

The Impact of the 2008-2009 Economic Recession on Acute Myocardial Infarction Occurrences in Various Socioeconomic Areas of Raritan Bay Region, New Jersey

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Abstract

Background: Psychosocial stress is one important risk factor for myocardial infarction. **Aim:** The study was to assess the impact of the 2008-2009 economic recession on myocardial infarction occurrences in different socioeconomic areas of Raritan Bay region, New Jersey. **Materials and Methods:** The patients, who were treated for acute myocardial infarction from January 2006 to June 2012, were grouped based on the average incomes of their residence districts in the Raritan Bay region. The Spearman Rank Correlation test was used to assess the correlation between the monthly occurrences of myocardial infarction and Dow Jones stock averages, as well as the correlation between the myocardial infarction occurrences and NJ State unemployment rates. **Results:** Among 1,491 cases that were identified, 990 cases resided in areas with income below the state average and 477 were from areas above the average. After the onset of the recession, the myocardial infarction occurrences trended up in the low-income area group but not in the high-income area group; and this increasing trend is correlated with the rise in NJ State unemployment rates but not with the changes in stock averages. **Conclusion:** Our findings suggest that unemployment contributed to an increased risk of myocardial infarction among the residents in low socioeconomic areas after the 2008-2009 economic recession.

Keywords: Cardiovascular disease, Psychosocial stress, Socioeconomic disparity, Unemployment

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Introduction

Cardiovascular disease is the leading cause of death in the United States. It is estimated that approximately 715,000 people in this country suffered myocardial infarction (MI) in 2012.^[1] Numerous risk factors for coronary artery disease have been identified, including active smoking, abdominal obesity, diabetes, dyslipidemia, hypertension, psychosocial stress and a family history of premature cardiovascular events. Psychosocial stress

is found to account for 30% of risks attributable to acute MIs in the 'INTERHEART' study, making it the third most important modifiable risk factor after smoking and dyslipidemia.^[2]

During an economic recession, financial uncertainty or difficulty often leads to greater psychosocial stress. During the 2008-2009 economic recession, the nadir of the Dow Jones Industrial Stock Average was more than 50% lower than its peak before the recession and the unemployment rate reached a historical high of 10%. According to the 2009 Gallup poll, most Americans experienced worsened mental health and were increasingly stressed out after the onset of the recession, with the greatest decline of mental health seen in those who were financially unstable.^[3] In United Kingdom, there was a significant increase in the number of people reporting poor health status across all regions and all socioeconomic groups.^[4] Meanwhile, a four to six

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DOI:
10.4103/1947-2714.132938

percent increase in suicide rates was also seen in many European and American countries in 2009.^[5] However, little research has been conducted to assess the impact of 2008-2009 recession on the incidence of cardiovascular diseases, especially among those who were less fortunate or those who resided in low socioeconomic neighborhoods. This study was designed to examine the impact of the 2008-2009 economic recession on the occurrences of acute MIs in different socioeconomic neighborhoods in the Raritan Bay region, New Jersey.

Materials and Methods

Study design

The design of this retrospective cohort study was approved by the Institutional Review Board at Raritan Bay Medical Center in New Jersey, USA. In this study, acute MI cases were collected from the Discharged Patient Databases of two hospitals (Old Bridge hospital and Perth Amboy hospital) of Raritan Bay Medical Center. These two hospitals are the major cardiac centers in Raritan Bay region in New Jersey. The query criteria used to identify acute MI cases was 'acute myocardial infarction (the ICD-9 code 410) being the primary discharge diagnosis during the time period from January 2006 to June 2012'.

Data collection

The patient information that was collected from the Discharged Patient Databases included the admission date, age, gender, ZIP code of residence, and the final diagnoses at discharge. The socioeconomic status of the residential neighborhood was assessed based on the mean Adjusted Annual Income (abbreviated as income in this article) reported on the 2010 Income Tax Returns in the corresponding ZIP code area. The monthly average of Dow Jones Industrial Stock Index was calculated as the mean of the daily Index averages in the corresponding month.^[6] The monthly state unemployment rates of New Jersey were obtained from the United States Bureau of Labor Statistics.

Statistical study

The acute MI cases were grouped based on whether the adjusted annual income of his/her residential neighborhood is above or below the New Jersey state average. To assess the baseline characteristics of these two groups, the difference in the ages were compared using a Student t-test, while a Chi-square test was employed to examine the differences in gender and co-morbid conditions, such as hypertension, diabetes mellitus and hyperlipidemia. The correlations between the monthly occurrences of acute MI in these two groups and the monthly Dow Jones Industrial Stock averages/

the monthly NJ State unemployment rates were assessed using a Spearman Rank Correlation test. The degrees of correlation were expressed as correlation coefficients. A two tailed *P*-value less than 0.05 was considered statistically significant.

Results

From January 2006 to June 2012, a total of 1,490 cases of acute MI were admitted into the Old Bridge hospital and the Perth Amboy hospital, two major cardiac centers in Raritan Bay region in New Jersey. Despite high variations, the monthly occurrences of acute MI trended up after early 2009 and peaked in March 2011, while the Dow Jones Industrial Stock Index dropped abruptly in October 2008 and the New Jersey monthly unemployment rate rose sharply within the same year [Figure 1].

To assess the impact of the 2008-2009 economic recession on the occurrences of acute MI in the different socioeconomic neighborhoods, the identified cases were separated into two groups based on the average adjusted annual incomes of their residential areas. In total, 990 patients came from the zip code districts where the income (\$44,515) was less than the NJ State average (\$52,118), while 477 patients were from areas with an average income (\$64,138) greater than the State average. Among the 1490 cases, 24 patients resided outside of Raritan Bay region and were not included in the subsequent analysis.

There was no statistically significant difference in ages and genders between these two groups [Table 1]. Although comorbid conditions (hypertension, diabetes, and hyperlipidemia) appeared to be more common in the acute MI patients residing in the lower socioeconomic neighborhoods, these differences were not statistically significant either [Table 1].

In the low-income neighborhood group, a similar rising trend of monthly occurrences of acute MI was found after the onset of the recession [Figure 2]. This

Table 1: The demographic characteristics and the comorbidities of the acute myocardial infarction cases

Characteristics	Low-income area group (total number = 990)	High-income area group (total number = 477)	<i>P</i> value
Mean age	69.5	70.1	0.50
Female/male ratio	0.86	0.81	0.58
Hypertension	452 (45.7%)	194 (40.7%)	0.07
Diabetes	365 (36.9%)	154 (32.3%)	0.09
Dyslipidemia	378 (38.2%)	161 (33.8%)	0.10

trend correlates with the increase of the monthly unemployment rates in New Jersey [Table 2]. In contrast, in the high income neighborhood group, the trend of monthly acute MI occurrences stayed flat after the onset of the recession [Figure 2] and had no correlation with the New Jersey State unemployment rates [Table 2]. Finally, no statistically significant correlation was found between the Dow Jones Index averages and the acute MI occurrences in either group [Table 2].

Discussion

The 2008-2009 economic recession has been the worst recession since the Great Depression, and its impact on public health remains mostly unknown. In this study, the impact of the 2008-2009 economic recession on acute myocardial infarction occurrence was examined in different socioeconomic areas of Raritan Bay Region, New Jersey. The results of this study suggest that, during the 2008-2009 economic recession, the residents of low socioeconomic neighborhoods had a higher risk for myocardial infarction, which was partially attributable to the higher unemployment rates.

Previous studies have shown that low socioeconomic status of individuals is linked with higher incidences of acute coronary diseases, increased sudden cardiac deaths and higher mortality rates after the first myocardial infarctions.^[7,8] When compared to the

individuals in a higher socioeconomic status, this increased risk for cardiovascular events in the lower socioeconomic individuals is not due to the differences in smoking, alcohol consumption or race, but is rather secondary to the lower education levels, less knowledge of cardiovascular diseases and limited access to healthcare resources.^[7,9] A low socioeconomic status of neighborhood is also found to be an independent risk factor for a higher incidence and worse prognosis of acute myocardial infarction.^[10-12] Although the exact mechanism is still not clear, some of the presumed factors contributing to this increased risk included less resources and a higher prevalence of unhealthy life styles in lower socioeconomic neighborhoods, such as unavailability of recreation spaces and lower physical activity.^[13,14] Consistent with these previous findings, the results of this study suggest that low socioeconomic status of neighborhoods could potentiate the negative impacts of economic recessions on risks of myocardial infarction.

Our study suggests that rising unemployment rates, rather than the decline of Dow Stock averages, contributed to the increasing MI occurrences in the low socioeconomic neighborhood during the 2008-2009 economic recession. Differing from our findings, Fiuzat *et al.* reported an inverse correlation between the NASDAQ stock index average and acute MI cases in a single institution during the recession in 2008-2009.^[15] This discrepancy could be caused by the different study design. In this study, for

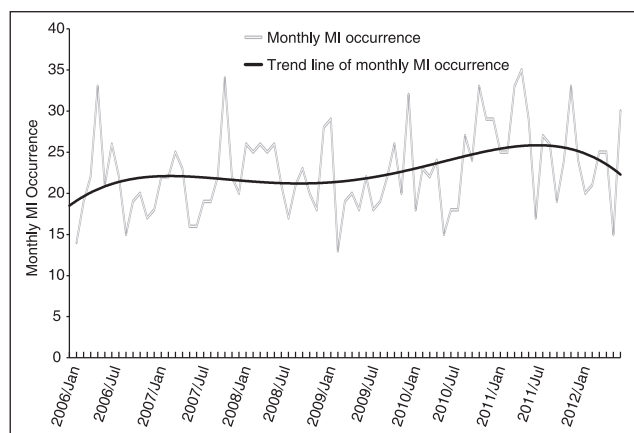


Figure 1: The monthly occurrences of acute MI in the Raritan Bay region from January 2006 to June 2012 and the corresponding trend line

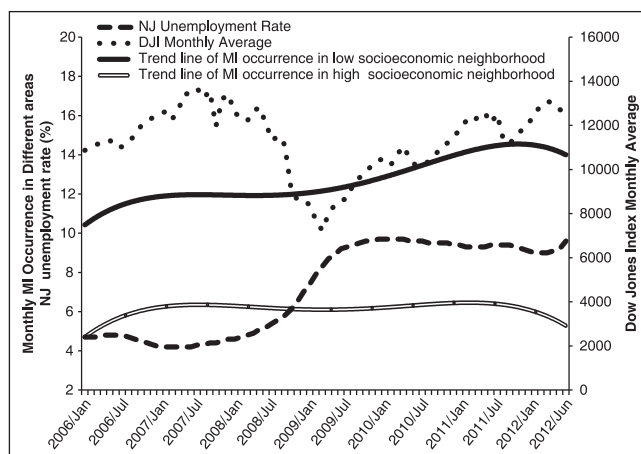


Figure 2: The monthly occurrences of acute MI in the low income neighborhoods, but not in the high income neighborhoods, correlates with the increases of the NJ state unemployment rates

Table 2: The correlation between acute MI occurrences in different socioeconomic neighborhoods and the NJ State unemployment rates as well as the Dow Jones Stock Index Averages

Groups to be compared	Low socioeconomic area (Coefficient/P value)	High socioeconomic area (Coefficient/P value)
AMI occurrence vs. NJ State Unemployment Rate	0.231 (0.04*)	-0.016 (0.89)
AMI occurrence vs. Dow Jones Average	0.137 (0.23)	0.060 (0.60)

*Represents statistical significance

instance, a much longer time period was examined and the patients were grouped based on the socioeconomic status of his/her neighborhood.

High unemployment rate is a hallmark of economic recession. Involuntary loss of work has been found to be a stressful life event that negatively impacts on the individual's health.^[16] Unemployment is also connected with elevated blood pressure, higher vascular disease incidences and the associated mortality of such ailments.^[17] In this study, the impact of unemployment on the patients residing in the low socioeconomic neighborhoods is found to be more significant when compared to those dwelling in the high socioeconomic neighborhoods. It is speculated that these observed differences are partially caused by lower financial reserves of the residents of lower socioeconomic neighborhoods and a more limited access to healthcare system and medications. In support of this notion, socioeconomic status was found to have a more significant impact on cardiovascular diseases among patients younger than 65 years than those older than 65 in Canada, where the healthcare is free of charge but prescription drugs are free only after age 65.^[18]

This study has several limitations, such as its small-scale retrospective design, limited data collection via hospital discharge record abstraction, and unavailability of individual socioeconomic information. Further large scale research is warranted to investigate the negative impact of unemployment on cardiovascular diseases among residents of lower socioeconomic neighborhoods, which may help design suitable programmatic interventions during economic recessions.

In summary, this study suggests that the high state unemployment rate was a contributing factor to the increasing trend of acute MI occurrences in low socioeconomic neighborhoods in Raritan Bay region, New Jersey during the 2008-2009 economic recession.

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How to cite this article: Li Y, Rukshin I, Pan F, Sen S, Islam M, Yousif A, Rukshin V. The impact of the 2008-2009 economic recession on acute myocardial infarction occurrences in various socioeconomic areas of Raritan bay Region, New Jersey. *North Am J Med Sci* 2014;6:215-8.

Source of Support: Nil. **Conflict of Interest:** None declared.