



# Abdominal adiposity and family income-to-poverty ratio in American women

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Received 18 August 2012; received in revised form 2 October 2012; accepted 8 December 2012

## KEYWORDS

Race/ethnicity;  
Fatness;  
Central obesity;  
Obesity

## Summary

**Objective:** We examined (a) secular changes in abdominal fat accumulation (AFA) and family income-to-poverty ratio (PIR) across race/ethnicity, education and age in Mexican (MA), non-Hispanic Whites (NHW), non-Hispanic Black (NHB), and (b) association between PIR and AFA among American women.

**Methods:** Data ( $n=9787$ ) from 2001–2002 to 2009–2010 NHANES were used. Rates of AFA and poverty by race/ethnic, age and education categories were determined across study time points. Subjects with low and medium PIR values were classified as poor. Linear trends in AFA and PIR were evaluated. Study time-specific odds ratios (OR) from logistic regression models were used to estimate risk of AFA due to low to medium PIR. Statistical adjustments were made for race/ethnicity, education, age, and marital status.

**Results:** Increased trends in low to medium PIR and AFA in MA, NHW, and NHB American women were observed between 2001 and 2010. Poor women had much higher prevalence of AFA compared to richer women. For each of the studied periods, medium and low PIR were each associated with increased odds of AFA. The association between poverty and AFA was weakest in 2001–2002 (OR=1.49, 95% CI: 1.05–2.11) compared to 2009–2010 (OR=1.64, 95% CI: 1.21–2.22). Compared to NHW, being of MA and NHB race/ethnicity was also each associated with increased odds of AFA, controlling for other independent variables.

**Conclusions:** Increase in poverty and AFA, and positive association between decreased PIR and increased odds of AFA were observed in the period between 2001 and 2010 in MA, NHW, and NHB American women. A robust economic policy designed to alleviate poverty may be an important means of reducing the trajectory of AFA in American women.

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## Introduction

Obesity is one of the leading public health concerns and is quickly becoming an epidemic that is contributing to the overall disease burden worldwide [1]. Abdominal fat accumulation (AFA) deposited viscerally rather than elsewhere in the body is the most potent form of obesity that is associated with public health concerns [2]. Indeed, AFA represents the pathogenic fat depot that is more strongly linked to cardiovascular diseases compared to other forms of adiposity, including the well known generalized adiposity determined using body mass index (BMI) [3]. AFA is an important component of the metabolic syndrome [4], and is associated with increased risks of some cancers, including colorectal and breast cancers [5,6] as well as all-cause mortality [7]. While the gold standard for identification of AFA remains imaging methods, waist circumference is the most robust anthropometric surrogate of AFA because of simplicity of measurement. Waist circumference is a variable for identifying people who are at elevated risk of developing obesity-related disorders, and thus a cornerstone for clinical management of subjects with obesity [8]. Prior studies have suggested that waist circumference correlates well with visceral adipose tissue [9]. Visceral adiposity is the component of body composition that is more metabolically active and most highly associated with many metabolic abnormalities such as hypertension, glucose intolerance, hyperinsulinemia, hypercholesterolemia, hypertriglyceridemia, and high levels of low-density lipoprotein cholesterol [2].

AFA is generally assumed to be associated with socioeconomic status and it is consequently expected to be more prevalent with economic development. However, some studies have shown positive relationship between AFA and social and economic factors influencing the position individuals or groups hold within the societal structure. This contrary observation underscores the need for a re-examination of the contribution of socioeconomic status to the distribution of AFA, particularly among female since females are differently exposed to social and economic inequality than males [10]. Indeed, an estimated 38.6% of United States women with annual household income of less than \$15,000 are obese, compared to 22% of obesity among men of same income group [11]. Current economic conditions in the United States are likely to lead to increased financial strain for women, particularly those of low socioeconomic status. The ongoing United States financial crisis and stagnation are expected to force millions

of American women into poverty as a result of increased unemployment and reduced availability of government assistance [12]. Hence, a good understanding of the role of socioeconomic status on AFA has important public health significance, particularly for the prevention and management of obesity.

For reasons yet to be fully understood racial/ethnic disparities in AFA are more marked in women than men. However, gender differences in AFA may be due to socio-behavioral factors that include physical inactivity and excess caloric intake as well as poor socioeconomic status [13,14]. While much of evidence linking physical inactivity and excess caloric intake to adiposity is well described, data linking poor socioeconomic standing have been inconsistent [15]. For many cardiovascular diseases, graded associations of poor socioeconomic standing with increased risks have been described [16,17]. Evidence for the causal role of poor socioeconomic standing in AFA have been inconsistent due to lack of unanimity on how to define and what measures of socioeconomic standing to use for delineating poor socioeconomic standing in women [18].

Socioeconomic status is a multidimensional concept most commonly operationalized in health inequalities research by education, occupation and income based social class or social status measures. However, models using educational and occupational stratifications are of limited values in disease studies because these models place too much weight to schooling and job placements, and ignore health acquiring and purchasing abilities [16,17]. Educational and occupational indexes are also problematic because they only define dimensions of education and occupation across and within peers [16,17]. Family income-to-poverty ratio [PIR] index of socioeconomic standing may be a more robust measure of socioeconomic standing than education and occupation. PIR represents family income defined in accordance with appropriate poverty threshold. From public health and clinical perspectives, a good understanding of the effect of PIR on AFA is important in gaining better understanding on the increasing prevalence of AFA and also in implementing global primary prevention strategies for curbing abdominal obesity.

This study is designed to examine secular changes in AFA and PIR-defined poverty across categories of race/ethnicity, education and age in Mexican-American (MA), non-Hispanic White (NHW) and non-Hispanic Black (NHB) women. The study also sought to determine association between PIR-defined poverty and AFA in American women. We posit a positive relationship between poor

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