4.6 (0.07)	21.6 (0.1)	13.9 (0.8)	14.9 (0.9)	18.2 (1.1)
Niger	1992	3,065	607	28.5 (0.1)	0.1 (0.01)	4.9 (0.07)	20.8 (0.1)	8.0 (0.5)	9.3 (0.7)	16.0 (0.8)
Nigeria	2003	3,727	1558	29.3 (0.2)	0.9 (0.04)	4.0 (0.08)	22.5 (0.2)	20.6 (1.5)	21.9 (1.4)	32.3 (1.8)
Nigeria	1999	2,038	1419	28.4 (0.2)	0.8 (0.03)	4.0 (0.07)	22.8 (0.1)	22.8 (1.2)	22.5 (1.4)	26.8 (2.0)
Peru	2000	12,155	5513	30.3 (0.1)	1.7 (0.01)	2.9 (0.03)	25.6 (0.1)	48.9 (0.6)	51.4 (0.7)	63.9 (0.7)
Peru	1992	4,986	4359	29.7 (0.1)	1.6 (0.02)	3.6 (0.05)	24.8 (0.1)	40.4 (0.8)	42.1 (1.0)	65.1 (1.4)
Rwanda	2005	2,918	793	30.6 (0.2)	0.9 (0.01)	3.7 (0.05)	22.1 (0.1)	12.0 (0.7)	11.8 (0.7)	16.4 (0.8)
Rwanda	2000	5,092	658	30.5 (0.1)	0.8 (0.02)	3.7 (0.05)	22.3 (0.1)	13.7 (0.6)	13.5 (0.6)	17.7 (0.9)
Senegal	2005	2,914	1614	30.1 (0.2)	0.5 (0.04)	3.3 (0.10)	22.7 (0.1)	24.3 (1.2)	27.3 (1.3)	46.3 (3.6)
Senegal	1992	2,804	1393	29.8 (0.1)	0.3 (0.02)	4.6 (0.06)	21.9 (0.1)	16.2 (0.8)	17.6 (0.9)	35.1 (1.4)
Tanzania	2004	5,776	990	29.3 (0.1)	0.8 (0.02)	3.6 (0.05)	22.4 (0.1)	17.2 (0.7)	18.2 (0.8)	25.2 (1.4)
Tanzania	1992	4,128	826	28.8 (0.1)	0.7 (0.02)	4.2 (0.05)	21.7 (0.1)	11.0 (0.6)	11.5 (0.7)	22.0 (3.7)
Turkey	2003	2,897	9505	28.7 (0.1)	1.2 (0.02)	2.7 (0.05)	26.5 (0.1)	57.1 (1.3)	61.5 (1.5)	69.3 (1.1)
Turkey	1993	2,222	8434	28.0 (0.2)	0.9 (0.02)	3.0 (0.07)	25.8 (0.1)	50.4 (1.2)	51.6 (2.2)	63.8 (1.4)
Uganda	2006	1,616	966	29.8 (0.2)	1.0 (0.03)	4.5 (0.08)	22.2 (0.1)	16.4 (1.2)	17.2 (1.3)	14.7 (1.9)
Uganda	1995	2,968	666	27.7 (0.2)	0.8 (0.02)	4.3 (0.06)	21.5 (0.1)	8.6 (0.7)	9.4 (0.9)	11.8 (0.9)
Zambia	2007	3,981	1212	29.4 (0.1)	1.2 (0.02)	3.8 (0.05)	22.5 (0.1)	18.8 (0.7)	21.1 (0.8)	37.3 (1.3)
Zambia	1992	2,976	1149	28.4 (0.1)	1.1 (0.02)	4.3 (0.06)	21.8 (0.1)	14.1 (0.8)	16.1 (1.0)	48.1 (1.5)
Zimbabwe	2005	4,698	1430	28.7 (0.1)	1.6 (0.02)	2.7 (0.05)	23.1 (0.1)	25.0 (1.1)	28.4 (1.2)	34.6 (1.8)
Zimbabwe	1994	1,779	1179	27.9 (0.2)	1.3 (0.02)	3.6 (0.07)	23.1 (0.1)	23.0 (1.1)	26.4 (1.9)	25.3 (1.1)

GDP: Gross Domestic Product; PPP: Purchasing power parity

GDP per capita is calculated using the purchasing power parity method and inflated to the 2005 international dollar value. The World Bank Global Indicators database provided the GDP statistics for all countries except Zimbabwe, for which GDP was imputed from the mean GDP in the Sub-Saharan Africa region in the first and last survey years among sample countries (25).

Age-standardization was performed by the direct method using the World Health Organization world standard population for the age structure (26).

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Table 2

Overweight prevalence in lowest and highest wealth quintiles for first and last survey year in each country, overweight prevalence difference between lowest and highest wealth quintiles for first and last survey year, and difference and annualized difference in overweight prevalence growth rates over the survey period between the lowest and highest wealth quintiles.

Country (First Year, Last Year)	First Year			Last Year				
	Prevalence in Lowest Wealth Quintile (SE)	Prevalence in Highest Wealth Quintile (SE)	Prevalence Difference (90% CI)	Prevalence in Lowest Wealth Quintile (SE)	Prevalence in Highest Wealth Quintile (SE)	Prevalence Difference (90% CI)	Difference in Overweight Prevalence Growth Rate	Annualized Difference in Overweight Prevalence Growth Rate
Armenia (2000, 2005)	36 (2.6)	35 (2.9)	1 (−5.8, 7.0)	39 (3.1)	33 (4.9)	6 (−3.6, 15.6)	5 (−6.2, 17.0)	1.1 (−1.2, 3.4)
Bangladesh (1996/97, 2007)	1 (0.4)	12 (1.4)	−11 (−13.2, −8.4)	2 (0.5)	29 (1.8)	−27 (−29.5, −23.6)	−16 (−19.5, −11.9)	−1.5 (−1.9, −1.1)
Benin (1996, 2006)	5 (1.1)	24 (3.2)	−19 (−24.2, −13.1)	6 (0.6)	36 (1.2)	−30 (−31.8, −27.4)	−11 (−17.0, −5.1)	−1.1 (−1.7, −0.5)
Bolivia (1994, 2003)	22 (2.1)	38 (3.3)	−16 (−22.6, −9.7)	35 (1.6)	53 (1.8)	−18 (−21.8, −14.0)	−2 (−9.4, 5.7)	−0.2 (−1.0, 0.6)
Burkina Faso (1992/93, 2003)	3 (0.8)	19 (1.4)	−15 (−17.9, −12.6)	2 (0.4)	30 (2.0)	−28 (−31.6, −24.9)	−13 (−17.3, −8.6)	−1.2 (−1.6, −0.8)
Cambodia (2000, 2005)	3 (0.7)	14 (1.9)	−11 (−14.5, −7.8)	4 (0.8)	18 (1.9)	−14 (−17.2, −10.3)	−3 (−7.6, 2.3)	−0.5 (−1.5, 0.5)
Cameroon (1998, 2004)	8 (1.8)	39 (3.0)	−31 (−36.6, −25.2)	12 (1.5)	49 (2.7)	−37 (−41.7, −31.5)	−6 (−13.5, 2.1)	−0.9 (−2.2, 0.3)
Chad (1996/97, 2004)	3 (0.8)	14 (1.3)	−11 (−13.4, −8.3)	4 (1.4)	20 (1.7)	−16 (−19.6, −12.2)	−5 (−9.4, −0.6)	−0.7 (−1.3, −0.1)
Colombia (1995, 2005)	33 (1.9)	44 (2.5)	−11 (−16.2, −6.0)	39 (1.1)	43 (1.8)	−5 (−8.3, −1.5)	6 (0.1, 12.3)	0.6 (0.0, 1.2)
Cote d'Ivoire (1994, 1998)	5 (1.1)	33 (2.4)	−28 (−31.9, −23.2)	5 (1.5)	35 (2.0)	−31 (−34.6, −26.5)	−3 (−8.7, 2.7)	−0.7 (−1.9, 0.6)
Egypt, Arab Rep. (1995, 2008)	32 (2.0)	73 (2.2)	−42 (−46.5, −36.7)	60 (1.7)	86 (1.2)	−25 (−28.5, −21.6)	17 (10.6, 22.5)	1.3 (0.8, 1.7)
Ethiopia (2000, 2005)	2 (0.7)	7 (0.8)	−5 (−7.0, −3.6)	2 (0.7)	9 (1.7)	−8 (−10.6, −4.5)	−2 (−5.8, 1.2)	−0.5 (−1.2, 0.2)
Ghana (1993, 2003)	6 (1.3)	33 (3.2)	−27 (−32.9, −21.6)	8 (1.2)	53 (2.6)	−45 (−49.6, −40.3)	−18 (−25.0, −10.4)	−1.8 (−2.5, −1.0)
Guatemala (1995, 1998/99)	21 (1.3)	57 (2.9)	−36 (−41.0, −30.6)	26 (2.5)	69 (3.3)	−43 (−49.7, −36.6)	−7 (−15.6, 0.9)	−2.4 (−5.2, 0.3)
Guinea (1999, 2005)	5 (0.9)	30 (2.0)	−26 (−29.2, −21.9)	7 (1.1)	28 (2.2)	−21 (−24.8, −16.9)	5 (−0.7, 10.1)	0.8 (−0.1, 1.7)
Haiti (1994/95, 2005/06)	4 (1.4)	32 (2.4)	−29 (−33.3, −24.5)	10 (1.7)	38 (3.0)	−28 (−34.3, −22.7)	0.4 (−6.9, 7.8)	0.0 (−0.6, 0.7)
Jordan (1997, 2007)	58 (2.4)	67 (2.1)	−8 (−13.6, −3.3)	62 (2.6)	58 (3.9)	4 (−4.3, 11.3)	12 (2.8, 21.2)	1.2 (0.3, 2.1)
Kazakhstan (1995, 1999)	29 (2.5)	37 (3.1)	−8 (−14.2, −0.9)	25 (4.2)	27 (4.5)	−2 (−12.5, 7.6)	5 (−7.0, 17.1)	1.3 (−1.7, 4.3)
Kenya (1993, 2003)	8 (1.1)	28 (2.1)	−20 (−24.0, −16.2)	9 (1.4)	39 (2.0)	−30 (−33.5, −25.6)	−9 (−15.0, −4.0)	−0.9 (−1.5, −0.4)
Madagascar (1997, 2003/04)	3 (0.6)	11 (1.8)	−9 (−11.8, −5.7)	3 (0.8)	14 (1.6)	−11 (−13.5, −7.8)	−2 (−6.2, 2.5)	−0.3 (−1.0, 0.4)
Malawi (1992, 2004)	5 (1.2)	19 (2.0)	−14 (−17.6, −10.0)	9 (1.1)	24 (1.4)	−15 (−18.3, −12.3)	−2 (−6.4, 3.3)	−0.1 (−0.5, 0.3)
Mali (1995/96, 2006)	4 (0.8)	24 (2.0)	−20 (−24.0, −16.8)	8 (1.0)	34 (1.4)	−26 (−28.8, −23.1)	−6 (−10.2, −1.0)	−0.5 (−1.0, −0.1)
Morocco (1992, 2003)	17 (1.7)	50 (2.9)	−33 (−38.7, −27.8)	27 (1.7)	51 (1.8)	−24 (−28.1, −20.1)	9 (2.2, 16.1)	0.8 (0.2, 1.4)

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Country (First Year, Last Year)	First Year			Last Year				
	Prevalence in Lowest Wealth Quintile (SE)	Prevalence in Highest Wealth Quintile (SE)	Prevalence Difference (90% CI)	Prevalence in Lowest Wealth Quintile (SE)	Prevalence in Highest Wealth Quintile (SE)	Prevalence Difference (90% CI)	Difference in Overweight Prevalence Growth Rate	Annualized Difference in Overweight Prevalence Growth Rate
Mozambique (1997, 2003)	4 (1.1)	26 (2.9)	−22 (−27.1, −17.0)	6 (0.7)	33 (1.7)	−27 (−30.0, −24.2)	−5 (−10.9, 0.8)	−0.8 (−1.8, 0.1)
Namibia (1992, 2006/2007)	8 (1.4)	43 (2.3)	−35 (−39.2, −30.3)	11 (1.2)	49 (3.2)	−38 (−43.6, −32.3)	−3 (−10.5, 4.0)	−0.2 (−0.8, 0.3)
Nepal (1996, 2006)	1 (0.3)	5 (1.0)	−4 (−5.9, −2.4)	3 (0.7)	22 (2.1)	−20 (−23.4, −15.7)	−15 (−19.7, −11.2)	−1.5 (−2.0, −1.1)
Nicaragua (1997/98, 2001)	29 (1.3)	51 (1.9)	−21 (−24.8, −17.4)	33 (1.5)	60 (2.0)	−27 (−30.9, −22.7)	−6 (−11.2, −0.2)	−1.6 (−3.2, 0.0)
Niger (1992, 2006)	3 (0.7)	28 (2.2)	−25 (−28.4, −21.0)	5 (1.1)	37 (2.0)	−32 (−35.8, −28.4)	−7 (−12.7, −2.2)	−0.5 (−0.9, −0.2)
Peru (1992, 2000)	28 (1.4)	45 (2.4)	−17 (−21.5, −12.2)	32 (1.2)	54 (1.7)	−22 (−25.8, −19.1)	−6 (−11.3, 0.1)	−0.7 (−1.4, 0.0)
Rwanda (2000, 2005)	10 (1.4)	25 (1.4)	−16 (−19.2, −12.5)	9 (1.3)	24 (1.7)	−15 (−18.2, −11.1)	1 (−3.8, 6.1)	0.2 (−0.8, 1.2)
Tanzania (1996, 2004)	8 (1.2)	31 (1.6)	−23 (−26.8, −20.2)	9 (1.5)	37 (2.0)	−28 (−32.2, −24.0)	−5 (−9.9, 0.6)	−0.4 (−0.8, 0.1)
Turkey (1993, 2003)	40 (3.1)	53 (2.5)	−14 (−20.3, −7.4)	52 (2.5)	52 (2.8)	0 (−6.1, 6.2)	14 (5.0, 22.9)	1.4 (0.5, 2.3)
Uganda (1995, 2006)	4 (0.8)	19 (1.6)	−15 (−18.2, −12.3)	6 (1.7)	32 (3.0)	−26 (−31.7, −20.4)	−11 (−17.2, −4.4)	−1.0 (−1.6, −0.4)
Zambia (1996, 2007)	7 (0.8)	24 (1.8)	−17 (−20.8, −14.2)	8 (1.0)	40 (2.0)	−31 (−35.1, −27.7)	−14 (−18.9, −8.9)	−0.9 (−1.3, −0.6)
Zimbabwe (1994, 2005/06)	13 (1.7)	44 (2.9)	−31 (−36.1, −25.3)	14 (1.6)	42 (1.8)	−29 (−32.8, −24.7)	2 (−4.7, 8.7)	0.2 (−0.4, 0.8)

Prevalence difference is the overweight prevalence in highest wealth quintile subtracted from that in lowest wealth quintile in each year, so that negative numbers for the prevalence difference indicate a higher overweight prevalence in the highest wealth quintile while positive numbers indicate higher overweight in the lowest wealth quintile.

Annualized difference in prevalence growth rate is change in prevalence over the survey period (last year minus first year) for the highest wealth quintile subtracted from that in the lowest wealth quintile divided by the number of years between the first and last survey years in each country. Negative numbers indicate faster overweight prevalence growth for the highest wealth quintile in comparison to the lowest, while positive numbers indicate faster overweight prevalence growth for the lowest quintile.

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Table 3

Overweight prevalence in least and most educated groups for first and last survey year in each country, overweight prevalence difference between least and most educated categories for first and last survey year†, and difference and annualized difference in overweight prevalence growth rates over the survey period between the least and most educated groups.

Country (First Year, Last Year)	First Year			Last Year				
	Prevalence in Least Educated Group (No Schooling) (SE)	Prevalence in Most Educated Group (≥Secondary School) (SE)	Prevalence Difference (90% CI)	Prevalence in Least Educated Group (No Schooling) (SE)	Prevalence in Most Educated Group (≥Secondary School) (SE)	Prevalence Difference (90% CI)	Difference in Overweight Prevalence Growth Rate	Annualized Difference in Overweight Prevalence Growth Rate
Armenia (2000, 2005)	38 (1.5)	40 (2.7)	−2 (−7.2, 3.0)	40 (1.8)	28 (3.4)	11 (5.9, 17.0)	14 (5.7, 21.4)	2.7 (1.1, 4.3)
Bangladesh (1996, 2007)	2 (0.3)	9 (1.3)	−8 (−9.9, −5.6)	5 (0.6)	16 (1.2)	−11 (−13.3, −9.4)	−4 (−6.6, −0.7)	−0.3 (−0.6, −0.1)
Benin (1996, 2006)	7 (0.6)	29 (5.0)	−22 (−30.2, −14.1)	13 (0.5)	31 (1.5)	−19 (−21.9, −16.3)	4 (−4.3, 12.6)	0.4 (−0.4, 1.3)
Bolivia (1994, 2003)	29 (3.3)	33 (1.9)	−4 (−10.2, 2.0)	46 (2.6)	47 (1.2)	−3 (−8.0, 1.5)	3 (−4.4, 10.9)	0.4 (−0.5, 1.2)
Burkina Faso (1992/93, 2003)	5 (0.4)	32 (3.5)	−26 (−32.2, −20.5)	6 (0.5)	34 (3.6)	−30 (−35.6, −23.8)	−2 (−9.7, 6.7)	−0.1 (−0.9, 0.6)
Cambodia (2000, 2005)	5 (0.8)	7 (1.4)	−1 (−3.7, 1.5)	8 (1.2)	12 (1.5)	−3 (−6.8, −0.1)	−2 (−6.7, 1.9)	−0.5 (−1.3, 0.4)
Cameroon (1998, 2004)	8 (1.6)	33 (2.6)	−25 (−30.2, −19.9)	10 (1.2)	39 (1.8)	−29 (−32.4, −25.6)	−4 (−10.2, 2.3)	−0.7 (−1.7, 0.4)
Chad (1996/97, 2004)	4 (0.4)	20 (2.9)	−16 (−21.3, −11.6)	6 (0.7)	24 (4.0)	−17 (−23.9, −10.7)	−1 (−8.8, 7.2)	1.7 (−0.5, 3.8)
Colombia (1995, 2005)	42 (4.2)	41 (1.2)	1 (−6.5, 8.0)	45 (2.5)	39 (0.8)	2 (−6.1, 10.2)	5 (−3.0, 13.6)	−0.1 (−1.1, 0.9)
Cote d'Ivoire (1994, 1998)	12 (1.0)	25 (3.6)	−13 (−19.1, −6.6)	17 (2.0)	23 (2.8)	−6 (−12.0, −0.1)	7 (−1.8, 15.4)	0.5 (−0.3, 1.4)
Dominican Republic (1991, 1996)	24 (4.7)	29 (2.0)	−4 (−12.5, 3.8)	35 (3.3)	39 (1.6)	−4 (−9.9, 1.9)	−0.4 (−9.8, 10.4)	0.1 (−2.0, 2.1)
Egypt, Arab Rep. (1992, 2008)	48 (1.9)	70 (2.1)	−22 (−26.4, −17.5)	70 (1.3)	78 (0.9)	−8 (−10.4, −5.7)	14 (8.9, 19.0)	1.1 (0.7, 1.5)
Ethiopia (2000, 2005)	2 (0.3)	12 (1.5)	−10 (−12.7, −7.7)	2 (0.4)	16 (3.0)	−14 (−18.5, −8.8)	−3 (−8.9, 2.0)	−0.7 (−1.8, 0.4)
Ghana (1993, 2003)	8 (1.2)	36 (4.8)	−29 (−36.6, −20.6)	14 (1.3)	33 (1.8)	−24 (−28.1, −20.8)	10 (1.1, 18.6)	1.0 (0.1, 1.9)
Guatemala (1995, 1998/99)	30 (1.3)	45 (2.7)	−16 (−20.5, −10.6)	37 (2.9)	58 (3.9)	−21 (−28.1, −13.6)	−5 (−13.7, 3.0)	−1.8 (−4.6, 1.0)
Guinea (1999, 2005)	10 (0.6)	28 (3.2)	−18 (−23.4, −12.6)	11 (0.9)	22 (2.9)	−11 (−15.7, −5.4)	7 (0.0, 14.9)	1.2 (0.0, 2.5)
Haiti (1994/95, 2005/06)	7 (1.1)	29 (2.5)	−22 (−26.6, −17.8)	16 (1.7)	30 (2.1)	−6 (−12.1, −0.7)	9 (2.4, 14.8)	0.8 (0.2, 1.3)
India (1998/99, 2005/06)	5 (0.2)	15 (0.5)	−9 (−10.0, −8.4)	5 (0.2)	17 (0.4)	−13 (−13.5, −12.1)	−4 (−4.6, −2.5)	−0.5 (−0.7, −0.4)
Jordan (1997, 2007)	68 (3.9)	60 (1.1)	8 (1.9, 14.8)	71 (4.8)	60 (1.6)	13 (6.6, 19.3)	2 (−8.4, 12.7)	0.2 (−0.8, 1.3)
Kazakhstan (1995, 1999)	32 (1.9)	34 (3.2)	−2 (−7.2, 3.9)	24 (2.0)	35 (5.1)	−10 (−18.9, −2.1)	−9 (−18.9, 1.3)	−2.2 (−4.7, 0.3)
Kenya (1993, 2003)	10 (1.4)	21 (1.9)	−10 (−13.8, −6.5)	11 (1.8)	33 (1.9)	−20 (−25.0, −15.7)	−12 (−17.6, − 6.1)	−1.2 (−1.8, −0.6)

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Country (First Year, Last Year)	First Year			Last Year			Difference in Overweight Prevalence Growth Rate	Annualized Difference in Overweight Prevalence Growth Rate
	Prevalence in Least Educated Group (No Schooling) (SE)	Prevalence in Most Educated Group (≥Secondary School) (SE)	Prevalence Difference (90% CI)	Prevalence in Least Educated Group (No Schooling) (SE)	Prevalence in Most Educated Group (≥Secondary School) (SE)	Prevalence Difference (90% CI)		
Madagascar (1997, 2003/04)	3 (0.8)	7 (1.2)	−3 (−5.7, −1.1)	3 (0.7)	13 (1.3)	−10 (−12.3, −7.3)	−6 (−9.7, −3.1)	−1.1 (−1.6, −0.5)
Malawi (1992, 2004)	8 (0.9)	36 (4.9)	−29 (−37.0, −20.6)	12 (0.9)	19 (1.6)	−9 (−11.5, −5.8)	22 (13.0, 30.5)	1.8 (1.1, 2.5)
Mali (1995/96, 2006)	7 (0.6)	32 (3.7)	−25 (−30.9, −19.0)	15 (0.8)	34 (2.4)	−22 (−25.8, −17.5)	6 (−1.2, 13.2)	0.5 (−0.1, 1.2)
Morocco (1992, 2003)	29 (1.5)	43 (3.4)	−14 (−19.9, −8.0)	38 (1.1)	43 (1.5)	−4 (−7.6, −1.3)	10 (2.7, 16.4)	0.9 (0.2, 1.5)
Mozambique (1997, 2003)	5 (1.1)	40 (6.1)	−35 (−45.2, −25.0)	8 (0.6)	28 (2.7)	−20 (−24.5, −15.5)	15 (4.0, 26.2)	2.5 (0.7, 4.4)
Namibia (1992, 2006/2007)	19 (2.4)	29 (1.9)	−10 (−14.2, −5.0)	22 (2.2)	31 (1.3)	−9 (−13.6, −5.4)	0 (−6.0, 6.3)	0.0 (−0.4, 0.4)
Nepal (1996, 2006)	1 (0.2)	5 (1.2)	−4 (−6.3, −2.2)	5 (0.6)	11 (1.3)	−9 (−10.8, −6.3)	−2 (−4.8, 1.0)	−0.2 (−0.5, 0.1)
Nicaragua (1997/98, 2001)	40 (1.4)	43 (1.2)	−3 (−5.8, 0.2)	45 (1.8)	51 (1.3)	−7 (−10.4, −3.1)	−4 (−8.7, 0.7)	−1.0 (−2.2, 0.2)
Niger (1992, 2006)	6 (0.6)	40 (4.2)	−34 (−40.5, −26.5)	11 (0.8)	43 (3.0)	−38 (−43.0, −32.9)	1 (−7.6, 9.8)	0.1 (−0.5, 0.7)
Nigeria (1999–2003)	22 (1.8)	27 (2.1)	−5 (−9.1, −0.4)	12 (1.2)	31 (2.6)	−18 (−23.1, −13.6)	−14 (−20.0, − 7.2)	−3.4 (−5.0, −1.8)
Peru (1992, 2000)	35 (2.5)	42 (1.1)	−6 (−10.9, −2.0)	38 (2.1)	52 (0.9)	−10 (−13.2, −6.1)	−7 (−12.5, − 1.1)	−0.8 (−1.6, −0.1)
Rwanda (2000, 2005)	11 (1.0)	30 (2.2)	−19 (−22.7, −14.6)	11 (1.3)	24 (2.4)	−13 (−16.9, −8.2)	6 (0.1, 12.1)	1.2 (0.0, 2.4)
Senegal (1992/93, 2005)	14 (0.8)	34 (3.8)	−20 (−25.9, −13.6)	20 (1.2)	33 (3.6)	−13 (−18.9, −6.3)	7 (−1.7, 16.0)	0.6 (−0.1, 1.2)
Tanzania (1992, 2004)	8 (0.9)	37 (5.1)	−29 (−36.9, −20.1)	13 (1.6)	33 (2.2)	−25 (−28.7, −20.8)	8 (−1.5, 17.3)	0.7 (−0.1, 1.4)
Turkey (1993, 2003)	49 (2.9)	45 (2.4)	4 (−2.2, 10.0)	61 (2.9)	46 (2.2)	11 (4.5, 16.8)	11 (2.6, 19.7)	1.1 (0.3, 2.0)
Uganda (1995, 2006)	5 (1.1)	17 (2.0)	−11 (−15.2, −7.7)	11 (2.2)	24 (3.1)	−16 (−21.1, −10.2)	−2 (−9.0, 5.8)	−0.1 (−0.8, 0.5)
Zambia (1992, 2007)	8 (1.2)	23 (1.9)	−15 (−18.4, −11.3)	8 (1.5)	26 (1.9)	−18 (−21.7, −13.8)	−3 (−8.2, 2.4)	−0.2 (−0.5, 0.2)
Zimbabwe(1994, 2005/06)	15 (2.7)	29 (2.1)	−14 (−19.6, −8.4)	21 (3.6)	28 (1.3)	−7 (−12.3, −2.4)	8 (0.0, 15.3)	0.7 (0.0, 1.4)

Prevalence difference is the overweight prevalence in highest education category (≥secondary school) subtracted from that in least educated group (no formal schooling completed) in each year, so that negative numbers for the prevalence difference indicate a higher overweight prevalence in the most educated education group while positive numbers indicate higher overweight in the lowest education category.

Annualized difference in prevalence growth rate is change in prevalence over the survey period (last year minus first year) for the most educated group subtracted from that in the least educated group divided by the number of years between the first and last survey years in each country. Negative numbers indicate faster overweight prevalence growth for the most educated group in comparison to the lowest, while positive numbers indicate faster overweight prevalence growth for the lowest group.

The least educated group consists of subjects who report no formal schooling completed, expect in Armenia and Kazakhstan where less than 1% of the population reported no formal schooling, so the lowest education group in these countries consists of subjects who report completing primary school only.

Int J Obes (Lond). Author manuscript; available in PMC 2012 December 06.