Obesity prevalence among male inmates and how their inclusion affects race-education disparities in U.S. national obesity prevalence, 2002-2004

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Abstract

Disparities between people of color and Whites exist for several health conditions. For obesity, racial disparities are not well understood – studies find differences between White, Black, and Mexican American women but not for men. The process of incarceration may help explain the distribution of obesity among men. The U.S. prison system has grown almost four-fold within twenty years − disproportionately affecting indigent, young men of color. This study estimates obesity prevalence among inmates and analyzes the effect of incarceration on male disparities in national obesity disparities. Estimates of male inmate obesity prevalence were generated from: (1) the 2002 Survey of Inmates in Local Jails; (2) the 2004 Survey of Inmates in State Correctional Facilities; and (3) the 2004 Survey of Inmates in Federal Correctional Facilities. Prevalence of obesity for the non-incarcerated U.S. adult male population was calculated using the 2004 National Health Interview Survey (NHIS). Self-reported weight and height data were analyzed from adult men aged 25-59 years for all surveys. Obesity was defined as BMI $\geq$30.0 kg/m^2. Among inmates, obesity prevalence estimates were 27.6% for federal and 24.4% for state correctional facilities, and 18.4% for local jails. Pooling together the entire inmate population using random effects yielded an overall obesity prevalence of 23.1%. Pooled logistic regression analyses from each survey for all inmates showed significant differences across race/ethnic groups compared to Whites. Older men were significantly more likely to be obese than younger men. Across race-education subgroups, inmates had lower obesity prevalence than the non-institutionalized population. Combining pooled inmate obesity prevalence with the civilian estimates using fixed effects suggested that including inmates in national estimates substantially alters race-education obesity disparities, particularly for subgroups which are over-represented in the penal system. This study has implications for understanding the burden of obesity in prisons and the processes underlying its national distribution.

1.0 Introduction

The Surgeon General and other national institutes have documented and called for work to eliminate disparities in health (USDHHS 2000; IOM 2003; AHRQ 2003). However, for many populations and health conditions there is limited research to understand why disparities exist (AHRQ 2004). Minority race/ethnic groups and the poor are particularly vulnerable populations; major health disparities among minorities account for premature mortality and disease burden when compared to the national average. While obesity is recognized as a major chronic health issue in the U.S. – with over 30% of adults classified as obese (Ogden et al. 2006) – the processes affecting obesity disparities among groups are not well understood. Obesity varies by age, socio-economic status, and race/ethnic group among women, though no systematic variation has been observed among men (Ogden et al. 2006; Ogden et al. 2007; Darmon and Drewnowski 2008; Drewnowski and Specter 2004).

Incarceration and health

Increasingly researchers have begun studying the effects of incarceration on health within sub-populations as a structural process driving observed disparities. Recent growth in the U.S. inmate population is staggering. Over the past two decades the prison system has grown almost fourfold -- a recent report found that 1 in 100 American adults are now in prison (Pew Center on the States 2008). Uggen et al. (2006), in documenting a new "criminal class" cite over 16 million felons and ex-felons presently. Using a life-course perspective, other researchers have documented the lifetime risks of imprisonment by race/ethnic group. Their findings suggest that incarceration has become a frequent and major life event, particularly for young black men (Pettit and Western 2004).

Several studies have examined the effects of imprisonment on morbidity and mortality for populations – particularly for communicable diseases (Butterfield 2003; US DOJ 2002;

Greifinger 2006). Inmates are disproportionately affected by health conditions such as tuberculosis, viral hepatitis, HIV, and sexually transmitted diseases (NCCHC 2002). The rates in prisons are virtually higher than any other American sub-group. The mechanisms underlying this increased risk include the disproportionate imprisonment of disadvantaged groups, exacerbating the already poor health conditions inside the actual prison.

Chronic health conditions, while not as well studied, are also likely higher among inmates than civilians (Greifinger 2006). Models predict disproportionate rates of diabetes, asthma, hypertension, and heart disease for inmates (Hornung, Greifinger, and Gadre 2002). Moreover, groups disproportionately representing inmates already have higher disparities in these conditions (e.g., CDC 2007; 2008). A recent study found that chronic health conditions such as hypertension, diabetes, and heart problems were common among inmates (Wilper et al. 2009). However, there has yet to be an empirical study of the burden of obesity among prisoners, which is of interest particularly since it is a risk factor for other chronic public health burdens (NHLBI 1998).

Incarceration and obesity – causal or selection mechanisms

Incarceration may structure inequality in obesity prevalence either causally, through selection, or a combination of both. Dietary quality within prisons and jails is difficult to assess systematically. At the federal level prepared meals adhere to the Institute of Medicine's recommended dietary reference intakes (Spark 2007; IOM 2005). Daily energy allowances for state facilities are determined by state legislatures and vary across states (Spark 2007). For local jails, diets are governed by local regulations – though most inmates are only incarcerated for a few days (MacReady 2009). Healthcare within prison facilities is also poor (Wilmer et al. 2009). Further, psychological distress and depression during imprisonment is likely to increase obesity

risk both during and post-incarceration (Massoglia 2008a; Lorant et al. 2003; Lett et al. 2004; Brunner 1997; Hassine 2004).

Minority inmates with low socioeconomic status are also released predominately into urban poverty areas (Massey 2007; Small 2001). Released inmates with low incomes and undue stress burden may preferentially select and consume energy-dense, high calorie foods that are more affordable and increase their risk for obesity (Drewnowski and Specter 2004). These neighborhoods also have greater crime rates that increase chronic stress exposure (Cohen, Doyle, and Baum 2006), fewer options for recreational activities (Yen and Kaplan 1998), and greater numbers of fast-food restaurants full of energy-dense, low-nutrient food and lower numbers of full-service supermarkets with healthier food options (Kawachi and Berkman 2003).

Finally, roughly one-half of released inmates are returned to prison within three years (Urban Institute 2008). These individuals re-enter the penal system with a constellation of risk factors, including pre-existing chronic health conditions, mental illness, and substance abuse problems (Baillargeon 2009; Wilper et al. 2009). Those individuals that do not re-enter the penal system face a range of obstacles impacted by incarceration, from unemployment to poverty to social isolation and stigma (Massoglia 2008b). These factors lead to increased morbidity and mortality among released prisoners (Binswanger et al., 2007; Schnittker and John 2007; Marmot 2001).

Alternatively the growing incarcerated population may affect obesity prevalence disparities through selection. In particular, incarceration disproportionately affects young, indigent men of color. Nationally, 50% of inmates are Black and 17% are Hispanic (US DOJ 2000) – these proportions are significantly different from their proportions in the general population. These groups are also disproportionately burdened with nutrition-related chronic diseases.

The exclusion of a growing incarceration process that applies to race/ethnic and educational groups differently has already been shown to affect national estimates. For example, one study found that high rates of joblessness due to incarceration explained up to 58% of the perceived increase in black wage gains during the 1990s for young men (Western and Pettit 2005).

The purpose of this study is to: (1) estimate the prevalence of obesity among male adult inmates within race/ethnic-education subgroups; (2) compare obesity prevalence between male inmates and the civilian, non-institutionalized male population; and (3) explore the effects of including inmate obesity prevalence estimates on our understanding of national obesity race and socioeconomic disparities among men.

2.0 Methods

This study was exempted from human subjects review by the University of Washington Institutional Review Board. Data were self reported by respondents in all surveys. Estimates of inmate obesity prevalence were generated from three sources: (1) the 2002 Survey of Inmates in Local Jails; (2) the 2004 Survey of Inmates in State Correctional Facilities; and (3) the 2004 Survey of Inmates in Federal Correctional Facilities (BJS 2002; BJS 2004). All surveys are cross-sectional, nationally representative interviews conducted by the U.S. Census Bureau. The response rates were 84.1% for the 2002 Survey of Inmates in Local Jails; 89.1% for the 2004 Survey of Inmates in State Correctional Facilities; and 84.6% for the 2004 Survey of Inmates in Federal Correctional Facilities. Prevalence of obesity for the non-institutionalized U.S. adult male population was calculated using the 2004 National Health Interview Survey (NHIS) (NCHS 2004). The NHIS is a cross-sectional survey of civilian households in the U.S conducted by the

U.S. Census Bureau. In 2004, the response rate was 72.5%. Data for analyses were available for a total of 12,572 inmates and 8,899 civilians (Table 1).

Inclusion criteria for all surveys were adult men from 25 to 59 years of age with valid height and weight data for calculating body mass index (BMI, calculated as kg/m^2). Participants with a BMI greater than or equal to 30 were categorized as obese. Potentially invalid BMI data was assessed as 1.5 times the interquartile BMI range. Only one case was identified as an outlier, results excluding this case were not significantly different and are not presented. Age was categorized into two groups: 25-39 years and 40-59 years. Race was categorized as non-Hispanic White, non-Hispanic Black, or Hispanic. Educational levels were categorized as less than high school, high school or GED, or more than high school.

Data were analyzed with Stata 10 (StataCorp, College Station, TX). All analyses included sample weights to account for non-response and oversampling of certain groups, and accounted for complex survey design. Crude obesity estimates were generated for each inmate survey and then age standardized to the 2004 NHIS population and summarized by race/ethnic-education subgroups. Weighted averages using random effects via the Metan (Bradburn, Deeks, and Altman) routine in STATA were computed to merge obesity estimates from all inmate surveys to account for both within and between survey variability. A random effects approach was selected since each survey is estimating different population means – thus each survey contributes to a distribution of obesity estimates in the inmate population, and the pooled effect represents the mean in this distribution. Using fixed effects via the Metan routine, the inverse variance weighted obesity prevalence for the pooled inmate effect and the NHIS were used to compare the effects of including inmates on national race/ethnic-education disparities. A fixed effects approach was used since the pooled inmate estimate and the NHIS survey are estimating one true

population mean. Further, since the random effects pooled inmate estimate generates wider confidence intervals, using this estimate in a fixed effect framework minimizes the contribution of inmates to the combined obesity prevalence. This results in a more conservative estimate of the effect of including inmates on national obesity prevalence estimates. Statistical tests of heterogeneity for the pooled estimates were calculated using the I-squared measure (Higgins et al. 2003); estimates exceeding $p < 0.05$ were rejected as having homogenous effects in all studies. Overall differences between race/ethnic-education groups were tested using t tests at the .05 significance level. In specifying logistic regression models, potential interactions were examined between education and race, and age and race. All two-way interaction terms were dropped from the model because they were not statistically significant. No third-level interactions were tested.

3.0 Results

Among inmates overall, the crude prevalence estimates of obesity were 27.6% for federal and 24.4% for state correctional facilities, and 18.4% for local jails. Pooling together the entire inmate population yielded an overall obesity prevalence of 23.1%. Specific estimates are presented by race/ethnicity and education in Table 2 for each survey and for the pooled total inmate population. Statistical tests of heterogeneity were significant for many of the pooled estimates, suggesting that there are distinct differences in obesity prevalence among male inmates by facility type.

Tests using logistic regression adjusted for age and education showed a significant difference in obesity prevalence between race/ethnic group and Whites across all inmate surveys (Table 3). The pooled odds ratio for all inmates also showed significant differences across race/ethnic

group. Results were less consistent across surveys for age and education adjusting for race/ethnic group. For federal and state correctional facilities, older men were significantly more likely to be obese. For the pooled total inmate population, older men were significantly more likely to obese than younger men. Those with a high school diploma were marginally significantly more like to be obese than those with less than a high school diploma.

National civilian estimates were similar to recent studies (Ogden et al. 2006), finding no significant differences among men between non-Hispanic Whites and Hispanics (Table 3). However, non-Hispanic Blacks were significantly more likely to be obese than non-Hispanic Whites. The most educated men were significantly less likely to be obese than the least educated men. Older men (ages 40-59 years) were significantly more likely to be obese than their younger counterparts.

To compare the prevalence of obesity among inmates to the non-institutionalized population, crude estimates were age adjusted to the NHIS population (Table 4). Across all race/ethnic-education subgroups the prevalence of obesity is lower among inmates compared to the non-institutionalized population. Those inmates in local jails also had the lowest obesity prevalence across race/ethnic-education subgroups. Statistical tests of heterogeneity were significant for the same pooled race/ethnic-education subgroups as the crude prevalence estimate – suggesting that the distinct differences in obesity prevalence among male inmates in different facilities are not attenuated by adjusting for varying age profiles.

To compare whether national race/ethnic and education subgroup differences are affected by including the incarcerated population, Figures 1 and 2 present obesity prevalence by race/ethnic and education subgroups for the non-institutional civilian population and for the fixed effects pooled estimate including the incarcerated population. For estimates of obesity prevalence, the

inclusion of the incarcerated population lowers the obesity prevalence across all race/ethnic and education subgroups. For men ages 25-39, the most dramatic reduction is among those with less than a high school education. For Whites, obesity prevalence reduced from 23.8% to 17%. For Blacks, obesity prevalence reduced from 29.1% to 24.7%.

Comparing within race/ethnic subgroups, for men ages 25-39 including the incarcerated population showed a significant difference between Whites with less than a high school education and those with more education. For Hispanics, amongst men ages 25-39 the significant difference between those with less than a high school education and those with a high school diploma or GED from the non-institutional civilian estimate were no longer significant by including inmates. For Hispanic men ages 40-59, the association of those with less than a high school education having significantly greater obesity prevalence in the non-institutional civilian estimate was also no longer significant when pooled with the inmate estimates.

Comparing between race/ethnic subgroups, for men ages 25-39 Whites with less than a high school education in the pooled estimate were significantly less likely to be obese compared to Blacks and Hispanics regardless of educational status. Conversely, for men ages 40-59 all significant differences between race/ethnic subgroups were attenuated by including the incarcerated population.

4.0 Discussion

This study estimated the burden of obesity among adult male inmates. Crude obesity prevalence summarized the obesity burden among inmates by type of facility and race-education subgroups. Adjusting for age, male inmates have a lower obesity prevalence than the male civilian population across all race-education subgroups. Controlling for age, education, and

race/ethnic group showed similarities and differences in the odds of being obese between inmates and the civilian population. For both groups, the most educated men were less likely to be obese compared to the least educated. Older men were more likely to be obese than their younger counterparts. However, unlike the civilian population male inmates show obesity disparities between race/ ethnic groups and Whites (though there was an observed disparity between non-Hispanic Blacks and Whites in the NHIS results). This research is also important in understanding the effects of excluding a growing incarcerated population from national estimates, particularly for those race/ethnic and education subgroups which are disproportionately incarcerated.

In 2002, Hornung and colleagues estimated models of chronic disease prevalence in the inmate population for diabetes, hypertension, and heart disease. Due to a lack of quality data on these conditions in prisons, they applied estimates from the Nutrition and Health Examination Survey (NHANES) to the inmate population. The prevalence of diabetes and hypertension were estimated at 5% and 18%, respectively. Since diabetes and hypertension disproportionately afflict older individuals and females, estimates were lower than the overall US population prevalence. Additionally, hypertension prevalence was likely underestimated since their model could not take into account the stress effects of incarceration. Similarly, this study's results, based on nationally representative inmate surveys suggest a lower burden of obesity among inmates than the civilian population. Though age was controlled for, comparisons of the age distribution between the inmate surveys and the NHIS population indicates that inmates are still relatively younger within age groups – likely accounting for at least part of the lower prevalence estimates. However, a recent study by Wilper et al. (2009) analyzed self-reported health conditions among inmates, finding that both diabetes and hypertension were higher among

inmates than the civilian population as assessed by NHANES. Differences in their results compared to this study may be due in part to their inclusion of a greater age range along with women in their analysis. Further, the relationship between BMI and percent fat are confounded by gender and ethnicity (Jackson et al. 2002). Thus, differences in obesity may be masked compared to other chronic conditions such as diabetes that are directly diagnosed.

Pooled random effects estimates of inmate obesity prevalence in this study suggested significant heterogeneity in estimates across race-education subgroup by facility. Pooled estimates were used to summarize overall obesity prevalence; however, care must be taken in interpreting the pooled effect for disparate results further (Greenland and Salvan 1990). Part of this variance can be explained by the varying age profiles of inmates by facility, particularly in local jails where inmates tend to be younger than those in state or federal correctional facilities (Hornung et al. 2002). Additionally, unobserved characteristics of inmates in each type of facility also likely vary.

The fixed effects estimates of the civilian and inmate combined obesity prevalence, as well as inmate estimates by facility type suggest that Whites have a lower prevalence of obesity compared to non-Hispanic Blacks and Hispanics within the same education level. One potential reason for this differential is that the returns of education vary by race for obesity. For instance, non-Hispanic Whites with less than a high school degree have comparably greater wealth than Blacks or Hispanics (Hayward et al. 2000). This level of wealth protects them from uncertainties and reduces levels of stress. Finally, they are more likely to come from neighborhoods that are not part of urban poverty centers (Pew Center on the States 2009).

An emerging literature has begun to document the effects of excluding inmates on national estimates. While these studies have focused largely on demographic outcomes, some research

suggests that including inmates has implications for public health surveillance, particularly for infectious diseases such as HIV/AIDS that disproportionately affect population subgroups which are also over-represented in the prison system (Pettit and Sykes 2008). Similarly, this study also points to the potential importance of excluding inmates from national health estimates, particularly for conditions that disproportionately affect young, indigent men of color. As these individuals represent the majority of current inmates, their exclusion may substantially alter observed disparities between race/ethnic and education groups and resulting public health interventions. However, even with inclusion of inmates, this study showed little systematic variation in obesity prevalence among men in the U.S. as measured by BMI.

This study has several limitations. First, height and weight were self-reported in all surveys, resulting in a likely underestimation of obesity prevalence. Research suggests that men may over report height, leading to systematically lower estimates of obesity prevalence (Mokdad 1999). It is also unknown if incarcerated men may systematically self-report height and weight differently than the civilian population. Second, data come from four different surveys which may have systematic differences which affect obesity estimates. However, inter-survey variability is likely reduced since all responses are self-reported and administered by trained interviewers from the Census Bureau. Also, all surveys but the 2002 Survey of Inmates in Local Jails were from 2004. The local jail population grew from 581,411 male inmates in 2002 to 619,908 in 2004 (Harrison and Beck 2004), meaning that their weight in pooled inmate totals are slightly lower than if data from 2004 were available. Third, this study is unable to analyze potential mechanisms underlying the observed differences in obesity disparities. Data on the frequency and duration of incarceration have a large non-response bias. Further, the data are cross-sectional and thus unable to address the causal effects of incarceration on male inmates

over time or after release. Fourth, this study only estimated obesity prevalence among male inmates. Though women represent a rapidly increasing proportion of the inmate population, men remain the overwhelming majority of those currently incarcerated (Pew Center on the States 2008).

As the inmate population continues to grow this study suggests that greater attention is needed to understand their current health status, the effects of incarceration on chronic health conditions, and the distal effects for inmates upon release. Obesity and related chronic health conditions are likely to increase among inmates as the population ages due to mandatory minimum sentencing, longer sentences, and stricter parole policies (Reimer 2008). This research, along with other recent studies suggests a constellation of risks for the health of inmates; and underscores the importance for public health agencies and researchers in understanding the effects of incarceration as an institutional process driving health inequities for the most disadvantaged groups in terms of health, economic, and social outcomes.

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Table 1. Sample Size[a] of US Male Inmates by Facility and Non-Institutional Male Civilians by Racial/ Ethnic Group and Education, Aged 25-59 Years, 2002-2004

	Incarcerated				Civilian
Characteristic	**Federal (n = 1,738)***	**State (n = 7,775)***	**Local (n = 3,059)***	**Total (N = 12,572)**	**All (N = 8,899)***
Non-Hispanic White					
All education	622	3,134	1,121	4,877	5,659
Less than high school	235	1,823	329	2,387	492
High school diploma/GED	140	742	593	1,475	1,606
More than high school	247	569	199	1,015	3,561
Non-Hispanic Black					
All education	953	3,710	1,189	5,852	1,134
Less than high school	584	2,450	447	3,481	173
High school diploma/GED	175	794	543	1,512	388
More than high school	194	466	199	859	573
Hispanic					
All education	119	671	580	1,370	1,720
Less than high school	75	518	321	914	732
High school diploma/GED	22	91	203	316	454
More than high school	22	62	56	140	534

* Totals include race/ethnic groups not shown separately above

[a] Unweighted sample size is reported

Table 2. Crude Prevalence of Obesity (BMI ≥ 30) in US Male Inmates Aged 25-59 Years, by Facility, Race/Ethnic Group and Education, 2002-2004

	Prevalence of Obesity, % (95% Confidence Interval)			
	Federal	**State**	**Local**	**Total[a]**
All				
All education	27.6 (25.2-30.1)	24.4 (23.4-25.3)	18.4 (17.0-19.9)	23.4 (18.7-28.2)*
Less than high school	28.9 (25.5-32.3)	24.2 (23.0-25.4)	17.3 (15.0-19.6)	23.3 (17.8-28.9)*
High school diploma/GED	30.1 (24.5-35.6)	25.9 (23.8-28.1)	18.5 (16.4-20.6)	24.5 (18.1-30.8)*
More than high school	22.7 (18.6-26.8)	23.1 (20.6-25.5)	21.0 (17.2-24.9)	22.5 (20.7-24.4)
Non-Hispanic White				
All education	21.8 (18.1-25.5)	20.3 (18.9-21.8)	15.1 (13.0-17.3)	19.0 (15.1-22.9)*
Less than high school	21.0 (14.9-27.1)	19.7 (17.8-21.5)	16.1 (12.0-20.2)	18.9 (16.6-21.3)
High school diploma/GED	23.9 (15.9-31.9)	21.6 (18.7-24.6)	14.1 (11.2-16.9)	19.3 (13.1-25.5)*
More than high school	21.2 (15.8-26.7)	20.8 (17.5-24.1)	16.6 (11.1-22.2)	20.0 (17.5-22.6)
Non-Hispanic Black				
All education	30.4 (27.1-33.8)	27.1 (25.7-28.6)	21.1 (18.6-23.6)	26.2 (21.5-30.8)*
Less than high school	31.2 (26.9-35.4)	26.7 (24.9-28.4)	19.6 (15.8-23.5)	25.8 (20.4-31.2)*
High school diploma/GED	34.1 (26.0-42.1)	29.3 (26.1-32.5)	20.8 (17.2-24.5)	27.5 (20.3-34.7)*
More than high school	24.2 (17.5-31.0)	25.7 (21.7-29.8)	25.2 (18.6-31.8)	25.3 (22.3-28.4)
Hispanic				
All education	30.3 (21.0-39.5)	26.9 (23.5-30.3)	18.9 (15.6-22.3)	24.6 (18.0-31.3)*
Less than high school	33.7 (21.6-45.8)	27.6 (23.7-31.4)	16.6 (12.3-21.0)	24.9 (15.6-34.2)*
High school diploma/GED	26.7 (6.3-47.1)	24.0 (15.3-32.6)	21.7 (15.9-27.6)	22.7 (18.0-27.4)
More than high school	22.4 (4.1-40.6)	25.8 (14.8-36.8)	22.2 (11.0-33.3)	23.8 (16.6-31.0)

* Indicates significant heterogeneity (I^2) between inmate survey estimates ($p < 0.05$)

[a] Total calculated using random effects

Table 3. Logistic Regression of Obesity (BMI ≥ 30) in US Male Inmates by Facility and Non-Institutional Male Civilians, Aged 25-59 Years, 2002-2004

	Odds Ratio (95% Confidence Interval)				
	Inmates				Civilian
	Federal	State	Local	Total[a]	
Age, y					
25-39	1.0	1.0	1.0	1.0	1.0
40-59	1.36 (1.05-1.75)	1.23 (1.11-1.37)	0.85 (0.69-1.05)	1.12 (0.87-1.45)*	1.22 (1.09-1.37)
Education					
Less than High School	1.0	1.0	1.0	1.0	1.0
High School Diploma/GED	1.10 (0.80-1.51)	1.12 (0.98-1.28)	1.13 (0.91-1.41)	1.13 (0.91-1.41)	0.96 (0.80-1.15)
More than High School	0.75 (0.55-1.01)	0.96 (0.82-1.12)	1.34 (1.00-1.79)	1.34 (1.01-1.79)	0.82 (0.69-0.98)
Race/ethnicity					
Non-Hispanic White	1.0	1.0	1.0	1.0	1.0
Non-Hispanic Black	1.64 (1.24-2.17)	1.48 (1.31-1.65)	1.51 (1.20-1.89)	1.50 (1.36-1.65)	0.97 (0.83-1.14)
Hispanic	1.67 (1.02-2.74)	1.49 (1.23-1.81)	1.35 (1.01-1.78)	1.46 (1.26-1.70)	1.21 (0.97-1.51)

* Indicates significant heterogeneity (I^2) between inmate survey estimates ($p < 0.05$)

[a] Total calculated using random effects

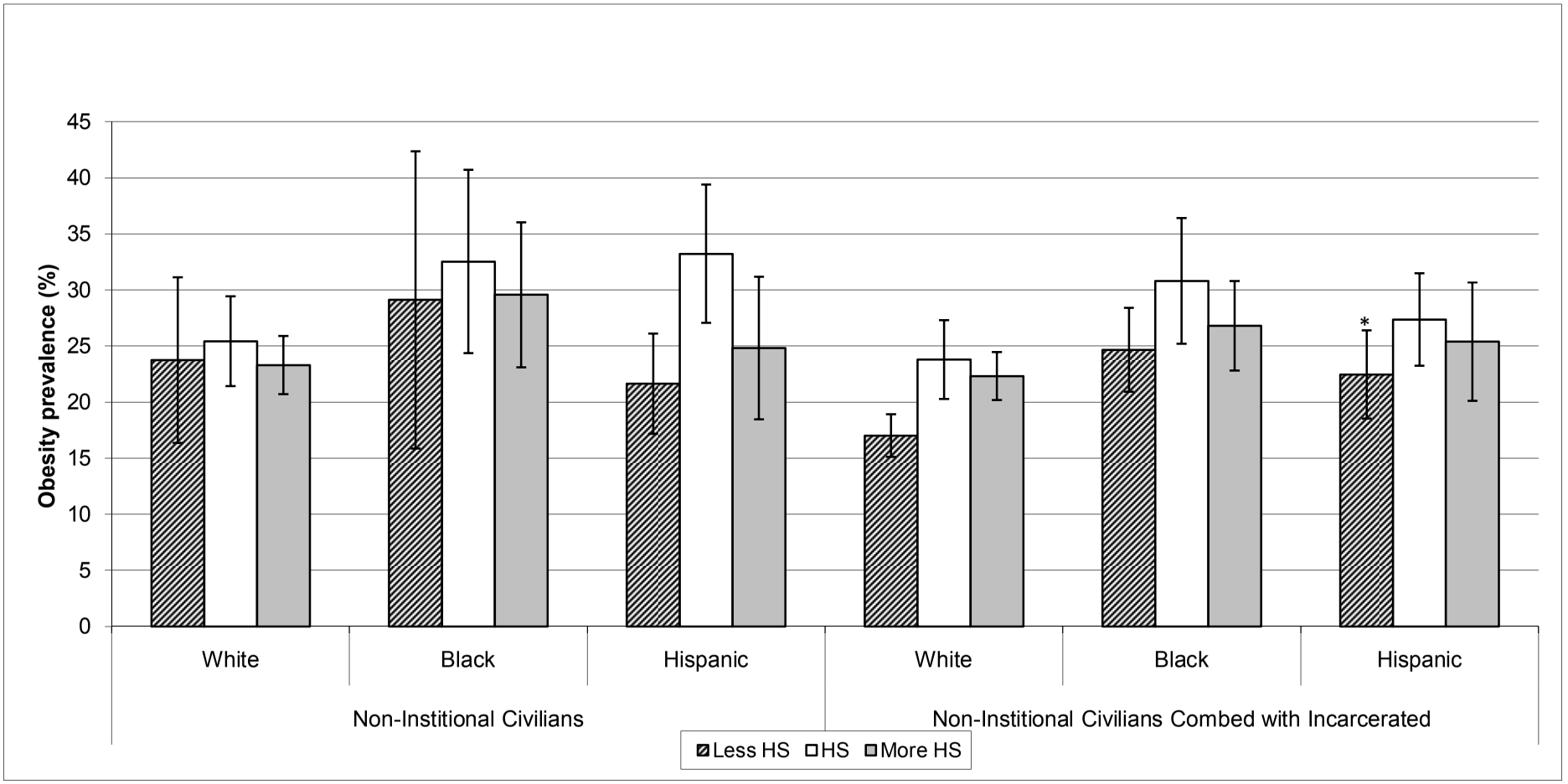
Table 4. Age-Adjusted Prevalence of Obesity (BMI ≥ 30) in US Male Inmates and Non-Institutional Male Civilians Aged 25-59 Years, by Facility, Race/Ethnic Group and Education, 2002-2004

	Prevalence of Obesity, % (95% Confidence Interval)				
	Inmates				Civilian
	Federal	State	Local	Total[a]	
All					
All education	28.2 (25.6-30.8)	25.0 (23.9-26.0)	17.9 (16.3-19.5)	23.6 (18.1-29.1)*	26.2 (25.1-27.4)
Less than high school	30.5 (26.6-34.5)	25.7 (24.3-27.0)	16.4 (13.8-18.9)	24.1 (17.0-31.2)*	28.9 (26.0-31.8)
High school diploma/GED	30.0 (24.0-36.0)	25.3 (23.1-27.5)	18.2 (15.9-20.5)	24.1 (17.9-30.2)*	28.3 (26.2-30.4)
More than high school	22.9 (18.7-27.0)	22.9 (20.5-25.4)	20.3 (16.5-24.2)	22.3 (20.5-24.2)	24.6 (23.2-26.0)
Non-Hispanic White					
All education	21.9 (18.2-25.6)	20.8 (19.4-22.4)	15.1 (12.8-17.4)	19.2 (15.0-23.4)*	26.3 (25.0-27.6)
Less than high school	22.5 (16.1-28.9)	20.9 (18.9-22.9)	15.7 (11.0-20.3)	19.7 (16.1-23.3)	31.8 (27.0-36.7)
High school diploma/GED	23.9 (15.9-31.9)	21.4 (18.3-24.4)	14.5 (11.4-17.6)	19.3 (13.6-25.0)*	27.5 (25.0-30.1)
More than high school	21.1 (15.5-26.6)	20.8 (17.4-24.1)	16.2 (10.7-21.7)	19.8 (17.1-22.5)	25.0 (23.4-26.6)
Non-Hispanic Black					
All education	31.8 (27.9-35.7)	27.9 (26.3-29.5)	20.0 (17.4-22.6)	26.4 (20.4-32.5)*	30.9 (27.5-34.4)
Less than high school	33.6 (28.3-38.9)	28.5 (26.5-30.5)	18.9 (14.7-23.0)	26.9 (19.7-34.1)*	34.6 (25.6-43.5)
High school diploma/GED	31.7 (22.2-41.2)	28.3 (25.0-31.7)	19.7 (15.8-23.7)	25.9 (18.9-32.9)*	31.0 (25.8-36.1)
More than high school	25.9 (18.7-33.2)	25.6 (21.6-29.7)	23.3 (16.9-29.7)	25.1 (22.0-28.2)	29.8 (25.1-34.6)
Hispanic					
All education	26.1 (14.8-37.5)	27.3 (23.4-31.1)	17.8 (13.9-21.6)	23.3 (15.8-30.8)*	27.4 (24.7-30.0)
Less than high school	24.6 (11.2-37.9)	28.7 (24.0-33.3)	14.8 (10.1-19.5)	22.4 (11.8-33.1)*	25.0 (21.5-28.5)
High school diploma/GED	35.4 (9.3-61.4)	23.7 (14.3-33.0)	21.0 (13.9-28.0)	22.5 (17.0-28.0)	33.1 (28.1-38.2)
More than high school	16.2 (3.9-28.5)	24.3 (13.3-35.2)	22.1 (9.6-34.6)	21.1 (14.3-28.0)	25.5 (20.6-30.4)

* Indicates significant heterogeneity (I^2) between inmate survey estimates ($p < 0.05$)

[a] Total calculated using random effects

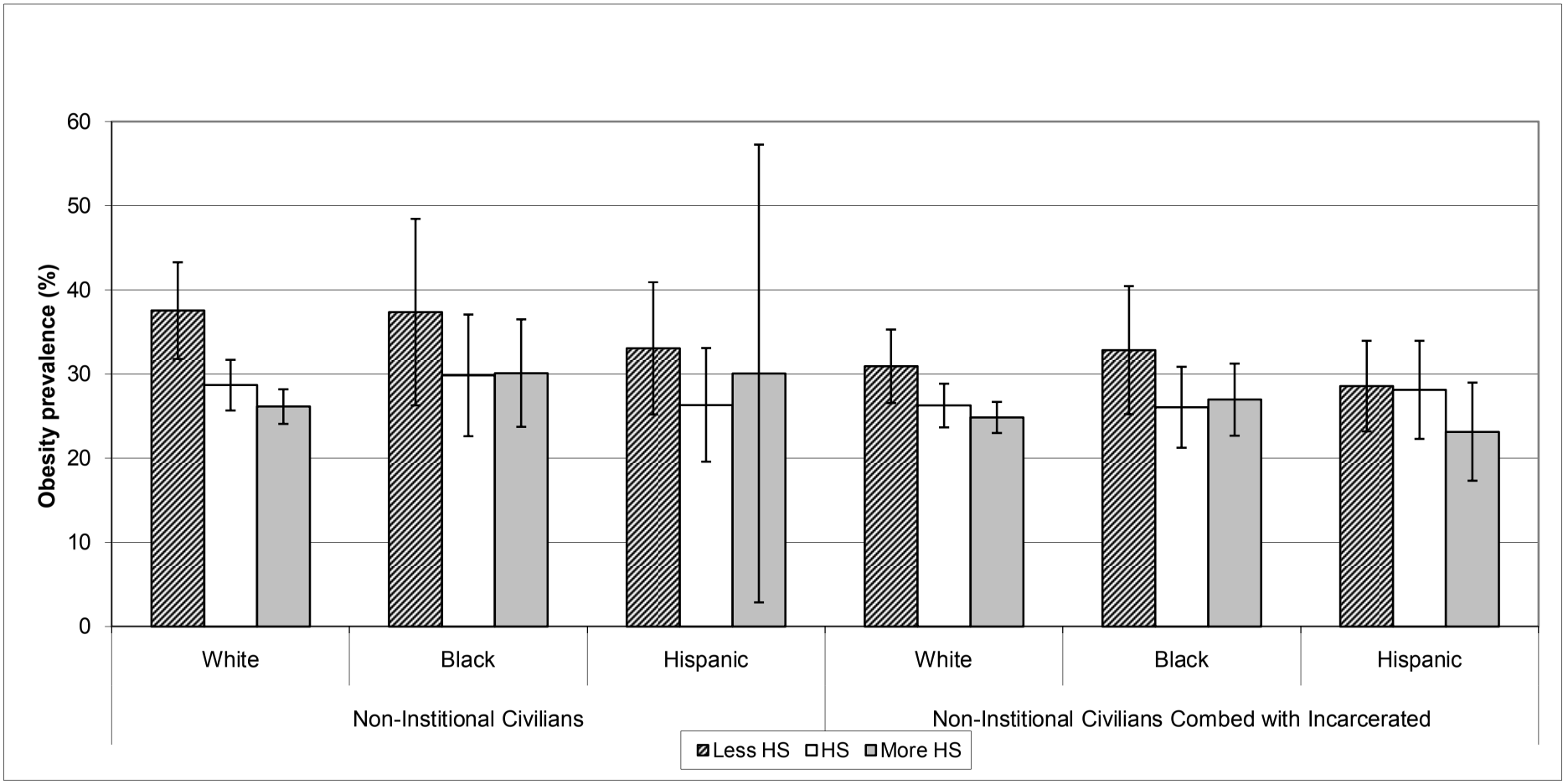
Figure 1. Comparison of Obesity Prevalence (BMI ≥ 30) between US Male Non-Institutional Civilians Alone and Combined with Pooled Inmate Totals,[a] by Race/Ethnic Group and Education, Ages 25-39



* Indicates significant heterogeneity (I^2) in pooled estimates ($p < 0.05$)

[a] Combined calculated using fixed effects

Figure 2. Comparison of Obesity Prevalence (BMI ≥ 30) between US Male Non-Institutional Civilians Alone and Combined with Pooled Inmate Totals,[a] by Race/Ethnic Group and Education, Ages 40-59



[a] Combined calculated using fixed effects