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Trends in overweight among women differ by occupational class: Results from 33 low and middle income countries in the period 1992–2009

Sandra Lopez-Arana, MPH, MSc[1], **Mauricio Avendano, PhD**[1,2,3], **Frank J van Lenthe, PhD**[1], and **Alex Burdorf, PhD**[1]

[1]Department of Public Health, Erasmus MC, Rotterdam, The Netherlands [2]London School of Economics and Political Science, LSE Health and Social Care, London, United Kingdom [3]Department of Social and Behavioral Sciences, Harvard School of Public Health, Boston, Massachusetts, United States of America

Abstract

Objective—There has been an increase in overweight among women in low- and middle-income countries, but whether these trends differ for women in different occupations is unknown. We examined trends by occupational class among women from 33 low- and middle-income countries in four regions.

Design—Cross-national study with repeated cross-sectional demographic health surveys (DHS).

Subjects—Height and weight were assessed at least twice between 1992 and 2009 in 248,925 women aged 25–49 years. Interviews were conducted to assess occupational class, age, place of residence, educational level, household wealth index, parity, and age at first birth and breastfeeding. We used logistic and linear regression analyses to assess the annual percent change (APC) in overweight (BMI > 25 kg/m^2) by occupational class.

Results—The prevalence of overweight ranged from 2.2% in Nepal in 1992–1997 to 75% in Egypt in 2004–2009. In all four regions, women working in agriculture had consistently lower prevalence of overweight, while women from professional, technical, managerial as well as clerical occupational classes had higher prevalence. Although the prevalence of overweight increased in all occupational classes in most regions, women working in agriculture and production experienced the largest increase in overweight over the study period, while women in higher occupational classes experienced smaller increases. To illustrate, overweight increased annually by 0.5% in Latin America and the Caribbean and by 0.7% in Sub-Saharan Africa among women from professional, technical, and managerial classes, as compared to 2.8% and 3.7%, respectively, among women in agriculture.

Conclusion—The prevalence of overweight has increased in most low and middle income countries, but women working in agriculture and production have experienced larger increases than women in higher occupational classes.

Contact Author Information: Address: Sandra Lopez-Arana, Department of Public Health, Erasmus MC, PO Box 2040, Rotterdam, the Netherlands s.lopezarana@erasmusmc.nl.

Conflict of interest
The authors declare no conflict of interest.

Keywords

overweight; occupation; labour force; developing countries

Introduction

In low and middle income countries, the prevalence of overweight (BMI >25 kg/m^2) among adults aged 20 years and older ranges from 18% to 59% in 2008, while the prevalence of obesity (BMI >30 kg/m^2) ranges from 7% to 24% in 2008 [1]. These cross-country differences are strongly clustered by region, with the prevalence of overweight ranging from 14% in South East Asia to 62% in the Americas[2]. Most low and middle income countries have experienced large and faster increases in overweight and obesity over the last decade[3, 4], paired with a decline in underweight [5, 6]. To some extent, these trends may be attributable to a shift towards more sedentary lifestyles and less healthy dietary habits as a result of rapid economic growth and industrialization[7, 8]. In addition, trends in overweight may also be the result of trends in labour force participation. For example, in most countries, there has been a decrease in the number of women working in the agricultural sector and an increase in women working in more sedentary occupations[9–11]. In addition, the nature of agriculture and production work has evolved towards less physically demanding and more sedentary routines[9]. Until now, no studies have examined how these changes have affected women working in different occupational sectors.

Understanding trends in overweight for women from different occupational groups may provide important insights into the nature of the obesity epidemic in low- and middle-income countries. During the second half of the 20th century, female labour force participation rates in many low- and middle-income countries rose sharply, while fertility rates dropped dramatically [12, 13]. On average, it is estimated that approximately 50% of women in low- and middle-income countries are currently in the labour force [14]. During recent decades, women in most countries have also experienced major changes in their occupation. For example, women working in agriculture have benefited from technological developments, which may have changed the level of physical activity for agricultural tasks[15]. This transition is likely to have pushed women into better paid jobs that may have enabled them to change their diet and increase their leisure time physical activity, while at the same time adopting more sedentary occupations. As a result of these changes, women from different occupations may have experienced different trends in overweight and obesity. In addition, cross-national differences in the pace of these changes [16] may have led to different patterns across countries.

Few studies have examined variations in overweight and obesity according to occupation in low and middle income countries. Existing studies have focused primarily on high-income countries, and suggested that the pattern of overweight and obesity by occupation differs by gender[17, 18]. Some studies found that women in professional, management, clerical, and service occupations have lower overweight prevalence and have experienced smaller increases in overweight than women in production and agriculture [19, 20]. However, whether this applies to women in low - and middle -income countries is uncertain. One study found that the prevalence of overweight is lower only among men in agricultural occupations compared with men in non-agricultural occupations, while there is no difference by occupation among women[21]. A comparative study in Asian countries found that the population in rural areas tends to be more physically active during work, but they are less active during leisure time [16]. This illustrates a lack of sufficient understanding of these trends and how they vary in women across countries.

In this study, we examine trends in overweight by occupational class among women in 33 low- and middle-income countries over the last two decades. We hypothesized that in low- and middle-income countries women in agricultural and manual occupations have lower risk of overweight as compared to women working in service and professional occupations. However, we expect a shift towards more rapid increases in overweight in agricultural and manual occupations. Our motivation for this hypothesis comes from previous evidence of more rapid declines in occupational physical activity associated with an increasing role of technology in the agricultural and production sectors [22].

Materials and Methods

Study population

Data were obtained from the Demographic Health Survey (DHS), a survey of nationally representative samples of women in reproductive ages (15–49 years) living in 33 middle- and low income countries interviewed between 1992 and 2009. Sampling was based on a stratified two-stage cluster design divided by residence areas (urban and rural), geographic or administrative regions within each country. Responses were high and ranged between 90% and 96%. The survey provides information on maternal and child health for women and their children < 5 years. In most countries, measurements were taken every 5 years starting in the early 1990s [23]. All DHS surveys were approved by the Opinion Research Corporation Company (ORC) Macro Institutional Review Board [23, 24], and informed consent was obtained from participants at time of interview. This study is based on the publicly available version of the data available online (http://www.measuredhs.com) with no identifiable information on survey participants.

We used data for 33 countries (Supplementary table 2). For analytical purposes we grouped the countries into four regions based on the World Bank classification by region: North Africa and West and Central Asia, South and Southeast Asia, Sub-Saharan Africa, and Latin America and the Caribbean [25]. These countries were selected because they had more than one survey and included information on height and weight from women aged between 15 and 49 years between 1992 and 2009. In most waves, weight and height were only measured in women who had had at least one child during the five years prior to the survey, so that results are generalizable to this population only. We restricted our sample to eligible non-pregnant women aged 25–49 year who had valid data for weight and height in all waves (n= 270,202). We excluded women who had biologically implausible values for height or weight (n= 5,732 observations), and women with missing data for relevant covariates (n=15,545). The final sample included 248,925 women.

Outcome measures—Anthropometric measures (height and weight) were taken as part of the survey using standardized procedures by trained personnel. Weight was measured using a solar powered scale (UNICEF electronic scale or Uniscale) with a precision of 0.1 kg. Height was measured using a wooden support board to place under the scale with a precision of 0.1 cm [26]. Body Mass Index (BMI) was defined as body weight in kilograms divided by the square of height in meters. The prevalence of obesity (≥ 30 kg/m^2) was very low (less than 5–10%) in many of the countries included in the study. We therefore focused on overweight (cut-off of ≥ 25 kg/m^2)[27], as a better indicator of changes in BMI trends and a relevant outcome from a prevention perspective [28].

Independent variables

Occupational classification: All respondents were asked whether they were currently in paid employment (yes or no), and women who reported being in the labour force were asked to describe their job, which was subsequently classified based on the one-digit occupational

codes from the International Standard Classification of Occupations (ISCO- 88) (http://www.ilo.org/public/english/bureau/stat/isco/index.htm) [29]. We collapsed codes into the following broad categories: 1) Managerial, professional, and technical, 2) clerical workers, 3) sale workers, 4) service (domestic and household/no domestic) workers, 5) production (skilled and unskilled) workers, 6) agricultural workers and 7) not working.

Covariates: Education was measured by asking respondents their highest level of education completed, and the highest year completed at that level. We created 5 categories: level 1 (no education), level 2 (incomplete primary), level 3 (complete primary), level 4 (secondary), and level 5 (post-secondary education).

Wealth was measured based on the DHS wealth index, which combines information on household assets such as televisions and bicycles, materials used for housing construction, water access and sanitation facilities. Each household asset was assigned a weight or factor score generated through principal component analysis (PCA) of assets. The resulting asset score was standardized and collapsed into quintiles as: 1) Lowest, 2) second, 3) middle, 4) fourth and 5) highest (http://www.measuredhs.com/topics/Wealth-Index.cfm) [30]. We incorporated age and urban/rural residence, parity, age at first birth, and duration of breastfeeding as potential confounders of the association between occupational class and overweight. In the majority of surveys parity was measured as total number of children ever born. We categorized this variable into three categories: One child, 2–3 children, and four or more children. Age at first birth was measured as a continuous variable in years. Months of breastfeeding was based on the most recent child born. About 56% of women reported that they were breastfeeding their last child at the time of interview, but they did not report for how many months. For these women, we assumed that they had started breastfeeding this child at the time of birth, and imputed duration of breastfeeding based on the current age of the child. We categorized values for all women into 0, 1–12, 13–24, and ≥ 25 months.

Statistical Analyses

We started by describing mean BMI and the proportion of overweight (BMI ≥ 25 kg/m^2) in each country by period and region. Logistic regression analysis was then used to assess the association between overweight and occupational class. These models did not always converge due to the high prevalence of overweight in several countries. Therefore, we used binary linear regression analysis models (or Poisson regression analysis if the latter failed to converge) to obtain prevalence ratios of overweight by occupational class [31]. All models controlled for age, residence, country, parity, age at first birth, breastfeeding, and year of interview. In subsequent models, we adjusted for educational level (model 2) and the household wealth index (model 3). Educational level was considered a potential confounder because it is typically completed prior to occupational achievement. In contrast, household wealth index was considered both a confounder and a potential mediator, as part of wealth is the result of occupational achievements. As expected, occupational class, educational level, and household wealth were correlated but correlations were relatively weak (Polychoric correlation coefficients between 0.27 and 0.34). We therefore placed particular emphasis on models that controlled for all covariates.

We conducted the analyses in the following steps. To provide an overall assessment of the association between occupational class and overweight, we first collapsed data across three time periods (1992–1997, 1998–2003 and 2004–2009) and presented odds ratios for each region. Subsequently, to assess trends in overweight, we incorporated year as a continuous variable in the logistic regression models. The coefficient for year in these models was interpreted as the Annual percent change (APC) in overweight. To assess whether trends differed by occupational class, we then incorporated a set of interaction terms between

occupational class and year and parameterised the model to obtain APC estimates for each occupational class in each region. In addition, we predicted probabilities of overweight for each year, occupational class, and region combinations based on these models.

Analyses were carried out using SAS 9.2 (SAS, Cary, NC, USA). Significance was considered at $p < 0.05$, and all analyses incorporated appropriate survey sample weights.

Results

Average age was around 32 years in most regions, except in South & Southeast Asia where it was 30.5 (table 1). The proportion of women who reported to be working was highest in Sub- Saharan Africa (75.4%), followed by Latin America and the Caribbean (63.0%), South and Southeast Asia (47.1%), and North Africa/West and Central Asia (22.2%). The distribution of occupational class differed across regions. A majority of women worked in agriculture, except in Latin America and Caribbean where there was also a large proportion of women working in services and sales. The distribution of education varied largely across countries. Around half of women in Sub-Saharan Africa and South/Southeast Asia had no education, this proportion was 30.8% in North Africa/West and Central Asia, and 16% in Latin America and the Caribbean. In total, 72.7% of women in Sub-Saharan Africa and 69.1% of women in South and Southeast Asia lived in rural areas as compared with 48.8% in North Africa/West and Central Asia and 46.6% in Latin America and the Caribbean.

Supplementary Table 1 shows trends in labour force participation and occupational distributions by region and period. Two patterns are noteworthy. First, labour force participation among women has not clearly increased in all regions. The proportion of women in the labour force in South and Southeast Asia decreased from 64.3% in 1992–97 to 46.2% in 2004–09, and from 24.3% to 19.7% in North Africa/West and Central Asia. In Sub-Saharan Africa, labour force participation increased marginally, while in Latin America there has been a large increase from 50.7% in 1992–97 to 79.6% in 2004–09. Second, the proportion of women working in agriculture has not changed in the same way in all regions. In South and Southeast Asia, the proportion of women working in agriculture declined from 52% in 1992–97 to 27.3% in 2004–09, while no consistent changes occurred in North Africa/West and Central Asia and Sub-Saharan Africa. In Latin America and the Caribbean, the proportion of women working in agriculture increased from 12.0 per cent in 1992–1997 to 18.9 per cent in 2004–2009.

The proportion of overweight ranged from 2.2% in Nepal to 75% in Egypt in the period 1992–2009 (figure 1). Overall, women in North Africa/West and Central Asia had the highest prevalence of overweight (73.7%) in the period 2004–2009, while women in South and Southeast Asia had the lowest prevalence (13.1%) in this period. In all regions the prevalence of overweight increased substantially. For example, in South/Southeast Asia it increased from 3.4% in 1992–1997 to 13.1% in 2004–2009, whereas in North Africa/West and Central Asia this increase ranged from 56.4% in 1992–1997 to 73.7% in 2004–2009. During the same period, the prevalence of underweight decreased in all regions, albeit at substantially slower pace than the increase in overweight. The prevalence of underweight changed in North Africa/West and Central Asia from 2.1% to 0.7% and in South and Southeast Asia from 30.7% to 24.6%.

Overweight prevalence increased most dramatically among women in North Africa/West in all occupational classes, and to a lesser extent in South/Southeast Asia, particularly among women working in professional, sales, services and production jobs (figure 2). Trends in Latin America and the Caribbean showed diverging patterns with increasing overweight trends among women working in agriculture, but less clear changes for women in other

occupational classes. In contrast, in Sub-Saharan Africa, the prevalence of overweight has remained rather stable at relatively lower levels than other regions in all occupational groups, except for modest increases in women working in Clerical, Sales and Production occupations.

In all regions, living in urban areas was associated with significantly higher risk of overweight as compared to living in rural areas (table 2). Having more children was generally associated with overweight, except in South & Southeast Asia where women with ≥4 children had the lowest risk. Age at first birth, education, wealth, and breastfeeding were associated with overweight, but associations differed across regions. Changes in breastfeeding patterns over time did not influence the observed trends in overweight, and do not explain occupational differences in trends. In South and Southeast Asia and Sub-Saharan Africa, women with lower education and wealth had considerable less overweight than women with higher education and wealth.

Table 3 shows odds ratios of the associations between overweight and occupational class. Controlling for basic demographics (model 1), in all regions, women working in agriculture had less often overweight than women working in other occupations, followed by women working in production. In contrast, women who worked in non-manual occupational classes tended to have the highest overweight prevalence. This association was substantially attenuated after controlling for education, but remained statistically significant in all regions except North Africa/West and Central Asia. The association was further attenuated but also remained significant after controlling for household wealth.

Figure 3 shows the annual percent change in the prevalence of overweight for each occupational class. In all regions, overweight has increased across most occupational classes. However, in Latin American and the Caribbean and Sub-Saharan Africa, increases in overweight have been significantly larger among women working in agriculture and production as well as women out of the labour force as compared to women working in professional, technical, managerial, and clerical occupations.

Discussion

Our results indicate that women working in agricultural occupations have a lower overweight prevalence than women working in higher occupational classes. However, there is a tendency towards larger increases in overweight in the agricultural group than among women working in services, clerical, and professional groups. The results point at the possible role of changes in industrialization, technology and the nature of agricultural work, and raise questions about the prevention strategies that may be required to prevent rising overweight and obesity trends among working women.

Comparisons with previous findings

To our knowledge, this is the first comparative study to assess trends in overweight by occupational class in a large number of low - and middle -income countries. Consistent with our results, previous studies in developing countries suggested that women classified as agricultural workers have a lower prevalence of overweight than non-agricultural workers[16, 21, 32, 33]. Some studies have found that agriculture activities have significantly higher energy expenditures and are associated with lower weight gain[32, 33]. One study in six countries in the Asian- Pacific region found that the lowest educated and wealthy populations had the highest levels of occupational physical activity and active commuting[16]. For example, farmers from Jamaica walk 60% more than their counterparts in urban areas [33]. Consistently, studies in developed countries suggest that jobs characterized by spending more than 50% of the working day sitting can increase weight gain

substantially[34, 35]. A study showed that sedentary employees often have an energy imbalance, characterized by increased levels of glucocorticoids such as insulin and cortisol, which may be a predisposing factor for abdominal obesity [36].

Previous studies suggest that overweight and obesity have increased more among women with lower education and occupational class[17, 18, 20]. Consistent with these findings, our results show that in Latin American and the Caribbean and Sub-Saharan Africa, women working in agriculture and production have had larger increases in overweight than women working in higher occupational classes. This pattern may partly be explained by a faster adoption of healthy behaviours such as greater intake of fruits and vegetables and increased leisure physical activity[17, 18, 20] among higher educated individuals.

Explanation of results

Our results show that overweight is higher among professionals and white collar occupations, while production and agricultural workers generally have lower overweight. In developing countries, agriculture is considered as a vulnerable employment characterized by low pay and strenuous working conditions [14]. In many countries women have less education and work experience than men, making them more vulnerable for less favorable forms of employment[15]. Women in agricultural occupations may enjoy less disposable income is for food consumption [37], which may paradoxically contribute to maintain relatively low levels of fat consumption and overweight. Furthermore, evidence suggests that working in agriculture, production, and other blue collar occupations involves more physical activity and energy expenditure than other jobs [35, 38, 39]. For example, a study reported that the average number of daily steps was significantly higher (8,757 steps per day) among blue collar workers than professionals and other white collar workers (2,835 steps per day) [39]. In addition, agriculture workers living in rural areas may have more access to fruits and vegetables, whole grains and non-hydrogenated fat than white-collar workers generally concentrated in urban areas[37].

Despite the general increase in overweight in most occupations, we found larger increases in overweight prevalence over time in production and agricultural groups. This pattern does not seem to be entirely explained by selective transition of agricultural workers into other occupations, as the proportion of women working in agriculture changed little over the study period in most regions. A possible explanation is that physical activity associated with agricultural work has declined due to industrialization and mechanization in the agricultural sector. Improvements in community infrastructure and technological changes are associated with declines in physical activity[22, 36, 40, 41]. For example, in China improvements in community infrastructures and services explained 40% of the decline in total physical activity among women[41]. Furthermore, a study showed that from the 1960s onwards India has experienced a major increase of modern farm machines such as tractors and pump sets, which have grown by a factor of 56 and 22 in the period 1962–2006, respectively. This mechanization of agriculture may partly explain the increasing prevalence of overweight and obesity among agricultural workers[22].

Why has overweight increased across all occupational classes in most regions? A possible explanation for the increase in overweight is that the prevalence of underweight has decreased. In sensitivity analyses, we found that parallel to increases in overweight, underweight prevalence has decreased, but the magnitude of this decrease is much smaller and does not account for the increase in overweight. In addition, most countries in Asia, Latin America, Northern Africa, Middle East and in urban areas in sub-Saharan Africa have experienced a shift in their dietary patterns. This includes a large increase in the consumption of fat and sugars[10, 40], paralleled by a decline in total cereal intake and fiber. For example, in India, the traditional coarse grains such as sorghum, millet, and corn, have

been replaced by simple carbohydrates such as rice, as they are easier to cook than other foods [22]. Furthermore, agriculture policies have increased food production and exports, which eventually have contributed to higher consumption of edible oil and animal foods such as red meat [4, 42]. To illustrate, in Egypt, average per capita consumption of protein from meat increased from 16.3 g/person/day in 1981 to 25.5g/person/day in 2000 [43]. These patterns are likely to have influenced dietary patterns of most women in low and middle income countries, although our study shows that the magnitude of these effects differ across occupations.

Limitations

To our knowledge, this is the first study to assess trends in overweight by occupational class in several low and middle income countries. However, several limitations should be considered. Although DHS surveys provide comparable data for many countries, our results are limited to women aged 25 to 49 who had recently had children, and are not generalizable to all women of reproductive age. However, among all women aged 25–49 in countries participating in DHS, the proportion having at least one fertile pregnancy ranged from 93.6 in the Central African Republic to 99% in Bolivia, suggesting that our results cover most women in this age range [44]. Similarly in our data 56% of women were breastfeeding and this might have a potential direct impact on women's weight. Nevertheless, in sensitivity analysis, we found that the pattern among women who were not breastfeeding (excluding the 56% who was breastfeeding at interview time) was almost identical to that for the entire sample. In addition, DHS is a repeated cross-sectional study, and it does not follow participants over time. Therefore, assessments of individual weight change and their associated determinants were not possible.

Some studies have reported a weaker association between BMI, percentage of body fat, and health risks in Asian countries as compared to other populations, suggesting that different cut-off points for overweight and obesity should be used in this region[45–47]. Nonetheless, we followed the WHO expert consultation that advises that BMI cut-off points of 25.0 kg/m^2 to 29.9 kg/m^2 for overweight and ≥ 30.0 kg/m^2 for obesity be used in international comparative studies including Asian countries [48]. BMI cut-off points in Asian populations have not been well defined and vary from 22 kg/m^2 to 25 kg/m^2 for overweight, 26 kg/m^2 to 31 kg/m^2 for obesity [48, 49]. Nevertheless, in a sensitivity analysis, we found that trends in overweight in the Asian region based on these cut-off points followed a very similar pattern as those described in our study.

Misclassification of educational level and occupational class is another potential source of bias. Individuals may report education differently across countries, and reclassification of national levels into an internationally comparable classification may not be accurate. Nevertheless, we used broad categories instead of very specific levels to diminish the potential bias associated with misclassification. Occupational class may also suffer from misreporting, and the same occupational category may be interpreted differently among women in different countries. Direct comparisons of estimates across regions and countries were therefore not possible. However, our study focused on generic patterns of prevalence and trends in overweight within countries across occupational classes, diminishing any bias introduced by cross-national differences in occupational classifications.

Conclusion

In conclusion, our study showed that women working in agricultural occupations have less often overweight than women working in higher occupational classes. The prevalence of overweight has increased in all regions, but women working in agriculture and production have experienced larger increases than women in higher occupational classes. These trends

may result from a combination of reduced physical activity at work due to changes in mechanisation and technology affecting women working in agriculture and production, together with changes in dietary habits that have affected women from all occupational classes. Findings highlight the need to target overweight and obesity prevention efforts towards women from all occupational classes. While women in higher occupations have a higher prevalence of overweight, the epidemic is rapidly extending towards women working in agricultural and production sectors. Overweight and obesity prevention efforts are therefore likely to benefit women from all occupational groups in low- and middle-income countries.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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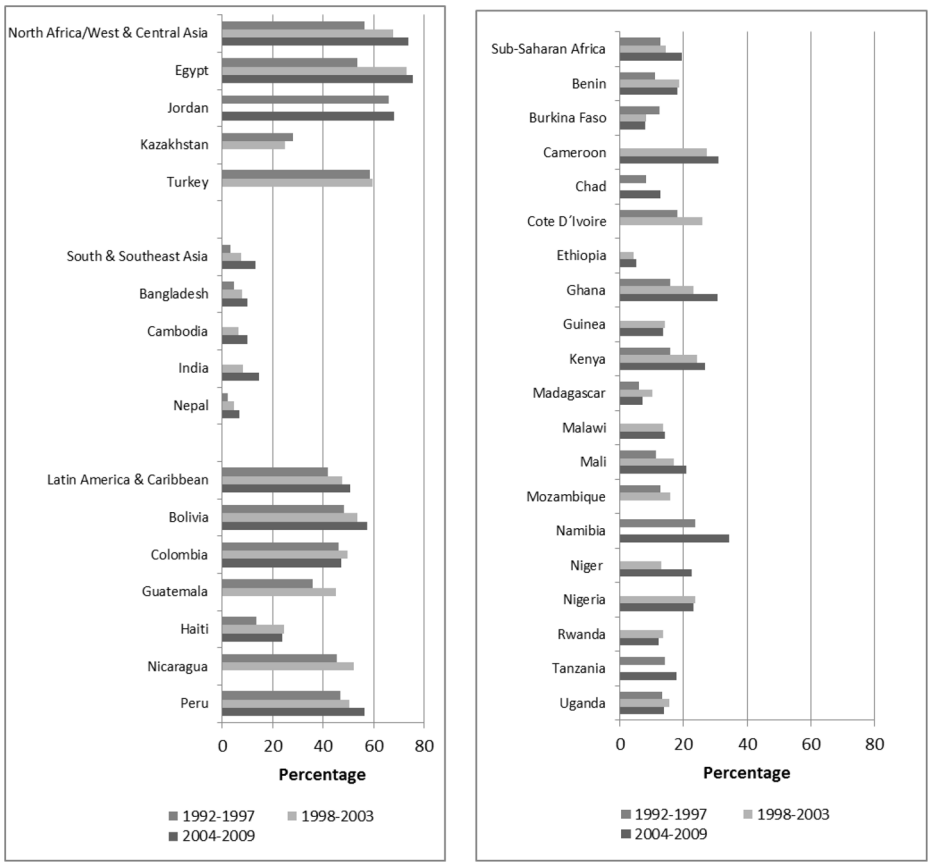

Figure 1.
Prevalence of overweight (BMI ≥ 25.0 kg/m^2) among women aged 25 – 49 years across 33 low and middle income countries participating in Demographic Health Survey (1992 – 2009).

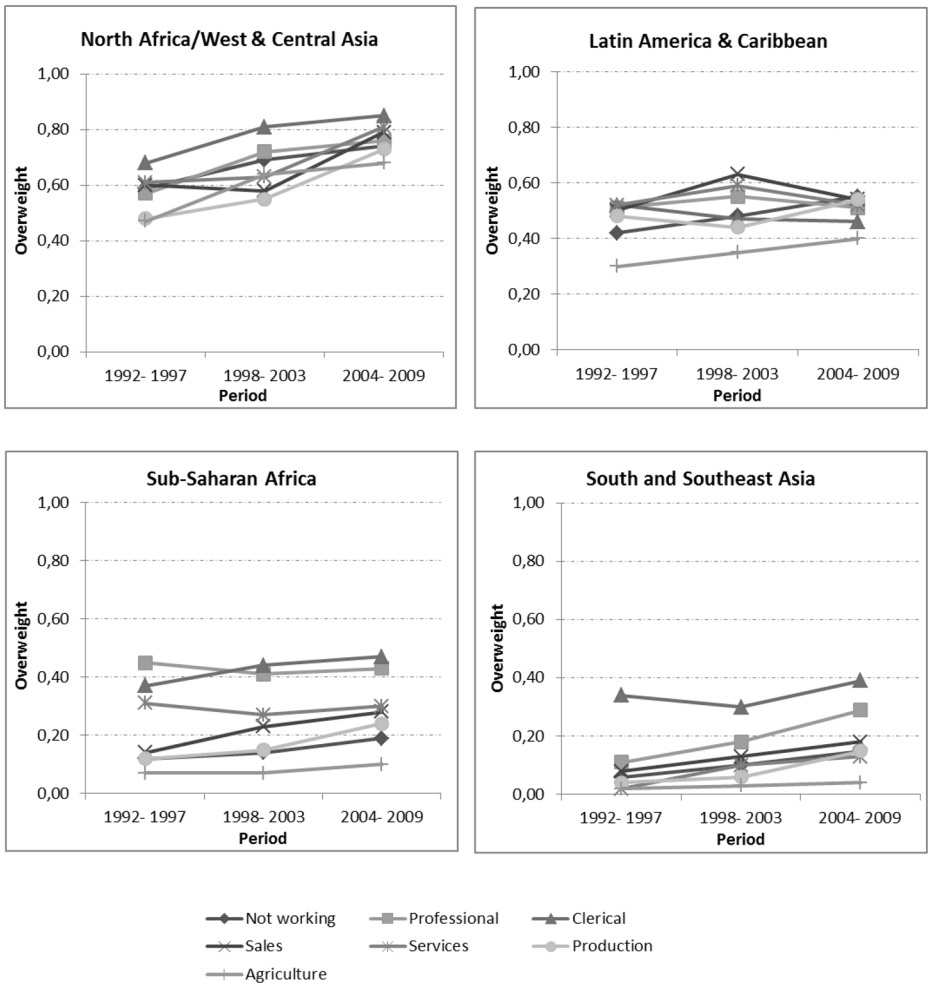

Figure 2. Trends in the prevalence of Overweight (BMI ≥25.0 kg/m^2) among women aged 25 – 49 years by occupational class and region across 33 low and middle income countries participating in Demographic Health Survey (1992 – 2009)

Variables included in the model: age, region, period, occupational class, interaction term region* time period *occupational class.

North Africa/West & Central Asia countries included (Egypt, Jordan, Kazakhstan, Turkey)

South & Southeast Asia countries included (Bangladesh, Cambodia, India, Nepal)

Sub-Saharan Africa countries included (Benin, Burkina Faso, Cameroon, Chad, Cote D'Ivoire, Ethiopia, Ghana, Guinea, Kenya, Madagascar, Malawi, Mali, Mozambique, Namibia, Niger, Nigeria, Rwanda, Tanzania, Uganda)

Latin America & Caribbean countries included (Bolivia, Colombia, Guatemala, Haiti, Nicaragua, Peru)

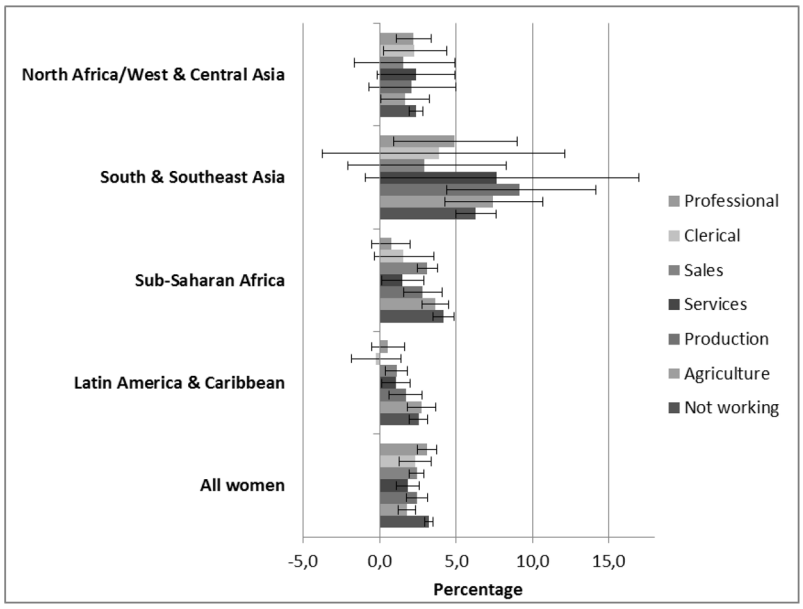

Figure 3. Annual percent change in the odds of overweight (BMI ≥25.0 kg/m^2) among women aged 25– 49 years by occupational class and region across 33 low and middle income countries participating in Demographic Health Survey (1992 – 2009)

Variables included in the model: age, household wealth, residence, country, educational level, parity, occupational class, age at first birth, months of breastfeeding, interaction term year of survey*occupational class.

North Africa/West & Central Asia countries included (Egypt, Jordan, Kazakhstan, Turkey)

South & Southeast Asia countries included (Bangladesh, Cambodia, India, Nepal)

Sub-Saharan Africa countries included (Benin, Burkina Faso, Cameroon, Chad, Cote D'Ivoire, Ethiopia, Ghana, Guinea, Kenya, Madagascar, Malawi, Mali, Mozambique, Namibia, Niger, Nigeria, Rwanda, Tanzania, Uganda)

Latin America & Caribbean countries included (Bolivia, Colombia, Guatemala, Haiti, Nicaragua, Peru)

Table 1

Characteristics of 248,925 women aged 25 – 49 years by region across 33 low and middle income countries participating in Demographic Health Survey in the period of 1992 to 2009.

	North Africa/West & Central Asia[1]	South & Asia[2] Southeast	Sub-Saharan Africa[3]	Latin America & Caribbean[4]
Characteristics	**n/mean (%/SD)**	**n/mean (%/SD)**	**n/mean (%/SD)**	**n/mean (%/SD)**
Age (years)				
Age at first birth	32.00 (5.3)	30.53 (4.9)	32.61 (5.9)	32.71 (5.7)
Currently employed	21.63 (4.2)	20.63 (4.1)	19.48 (3.9)	20.96 (4.5)
No	20,058 (77.8)	28,401 (52.9)	28,401 (24.6)	21,798 (37.0)
Yes	5720 (22.2)	22,864 (47.1)	87,224 (75.4)	37,192 (63.0)
Occupational class				
Professional. technical & managerial	2381 (9.2)	1391 (2.9)	2997 (2.6)	4241 (7.2)
Clerical	774 (3.0)	326 (0.7)	924 (0.8)	1810 (3.1)
Sales	310 (1.2)	1469 (3.0)	24,340 (21.1)	9576 (16.2)
Services	396 (1.5)	1245 (2.6)	2979 (2.6)	6214 (10.5)
Production	490 (1.9)	3254 (6.7)	8293 (7.2)	5987 (10.2)
Agriculture	1369 (5.3)	15,179 (31.3)	47,691 (41.3)	9364 (15.9)
Not working	20,058 (77.8)	25,668 (52.9)	28,401 (24.6)	21,798 (37.0)
Education				
No education	7935 (30.8)	23,006 (47.4)	63,514 (54.9)	9696 (16.4)
Incomplete primary	2721 (10.6)	6166 (12.7)	24,224 (21.0)	17,990 (30.5)
Primary	5628 (21.8)	12,320 (25.4)	21,672 (18.7)	15,776 (26.7)
Secondary	6258 (24.3)	2534 (5.2)	4030 (3.5)	8091 (13.7)
Higher	3236 (12.6)	4506 (9.3)	2185 (1.9)	7437 (12.6)
Wealth Index				
Lowest	5825 (22.6)	9433 (19.4)	24,944 (21.6)	14,861 (25.2)
Second	5081 (19.7)	8709 (17.9)	23,035 (19.9)	13,881 (23.5)
Middle	5084 (19.7)	8988 (18.5)	22,436 (19.4)	12,369 (21.0)
Fourth	5000 (19.4)	9876 (20.4)	22,091 (19.1)	10,202 (17.3)
Highest	4788 (18.6)	11,526 (23.8)	23,119 (20.0)	7677 (13.0)
Residence				
Urban	13,197 (51.2)	14,999 (30.9)	31,598 (27.3)	31,488 (53.4)
Rural	12,581 (48.8)	33,533 (69.1)	84,027 (72.7)	27,502 (46.6)
Parity (number of live births)	4.06 (2.4)	3.73 (2.1)	5.11 (2.6)	4.14 (2.6)
Breastfeeding (number of months)	13.22 (8.7)	17.76 (12.3)	14.68 (9.4)	13.56 (9.5)

[1] **North Africa/West & Central Asia countries included** (Egypt, Jordan, Kazakhstan, Turkey)

[2] **South & Southeast Asia countries included** (Bangladesh, Cambodia, India, Nepal)

[3] **Sub-Saharan Africa countries included** (Benin, Burkina Faso, Cameroon, Chad, Cote D'Ivoire, Ethiopia, Ghana, Guinea, Kenya, Madagascar, Malawi, Mali, Mozambique, Namibia, Niger, Nigeria, Rwanda, Tanzania, Uganda)

[4] **Latin America & Caribbean countries included** (Bolivia, Colombia, Guatemala, Haiti, Nicaragua, Peru)

Table 2

Odds ratio estimates of the association of overweight (BMI ≥ 25.0 kg/m^2) with age, residence, parity, age at first birth, breastfeeding, education and wealth among women aged 25 – 49 years by region across 33 low and middle income countries participating in Demographic Health Survey (1992 – 2009).

Models	North Africa/West & Central Asia[1] OR* (95% CI)	South & Southeast Asia[2] OR* (95% CI)	Sub-Saharan Africa[3] OR* (95% CI)	Latin America & Caribbean[4] OR* (95% CI)
Age	1.07 (1.07– 1.08)	1.06 (1.05– 1.07)	1.04 (1.04– 1.04)	1.05 (1.04– 1.05)
Residence				
Urban	1.48 (1.39– 1.58)	2.90 (2.69– 3.12)	3.00 (2.90– 3.12)	1.85 (1.78– 1.93)
Rural	Reference			
Parity				
1 child	Reference			
2–3 Children	1.14 (1.03– 1.25)	1.03 (0.93– 1.14)	1.21 (1.12– 1.31)	1.39 (1.31– 1.47)
> 4 Children	1.09 (0.98– 1.22)	0.62 (0.55– 0.71)	1.25 (1.16– 1.36)	1.34 (1.25– 1.43)
Age at first birth	0.99 (0.98– 0.99)	1.02 (1.01– 1.02)	0.98 (0.98– 0.98)	0.96 (0.96– 0.97)
Breastfeeding				
Never breastfeeding	1.03 (0.92– 1.16)	1.56 (1.33– 1.82)	1.23 (1.13– 1.33)	1.33 (1.22– 1.44)
1– 12 months	0.93 (0.88– 0.99)	1.05 (0.97– 1.14)	1.10 (1.06– 1.14)	1.11 (1.07– 1.15)
13– 24 months**	Reference			
> 25 months	0.86 (0.76– 0.98)	1.01 (0.92– 1.11)	0.83 (0.78– 0.89)	1.23 (1.16– 1.31)
Education				
No education	0.87 (0.79– 0.96)	0.13 (0.12– 0.15)	0.20 (0.18– 0.22)	0.63 (0.59– 0.68)
Incomplete Primary	1.13 (1.01– 1.27)	0.25 (0.22– 0.29)	0.31 (0.28– 0.34)	1.06 (1.00– 1.13)
Primary	1.23 (1.12– 1.35)	0.49 (0.45– 0.54)	0.52 (0.47– 0.55)	1.25 (1.18– 1.32)
Secondary	1.28 (1.17– 1.41)	0.84 (0.74– 0.97)	0.74 (0.66– 0.83)	1.20 (1.13– 1.28)
Higher	Reference			
Wealth				
Lowest	0.31 (0.29– 0.35)	0.10 (0.08– 0.12)	0.29 (0.27– 0.31)	0.48 (0.45– 0.52)
Second	0.50 (0.45– 0.55)	0.15 (0.13– 0.17)	0.34 (0.32– 0.37)	0.67 (0.63– 0.72)
Middle	0.62 (0.56– 0.68)	0.27 (0.24– 0.31)	0.47 (0.44– 0.50)	0.82 (0.78– 0.87)
Fourth	0.84 (0.76– 0.92)	0.47 (0.42– 0.51)	0.62 (0.59– 0.65)	0.96 (0.91– 1.02)
Highest	Reference			

*All models were adjusted for age, residence, educational level and time period.

**Since most women were breastfeeding between 13 to 24 months, this category was selected as reference in order to obtain precise estimates in the model.

[1]**North Africa/West & Central Asia countries included** (Egypt, Jordan, Kazakhstan, Turkey)

[2]**South & Southeast Asia countries included** (Bangladesh, Cambodia, India, Nepal)

[3]**Sub-Saharan Africa countries included** (Benin, Burkina Faso, Cameroon, Chad, Cote D'Ivoire, Ethiopia, Ghana, Guinea, Kenya, Madagascar, Malawi, Mali, Mozambique, Namibia, Niger, Nigeria, Rwanda, Tanzania, Uganda)

[4]**Latin America & Caribbean countries included** (Bolivia, Colombia, Guatemala, Haiti, Nicaragua, Peru)

Table 3

Odds ratios estimates of the association of overweight (BMI ≥ 25.0 kg/m^2) with occupational classes among women aged 25 – 49 years by region across 33 low and middle income countries participating in Demographic Health Survey (1992– 2009).

Model	North Africa/West & Central Asia[1]. OR (95%CI)	South & Southeast Asia[2]. OR (95%CI)	Sub-Saharan Africa[3]. OR (95%CI)	Latin America & Caribbean[4]. OR (95%CI)
Model 1				
Professional, technical & managerial	1.10 (0.94– 1.29)	4.21 (3.46– 5.11)	3.65 (3.34– 3.99)	1.54 (1.41– 1.68)
Clerical	1.44 (1.15– 1.79)	6.22 (4.44– 8.73)	3.26 (2.82– 3.78)	1.26 (1.13– 1.41)
Sales	1.26 (0.97– 1.64)	3.37 (2.76– 4.12)	2.15 (2.04– 2.26)	1.83 (1.71– 1.97)
Services	1.24 (0.96– 1.61)	2.47 (1.97– 3.09)	2.20 (1.99– 2.43)	1.61 (1.49– 1.74)
Production	0.94 (0.75– 1.18)	1.75 (1.46– 2.10)	1.60 (1.49– 1.71)	1.59 (1.47– 1.72)
Not working	0.84 (0.65– 1.07)	3.81 (3.05– 4.76)	1.63 (1.47– 1.82)	1.66 (1.53– 1.80)
Agriculture	Reference			
Model 2				
Professional, technical & managerial	0.99 (0.84– 1.17)	2.10 (1.71– 2.58)	2.18 (1.98– 2.13)	1.66 (1.51– 1.83)
Clerical	1.11 (0.89– 1.40)	3.56 (2.52– 5.01)	2.06 (1.77– 2.39)	1.33 (1.19– 1.50)
Sales	1.23 (0.94– 1.61)	2.83 (2.31– 3.46)	2.03 (1.93– 2.13)	1.82 (1.70– 1.96)
Services	1.15 (0.89– 1.49)	2.32 (1.85– 2.91)	1.90 (1.72– 2.10)	1.59 (1.47– 1.72)
Production	0.88 (0.70– 1.11)	1.66 (1.38– 1.99)	1.49 (1.39– 1.60)	1.58 (1.46– 1.70)
Not working	0.77 (0.61– 0.99)	3.01 (2.40– 3.78)	1.56 (1.40– 1.74)	1.67 (1.54– 1.81)
Agriculture	Reference			
Model 3				
Professional, technical & managerial	0.84 (0.71– 1.00)	1.50 (1.22– 1.84)	1.75 (1.58– 1.94)	1.50 (1.36– 1.65)
Clerical	0.95 (0.75– 1.19)	2.47 (1.75– 3.48)	1.58 (1.36– 1.84)	1.14 (1.02– 1.29)
Sales	1.13 (0.87– 1.48)	1.94 (1.58– 2.39)	1.62 (1.54– 1.71)	1.67 (1.55– 1.79)
Services	1.06 (0.82– 1.37)	1.75 (1.39– 2.20)	1.47 (1.33– 1.63)	1.51 (1.40– 1.64)
Production	0.80 (0.64– 1.00)	1.33 (1.11– 1.61)	1.23 (1.15– 1.32)	1.44 (1.33– 1.56)
Not working	0.69 (0.54– 0.88)	2.06 (1.64– 2.60)	1.29 (1.16– 1.44)	1.54 (1.42– 1.67)
Agriculture	Reference			

Variables included in the model 1: age, residence, country, parity, age at first birth, breastfeeding, time period, occupational class.

Variables included in the model 2: variables of model 1 + educational level.

Variables included in the model 3: variables of model 2 + household wealth.

[1] **North Africa/West & Central Asia countries included** (Egypt, Jordan, Kazakhstan, Turkey)

[2] **South & Southeast Asia countries included** (Bangladesh, Cambodia, India, Nepal)

[3] **Sub-Saharan Africa countries included** (Benin, Burkina Faso, Cameroon, Chad, Cote D'Ivoire, Ethiopia, Ghana, Guinea, Kenya, Madagascar, Malawi, Mali, Mozambique, Namibia, Niger, Nigeria, Rwanda, Tanzania, Uganda)

[4] **Latin America & Caribbean countries included** (Bolivia, Colombia, Guatemala, Haiti, Nicaragua, Peru)