

Socioeconomic status and obesity in adult populations of developing countries: a review

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Abstract A landmark review of studies published prior to 1989 on socioeconomic status (SES) and obesity supported the view that obesity in the developing world would be essentially a disease of the socioeconomic elite. The present review, on studies conducted in adult populations from developing countries, published between 1989 and 2003, shows a different scenario for the relationship between SES and obesity. Although more studies are necessary to clarify the exact nature of this relationship, particularly among men, three main conclusions emerge from the studies reviewed: 1. Obesity in the developing world can no longer be considered solely a disease of groups with higher SES. 2. The burden of obesity in each developing country tends to shift towards the groups with lower SES as the country's gross national product (GNP) increases. 3. The shift of obesity towards women with low SES apparently occurs at an earlier stage of economic development than it does for men. The crossover to higher rates of obesity among women of low SES is found at a GNP per capita of about US\$ 2500, the mid-point value for lower-middle-income economies. The results of this review reinforce the urgent need to: include obesity prevention as a relevant topic on the public health agenda in developing countries; improve the access of all social classes in these countries to reliable information on the determinants and consequences of obesity; and design and implement consistent public actions on the physical, economic, and sociocultural environment that make healthier choices concerning diet and physical activity feasible for all. A significant step in this direction was taken with the approval of the Global Strategy on Diet, Physical Activity and Health by the World Health Assembly in May 2004.

Keywords Obesity/epidemiology; Body mass index; Socioeconomic factors; Social class; Sex factors; Economic development; Men; Women; Adult; Review literature; Developing countries (*source: MeSH, NLM*).

Mots clés Obésité/épidémiologie; Indice masse corporelle; Facteur socio-économique; Classe sociale; Facteur sexuel; Développement économique; Hommes; Femmes; Adulte; Revue de la littérature; Pays en développement (*source: MeSH, INSERM*).

Palabras clave Obesidad/epidemiología; Índice de masa corporal; Factores socioeconómicos; Clase social; Factores sexuales; Desarrollo económico; Hombres; Mujeres; Adulto; Literatura de revisión; Países en desarrollo (*fuente: DeCS, BIREME*).

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Voir page 944 le résumé en français. En la página 944 figura un resumen en español.

Introduction

An exhaustive review of studies published prior to 1989 that provided information on socioeconomic status (SES) and obesity (1) concluded that high SES showed a consistent positive relationship to obesity in societies in developing countries. This landmark review identified strong positive relationships between SES and obesity among men, women and children in nearly 90% of the studies conducted in developing societies, and none of these studies showed an inverse relationship. These findings have supported the view that obesity in the developing world, in contrast to the situation described for the developed countries, would be a disease of the groups with higher SES

(2, 3). This view has recently been disputed by expert committees and international public health organizations (4, 5), although, to our knowledge there has been no attempt to review the literature on SES and obesity in the developing world after 1989 — the objective of the present review.

There are several reasons why an update of the association between SES and obesity in the developing countries is relevant. Firstly, obesity is increasing worldwide (4) and there is evidence that this increase has been faster among the developing countries (6). In at least one developing country (Brazil), there is abundant documentation that obesity is increasing faster among the groups with lower SES (7–10). Secondly, in addition to being a disease in its own right, obesity substantially

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increases the risk of several fatal and non-fatal, but highly debilitating, noncommunicable diseases, particularly cardiovascular diseases, non-insulin dependent diabetes mellitus, endocrine and metabolic disturbances, sleep apnoea, osteoarthritis, certain types of cancer and several psychological problems (4). According to WHO, obesity ranks fifth and seventeenth in the list of the leading risk factors underlying the total burden of disease of the low-mortality and the high-mortality developing countries, respectively (11). In most parts of Latin America, obesity is already the second most important risk factor for mortality and disease (11). Thirdly, understanding social disparities in health status is presently an important topic on the international health agenda and an essential element in establishing public health priorities (12, 13).

Search strategy

Our search strategy aimed to identify studies that presented estimates of obesity prevalence, stratified by some indicator of SES in adult male and female populations from developing countries. We did not consider studies on children and adolescents because of the difficulties in assessing obesity status in these groups. We adopted the income definition of developing countries used by The World Bank that includes all countries having an annual gross national product (GNP) per capita equivalent to US\$ 9075 or less; these countries include low-income countries (GNP per capita up to US\$ 735), lower-middle-income countries (GNP per capita from US\$ 736 to 2935) and upper-middle-income countries (GNP per capita from US\$ 2936 to 9075) (14).

We restricted our search to articles and reports on SES and obesity published from January 1989 to June 2004; therefore, only articles published after the above-mentioned exhaustive review (1) were included in our review. We made our search using the MEDLINE database (via the PubMed web site), together with our own library of reports and articles on SES and obesity in developing countries. In the MEDLINE search, we applied SES, social class, education, occupation and income as *exposure search terms*, and obesity, overweight and body mass index (BMI) as *outcomes search terms*. We also included "survey" as an additional *obligatory term*, with the aim of restricting the search to population-based studies.

From this initial search, we identified over 700 articles. The titles and abstracts of these articles were then reviewed to screen for publications that potentially addressed obesity by SES in adult populations in developing countries. At this point, we excluded:

- studies in developed countries (most exclusions were in this category);
- studies conducted in developing countries that were restricted to users of health services, small towns or marginal social segments of the general population (e.g. college students or people living in slums); and
- studies restricted to child and adolescent populations.

After this screening, we identified 45 articles that potentially fitted our selection criteria. After a subsequent screening of the full texts of these 45 articles, we confirmed that 11 fulfilled our selection criteria. At this stage of the search, we mainly excluded articles that did not report obesity stratified by SES, those that reported only average BMI by SES, or those that presented figures for the prevalence of obesity for the two sexes combined.

The authors' own libraries on SES and obesity in developing countries provided four additional publications (reports and articles not indexed in MEDLINE) that also fulfilled the selection criteria. This resulted in 15 publications that fitted the inclusion criteria for the review study. Thirteen of the publications described results from single-country studies on both men and women and two publications described results from multi-country studies on women of reproductive age. The review of the relationship between SES and obesity found by these studies is presented first for the single-country studies on men and women, and then for the multi-country studies (restricted to women of reproductive age).

Results

Single-country studies on men and women

Table 1 summarizes the characteristics and results of 14 studies conducted between 1982 and 2002 on SES and obesity in male and female populations of developing countries (two of the studies were described in the same publication). Seven studies reported on nationwide surveys, whereas the others described findings from surveys that covered major regions or cities in the countries being studied. The countries surveyed included several transitional middle-income countries, but most were of lower-middle-income economies; only two were conducted in low-income economies (the studies in China and India) and two in upper-middle-income economies (the study in the south-eastern region of Brazil and the 1997 study in Chile). The figures for GNP shown in Table 1 refer to the year of the survey and the sources for them were The World Bank, or the study publication in the case of the Brazilian regional studies. In the case of Cuba, classified in the category of lower-middle-income economy by The World Bank, we adopted the mid-point GNP for this category. The sample size in the studies ranged from 535 (men in Albania) to 19 750 (women in Cuba). All studies used BMI to assess obesity status and most employed the BMI cut-off point of 30 kg/m² for obesity. For China a cut-off point of 25 kg/m² was used for men and women and for Chile a cut-off point of 27.3 kg/m² was used for women and 27.8 kg/m² was used for men (22, 23). Weight and height were measured directly using standard techniques in all studies, except for the study in Lithuania, where weight and height were self-reported. Socioeconomic status was measured using levels of education in eight studies, levels of income in three studies, and composite indices in three studies.

The pattern of association between SES and obesity found in the 14 studies differed substantially according to gender. Among men, the studies pointed either to a statistically significant positive association (7 studies) or the absence of an association (7 studies). Among women, most studies (10 of 14) revealed a statistically significant inverse association, two studies pointed to lack of an association, and the other two studies showed a statistically significant positive association between SES and obesity.

With the aim of exploring the relationship between the SES-obesity association and the level of economic development of the populations studied we regressed the relative risks of obesity in the lower SES group (using the higher SES group as reference) on the estimated GNP per capita of the country/setting where and when the study was conducted. To take into account the fact that in four studies the surveys were restricted to urban settings (see Table 1) — where the level of economic development tends to be higher than for the country

Table 1. Patterns of association between socioeconomic status and obesity in male and female populations from developing countries (1982–2002)

Country	Survey year	GNP ^a per capita (US\$)	Study setting	SES ^b indicator	Age range (years)	Sample size		Overall obesity prevalence (%) ^c		Association of SES with obesity		Source (Ref. no.)
						men	women	men	women	men	women	
Cuba	1982	1833	National	education	20–59	11 912	19 750	5.1	12.2	positive	inverse	15
Chile	1986–87	1570	Santiago city	composite	≥ 15	475	728	13.3	22.9	none	inverse	16
Brazil	1989	2600	National	income	≥ 18	16 783	17 168	4.6	10.3	positive	positive	17
India	1989–90	390	Bombay city	income	≥ 15	791	791	4.8	7.8	none	none	18
Samoa	1991	1010	National	education	25–74	797	989	48.7	68.0	positive	positive	19
Lithuania	1994–2002	2650	National	education	20–64	4337	5440	16.2	16.0	none	inverse	20
Brazil	1996–97	1728	North-eastern region	education	≥ 20	1971	2588	4.4	12.6	positive	inverse	21
Brazil	1996–97	4913	South-eastern region	education	≥ 20	2289	2549	8.4	12.0	none	inverse	21
Chile	1997	4970	Valparaiso city	composite	24–64	1020	2100	15.7	23.1	none	inverse	22
China	1997	710	Eight provinces	education	18–49	2796	2936	15.3	17.1	positive	inverse	23
South Africa	1998	3330	National	education	≥ 15	5671	8156	9.1	29.3	positive	inverse	24
Peru	1998–2000	2090	Six cities	composite	≥ 18	1163	1159	16.0	22.7	none	inverse	25
Russian Federation	2000	1690	National	income	19–55	4503	4503	10.3	21.7	positive	none	26
Albania	2001	1340	Tirana city	education	≥ 25	535	585	22.8	35.6	none	inverse	27

^a GNP = gross national product.

^b SES = socioeconomic status.

^c Body mass index ≥ 30 kg/m² except for the studies in China (≥ 25 kg/m² for both men and women) and Santiago, Chile (≥ 27.3 kg/m² for women and ≥ 27.8 kg/m² for men).

as a whole — we arbitrarily increased the national figures for GNP per capita for these cases by 50%. The results from the regression analyses conducted separately for men and women are presented in Fig. 1. There is an indication that as GNP increases, individuals from the lower SES groups tend to lose their relative protection against obesity (males) or to accentuate their relatively higher exposure to the disease (females). We made a sensitivity analysis of the GNP conversion used when we had data only for urban areas and found that increasing GNP per capita by 30% or 70% for residents of urban settings rather than by 50% (as mentioned above) did not alter the effect of GNP on the association between SES and obesity.

Multi-country studies on women of reproductive age

The first multi-country study on women of reproductive age (28) analysed data sets from 38 surveys conducted between 1987 and 1996 in national samples of non-pregnant women aged 15–49 years from 32 developing countries (six countries had conducted two surveys). Most data sets were obtained from the Demographic Health Surveys (DHS), in which women of childbearing age were interviewed and measured using standard survey instruments. Data sets covered five developing regions

(Central Eastern Europe, Latin America and the Caribbean, Middle-East and North Africa, South Asia and sub-Saharan Africa). Twenty-two studies were conducted on low-income economies, 15 on lower-middle-income economies, and only one looked at an upper-middle-income economy (Brazil in 1996). Sample size ranged from 773 to 10 747 women, with most studies involving 2000 to 5000 women. The overall prevalence of obesity (BMI ≥ 30 kg/m²) ranged from 0.1% (Nepal in 1996) to 23.5% (Egypt in 1995–96). This study used two categories of education as markers of SES: namely, none, or primary education; and secondary education, or higher.

After adjustment for age, the authors of this study identified a lower risk of obesity among the groups with low SES in 24 surveys, no statistically significant differences in 11 surveys, and a higher risk of obesity among the groups with low SES in three surveys. They also noted that the relative protection against obesity among women of low SES was attenuated with rising national incomes.

The second multi-country study on women of reproductive age (29) analysed data sets from 37 surveys conducted between 1992 and 2000 in national samples of non-pregnant women aged 20–49 years from 37 developing countries. This study considered only one data set per country (the most recent

survey available): 18 data sets came from surveys conducted from 1992 to 1996 that had already been included in the previous multi-country study (28) and 19 newer data sets came from surveys conducted between 1997 and 2000. The data sets used in this study covered seven developing regions (Central Eastern Europe, Latin America and the Caribbean, Middle-East and North Africa, South Asia, South-east Asia, East Asia and sub-Saharan Africa) with 22 surveys from low-income countries, 11 from lower-middle-income countries and four from upper-middle-income countries. Sample size ranged from 1460 to 21 171 with most studies involving 2000 to 5000 women. The overall prevalence of obesity (BMI ≥ 30 kg/m²) ranged from 0.7 (Madagascar) to 34.2% (Jordan). This study employed a country-specific SES indicator represented by the quartiles of the women's years of schooling calculated from each survey.

After comparing the age-adjusted prevalence of obesity in extreme SES groups (the 25% least-educated and the 25% most-educated women in each country), the authors of this second multi-country study found a lower risk of obesity among the lower SES groups in 26 countries, no statistically significant differences in three countries and a higher risk of obesity among the lower SES groups in eight countries. Obesity was significantly more common among women of higher SES in all low-income economies and more common among women of lower SES in all upper-middle-income economies. In the lower-middle-income economies, the picture was mixed: in seven countries, obesity was more common in the members of the higher SES groups; in three countries there were no statistically significant differences; and in two countries obesity was more common in members of the lower SES groups.

Fig. 2 summarizes the association found by this study between quartiles of education and obesity across low-income, lower-middle-income and upper-middle-income economies. The analysis of these associations indicated that the country's level of economic development was indeed a statistically significant modifier of the effect of SES on obesity. Furthermore, a logistic model, which included women's SES, the country's GNP per capita, and an interaction term between SES and GNP as explanatory variables, indicated that the probability of obesity in the members of the group with lower SES exceeded the same probability in the group with higher SES at a GNP value of approximately US\$ 2500 per capita.

Discussion

The review of findings from studies on SES and obesity in adult populations of developing countries published from 1989 to 2003 shows a different scenario from that previously presented (1). Although more studies are necessary to clarify the exact relationship between SES and obesity, particularly among men, three main conclusions may be drawn from the studies reviewed here.

- Obesity in the developing world can no longer be considered solely a disease of groups of higher SES.
- The burden of obesity in a particular developing country tends to shift towards the groups of lower SES as that country's GNP increases.
- The shift of obesity towards the poor apparently occurs at earlier stages of the economic development among women than among men, and for women, inequities in health determined by obesity are expected once GNP per capita reaches about US\$ 2500 — the mid-point value for lower-middle-income economies.

Fig. 1. Relative risk (RR) of obesity among men and women of lower socioeconomic status (SES) regressed on the gross national product (GNP) per capita in developing societies (1982–2002)

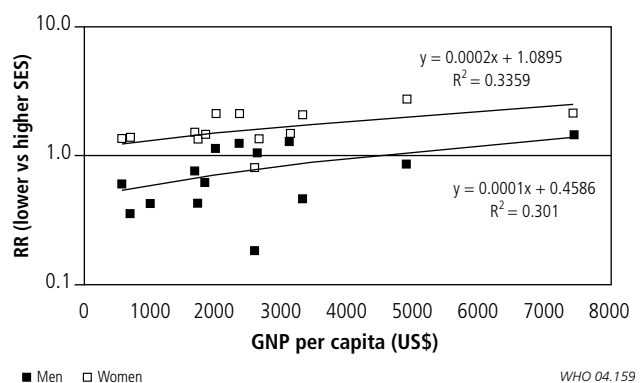
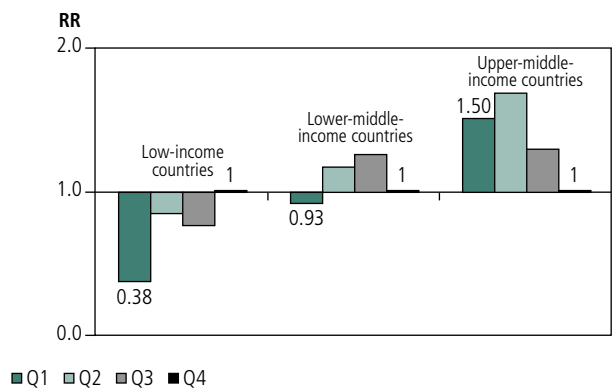


Fig. 2. Relative risk (RR) of obesity among women by quartiles of years of schooling in 37 developing countries (1992–2002)



Source: Monteiro et al. 2004

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The present review did not explicitly address prevalence of obesity or its trends, but did include key studies showing that levels of obesity in the developing world are currently high and are rising rapidly. Furthermore, other research conducted by the authors of this study shows that there is a global trend towards an increase in obesity and a reduction in undernutrition and towards the situation in which obesity is superseding undernutrition both in urban and rural areas (30).

The reasons why the groups with lower SES in developing populations were protected against obesity have usually been explained as being related to:

- food scarcity and patterns of high energy expenditure commonly found among the poor;
- the greater capacity of the élite to obtain adequate food supplies; and
- cultural values favouring fat body shapes (1).

It is probable that these same reasons explain the relatively lower prevalence of obesity we found among groups with lower SES in most low-income and some of the lower-middle-income developing economies.

Explanations of the inverse association between SES and obesity among women, or the lack of association among men shown to exist in lower-middle-income and upper-middle-income developing economies are complex and more research

on this topic is certainly necessary. There are several likely explanations for this inverse association. Lack of food and/or high energy expenditure patterns become less common in a society after a certain stage of economic growth has been reached, even among its poorer social segments. The lower level of education and health-related knowledge among the poor is coupled with a greater difficulty in acquiring the more expensive and less energy-dense foods (e.g. fruits, vegetables and whole-grain cereals) and there is a trend towards less leisure-time and fewer opportunities for recreational exercise (1, 4). Furthermore, people with a high SES may be the only ones able to resist increasing obesogenic environments because they are more likely to have flexibility in their choice of diet and activity pattern than the poor who are more constrained in their choices (31). Repeated comparable cross-sectional surveys undertaken in Brazil indicate that the present inverse association between women's SES and obesity has resulted from both the continuous increase of the disease among the lower income groups and the recent decline in obesity observed among the higher income groups (10). Research on the mechanisms that link SES to obesity is still scarce in the developing world and this subject certainly deserves more attention from researchers, funding institutions and public health authorities.

Regardless of the explanations underlying the shift of the burden of obesity towards the groups with the lowest SES in parts of the developing world, this phenomenon has important policy implications. First, for many developing countries (most or all upper-middle-income economies and some of the lower-middle-income economies), obesity should be seen — at least among women — as a relevant booster of the already high health inequities generated by nutritional deficiencies, infectious diseases and maternal and perinatal conditions. As

previously stated, in addition to being a disease in its own right, obesity substantially increases the risk of several leading causes of death and disease in the developing world (4). Second, in the absence of concerted national public actions to prevent obesity in the developing world, economic growth — a highly desirable and necessary goal for any developing country — will tend to greatly increase the number of developing countries in which obesity will fuel inequities in health.

Finally, the results of this review reinforce the urgent need to: include prevention of obesity as a relevant topic for the public health agenda in the developing countries; to improve the access of all social classes in these countries to reliable information on determinants and consequences of obesity; and to design and implement consistent public actions on the physical, economic and sociocultural environment that make healthier choices concerning diet and physical activity feasible for all. Although a significant step in this direction was taken with the recent approval of the Global Strategy on Diet, Physical Activity and Health by the World Health Assembly (32), much has still to be done and this will depend largely on the energy and political will the national governments devote to implementing the coherent and multisectoral measures contemplated by this strategy. ■

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Résumé

Statut socio-économique et obésité parmi les populations adultes des pays en développement : revue

Une revue de référence des études publiées avant 1989 sur le thème statut socio-économique (SSE) et obésité a soutenu le point de vue que, dans le monde en développement, l'obésité était essentiellement une maladie de l'élite socio-économique. La présente revue, qui concerne des études menées chez des populations adultes de pays en développement, publiées entre 1989 et 2003, révèle un schéma différent pour la relation entre SSE et obésité. Bien que des études supplémentaires soient nécessaires pour clarifier la nature exacte de cette relation, en particulier chez les hommes, trois conclusions principales ressortent des études examinées : 1. l'obésité dans le monde en développement ne peut plus être considérée uniquement comme une maladie des groupes de statut socio-économique élevé, 2. dans chaque pays en développement, la charge de l'obésité tend à se transposer aux groupes de faible SSE à mesure que le produit national brut (PNB) du pays augmente, 3. la transposition de l'obésité aux femmes de faible SSE se produit apparemment à un stade plus

précoce du développement économique que pour les hommes. La transition vers des taux élevés d'obésité parmi les femmes de bas SSE s'observe pour un PNB par tête d'environ US \$ 2500, correspondant à la valeur moyenne du PNB pour les économies à revenus faibles et moyens. Les résultats de cette revue renforcent encore la nécessité pressante d'inscrire la prévention de l'obésité parmi les questions de santé publique importantes dans les pays en développement, d'améliorer l'accès de toutes les classes sociales de ces pays à une information fiable sur les déterminants et les conséquences de l'obésité, et de concevoir et de mettre en œuvre des interventions publiques cohérentes sur l'environnement physique, économique et socioculturel, permettant à tous des choix plus sains en matière de régime alimentaire et d'activité physique. Une étape importante dans cette direction a été franchie avec l'approbation de la stratégie mondiale pour l'alimentation, l'activité physique et la santé par l'Assemblée mondiale de la santé, en mai 2004.

Resumen

Análisis del estatus socioeconómico y la obesidad en las poblaciones adultas de los países en desarrollo

Un análisis que marcó un hito sobre los estudios publicados antes de 1989 acerca de la situación socioeconómica (SSE) y la obesidad respaldó la idea de que en el mundo en desarrollo esa patología era fundamentalmente una enfermedad de la élite socioeconómica. El

presente análisis, centrado en estudios realizados en poblaciones adultas de los países en desarrollo y publicados entre 1989 y 2003, muestra un panorama distinto de la relación entre la SSE y la obesidad. Aunque se necesitan nuevos trabajos para

esclarecer la naturaleza exacta de esa relación, en particular entre los hombres, de los estudios examinados se desprenden tres conclusiones principales: 1. Ya no es posible considerar que en el mundo en desarrollo la obesidad sea exclusivamente una enfermedad de los grupos con mejor SSE. 2. La carga de obesidad de cada país en desarrollo tiende a desplazarse hacia los grupos con SSE inferiores a medida que aumenta el producto nacional bruto (PNB). 3. El desplazamiento de la obesidad hacia las mujeres con menor SSE ocurre aparentemente antes que en los hombres conforme avanza el desarrollo económico. El punto de transición a las tasas mayores de obesidad entre las mujeres de baja SSE se encuentra a un PNB per cápita de aproximadamente US\$ 2500, el punto medio de las economías de ingresos bajos-medios. Los

resultados de este análisis subrayan la necesidad urgente de incluir la prevención de la obesidad como tema destacado en la agenda de salud pública en los países en desarrollo; mejorar el acceso de todas las clases sociales de esos países a información fidedigna sobre los factores determinantes y las consecuencias de la obesidad; y concebir y aplicar en los entornos físico, económico y sociocultural medidas de salud pública coherentes que aseguren que todo el mundo pueda elegir las opciones más saludables en materia de régimen alimentario y actividad física. Un importante paso en ese sentido es el que dio la Asamblea Mundial de la Salud en mayo de 2004 al aprobar la Estrategia Mundial sobre Régimen Alimentario, Actividad Física y Salud.

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