

Lead Exposure and Metabolic Syndrome in U.S. Population, NHANES 2013-2014

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Background

Lead exposure is a public health concern. Lead is a known endocrine disruptor and can impair regulation of blood glucose, blood pressure, abdominal adiposity, and blood lipid levels which are risk factors for metabolic syndrome (MetS).¹

MetS is characterized by hypertension, hyperglycemia, hypertriglyceridemia, reduced high-density lipoprotein (HDL) levels, and abdominal obesity.²

The disruptive nature of lead has been well documented and, therefore, we hypothesized that there would be a positive association between blood lead levels and MetS.

Methods

Data were obtained from the 2013-2014 National Health and Nutrition Survey (NHANES). This study used de-identified data; therefore, an IRB ethical review was not required. Individuals aged 20 years or older with available blood lead samples and data for the five components of MetS were included in the analysis.

Descriptive statistics of the data was conducted overall and at the median by gender. Frequency distributions were computed for all categorical variables and MetS risk factors.

Unadjusted and multivariable logistic regression was conducted to assess association of MetS with high exposure to blood lead levels. Covariates included age, income levels, race/ethnicity, and smoking status.

Results

Figure 1 illustrates that the median blood lead levels for the overall NHANES population is 1.03 ug/dL, 1.23 ug/dL for males and 0.86 ug/dL for females.

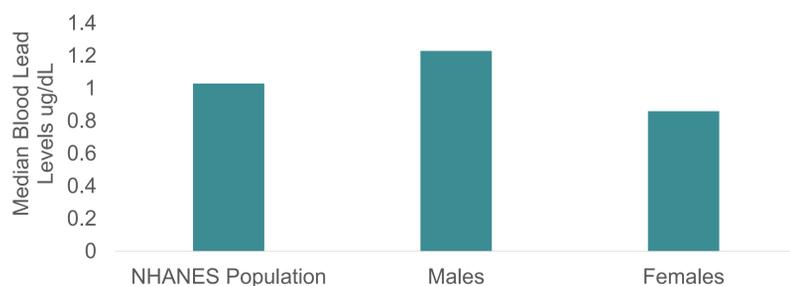


Figure 1. Median blood lead levels of NHANES population overall, males and females.

Figure 2 shows that non-Hispanic Whites are the largest demographic in our study sample for both males and females.

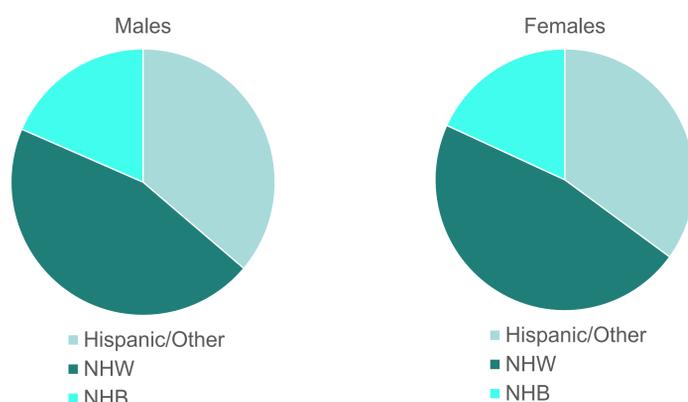


Figure 2. Race and ethnicity for males and females.

Results (continued)

Table 1 shows that males have a higher median blood lead levels, age and MetS prevalence when compared to females.

Table 1 Characteristics of 2013-2014 NHANES Adult Participants and Metabolic Syndrome Prevalence		
Characteristics	Male	Female
Median BLL (ug/dL)	1.23 ug/dL	0.86 ug/dL
Mean Age (years)	49.57	48.74
Mean BMI (kg/m ²)	28.13	29.68
MetS Prevalence	57.55%	38.60%

Note: BLL = Blood Lead Levels; BMI = Body Mass Index; MetS = Metabolic Syndrome

Figure 3 illustrates that males have a greater prevalence in blood pressure, triglycerides and fasting blood glucose in comparison to females.

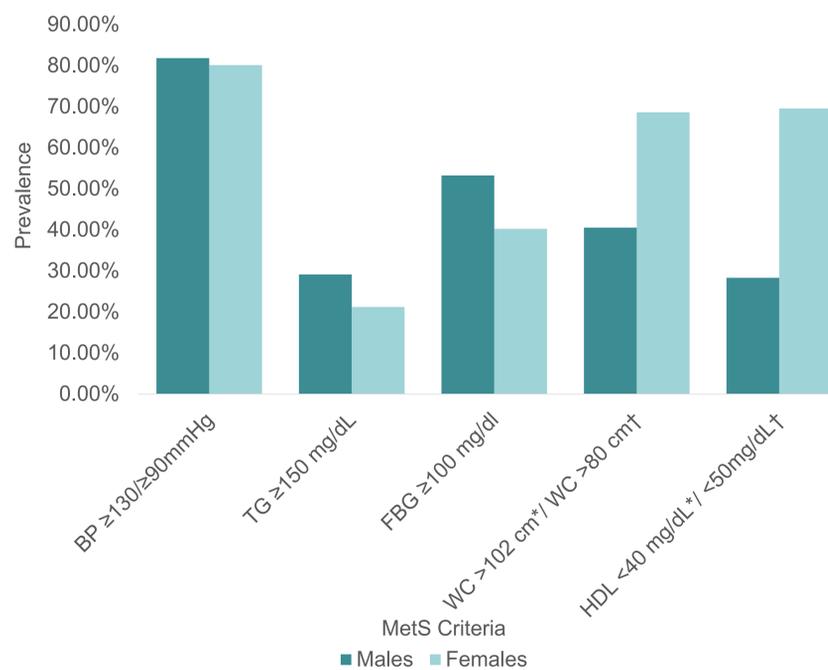


Figure 3. Metabolic syndrome criteria prevalence in males and females.

Figure 4 displays the criteria for metabolic syndrome, presence of three or more of these criteria equates to a MetS diagnosis.

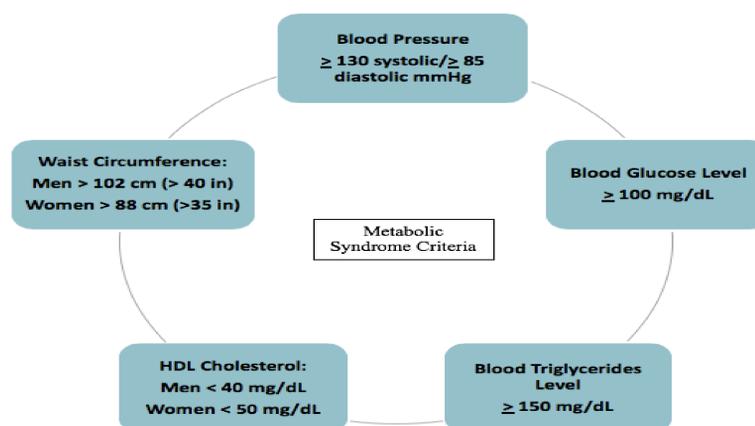


Figure 4. Metabolic syndrome criteria.

Results (continued)

Figure 5 illustrates that age, smoking status and BMI show to have an increased risk of MetS.

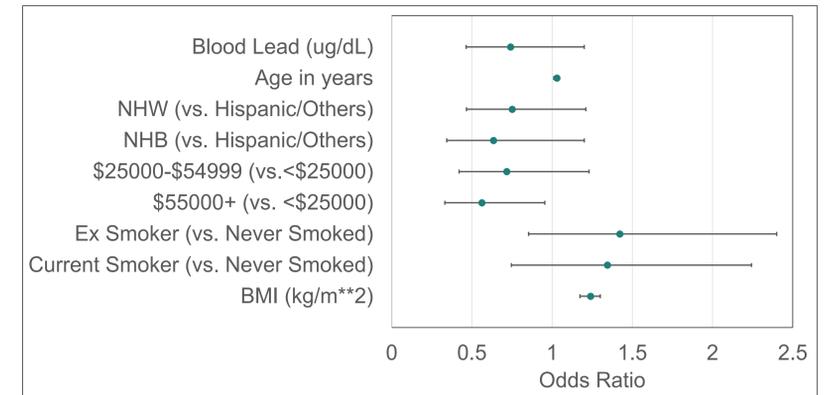


Figure 5. Odds ratio and 95% confidence interval for male blood lead levels and risk factors of metabolic syndrome.

Figure 6 illustrates that age, income status, smoking status and BMI show to have increased risk of MetS.

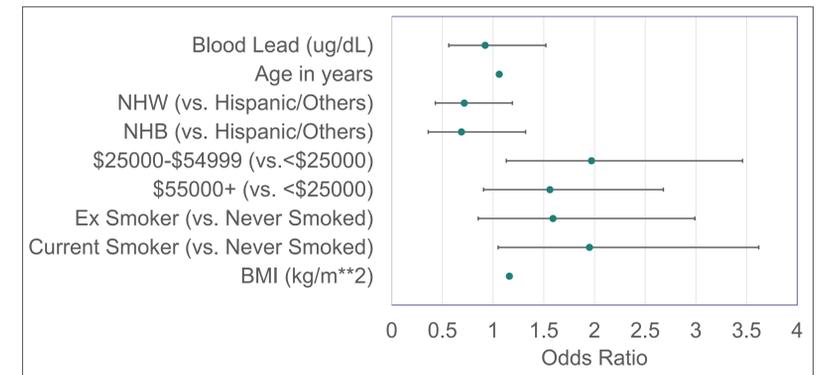


Figure 6. Odds ratio and 95% confidence interval for female blood lead levels and risk factors of metabolic syndrome.

Discussion and Conclusion

In this cross-sectional analysis of the NHANES 2013-2014 data, blood lead was not associated with MetS in U.S adults aged 20 years older in adjusted models.

The prevalence of MetS in our studied population, was nearly 58%. The prevalence of MetS in the U.S. adult population has increased from 32.9% to 34.7% in the 2003-2004 to 2011-2013 NHANES datasets.³

Strengths of this study include the usage of NHANES data, a nationally representative dataset. This study is high in internal validity, since we adjusted for confounding variables. Given that NHANES is an excellent representation of the general population it has external validity.

Limitations of this study include the cross-sectional nature of the NHANES data.

According to our study lead exposure in U.S. adults aged 20 years and older does not have a statistically significant association with the prevalence of MetS.

References

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