National Economic Conditions and Patient Insurance Status Predict Prostate Cancer Diagnosis Rates and Management Decisions

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Purpose: The recent Great Recession from December 2007 to June 2009 presents a unique opportunity to examine whether the incidence of nonpalpable prostate cancer decreases while conservative management for nonpalpable prostate cancer increases during periods of national economic hardship.

Materials and Methods: We derived rates of national monthly diagnosis and conservative management for screen detected, nonpalpable prostate cancer and patient level insurance status from the SEER (Surveillance, Epidemiology and End Results) database from 2004 to 2011. We derived monthly statistics on national unemployment rates, inflation, median household income and S&P 500® closing values from government sources. Using linear and logistic multivariable regression we measured the correlation of national macroeconomic conditions with prostate cancer diagnosis and treatment patterns. We evaluated patient level predictors of conservative management to determine whether being insured by Medicaid or uninsured increased the use of conservative management.

Results: Diagnosis rates correlated positively with the S&P 500 monthly close (coefficient 24.90, 95% CI 6.29–43.50, p = 0.009). Conservative management correlated negatively with median household income (coefficient −49.13, 95% CI −69.29–−28.98, p <0.001). In a nonMedicare eligible population having Medicaid (OR 1.51, 95% CI 1.32–1.73, p <0.001) or no insurance (OR 2.27, 95% CI 1.93–2.67, p <0.001) increased the use of conservative management compared to that in men with private insurance. As indicated by a significant interaction term being diagnosed during the Great Recession increased the Medicaid insurance predictive value of conservative management (OR 1.30, 95% CI 1.02–1.68, p = 0.037).

Conclusions: National economic hardship was associated with decreased diagnosis rates of nonpalpable prostate cancer and increased conservative management.

Key Words: prostatic neoplasms, SEER program, United States/epidemiology, watchful waiting, early detection of cancer

Abbreviations and Acronyms

BLS = Bureau of Labor Statistics
CM = conservative management
CPI = Consumer Price Index
NCCN® = National Comprehensive Cancer Network®
PCa = prostate cancer
PSA = prostate specific antigen

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The Great Recession from December 2007 to June 2009 was the largest national economic contraction since the Great Depression, negatively impacting median household wealth, employment rates and individual access to health insurance.[1] During this period aggregate spending on medical

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care decreased. According to 1 study more than a quarter of Americans reported reductions in medical care use.[2]

It is plausible that national patterns of diagnosis and treatment of PCa may be sensitive to economic hardship imposed by events such as the Great Recession. PCa is prevalent in the American population and there are significant cost differences between CM and active treatment.[3] Studies published before the Great Recession suggested that screening for PCa was leading to the diagnosis of clinically indolent disease and others reported high numbers needed to treat to prevent 1 PCa related death.[4] Consequently faced with the significant medical costs associated with limited diagnostic and treatment efficacy at a time of increased economic uncertainty patients or their medical providers may have chosen less expensive patterns of medical care in aggregate.

It is important to account for insurance status when examining the correlation between negative national macroeconomic conditions and aggregate health care.[5–8] A large portion of reduced health care use during the Great Recession may be attributable to the 5 million Americans who lost health insurance.[9] However, claims based data showed significant decreases in preventive care even among insured patients.[6] Poor macroeconomic conditions may result in increased employer sensitivity to employee work absences or employee job loss, increasing the likelihood that access to health insurance and the generosity of health insurance offered to employees may be negatively affected. Aggregate wealth loss and increases in unemployment rates due to national recessions have been reported in previous studies to predict decreased use of routine medical care, notably prescription drug refills, inpatient stays for nonemergent conditions, and routine screening and other preventive care among insured individuals.[2,10,11] Studies at the individual level also suggest that cancer screening behavior[12,13] and aggressive treatment methods[14,15] are sensitive to the presence and generosity of insurance coverage.

We performed this study to evaluate whether the national incidence of nonpalpable, PSA screen detected PCa decreases and the use of CM for nonpalpable PCa increases during periods of national economic hardship. We also evaluated patient level predictors of CM to determine whether being insured by Medicaid or uninsured increases the use of CM.

METHODS

We identified all 237,646 patients from 2004 to 2011 in the SEER database with PCa diagnosed following elevated PSA (nonpalpable clinical stage T1c) on biopsy who had complete treatment data available. SEER data accounts for approximately 28% of the American population (http://seer.cancer.gov/about/overview.html). We estimated the monthly number of men diagnosed with cT1c PCa per million at risk adult males (age 18 years or greater) adjusted for yearly national population estimates from the United States Census Bureau (http://www.census.gov/). SEER data provided additional individual level information on patient race, age, geographic region and NCCN PCa risk level.[16] The insurance status (commercial, Medicaid or uninsured) of individuals in SEER was only available between December 2006 and December 2011 for patients younger than 65 years who were not insured by Medicare.

Data on monthly macroeconomic conditions and changes during our study period were derived from several sources. Data on the unemployment rate and the inflation rate measured by the All Urban CPI were obtained from the United States BLS (http://www.bls.gov/data/). S&P 500 closing levels were obtained from FRED® (http://research.stlouisfed.org/). Data on real median household income seasonally adjusted based on the All Urban CPI to the October 2015 United States dollar were obtained from Sentier Research (http://sentierresearch.com/), which derives data from the CPS (Current Population Survey) sponsored by the United States Census Bureau and the United States BLS.[17] Increases in inflation and unemployment are generally associated with periods of financial insecurity while increases in the S&P 500 and median household income are associated with periods of financial security. All data sources were publicly available.

We fit multiple linear multivariable regression models with different outcome variables, including 1) the monthly number of men diagnosed with cT1c PCa and 2) of those with cT1c PCa the proportion electing CM (no surgery or radiation therapy within 1 year of diagnosis). In regressions with the second outcome analyzing CM use only the 212,166 men with PSA less than 50 ng/ml and localized PCa (clinically N−/M−) were included. The Pearson test suggested that these macroeconomic measures significantly correlated with each other. S&P 500 closing correlated negatively with unemployment (coefficient −0.5180, $p < 0.0001$) and positively with inflation (coefficient 0.6112, $p < 0.0001$). Inflation correlated negatively with unemployment (coefficient −0.5370, $p < 0.0001$). Median household income correlated negatively with unemployment (coefficient −0.7546, $p < 0.0001$). To account for this collinearity we ran separate regressions for each national macroeconomic condition measure as a predictor of these outcomes and compared the results of each model mean square error as a measure of model goodness of fit.

Aggregate patient characteristics in each model included median patient age and the proportion of patients of black race. To account for nonlinearity we used logarithmic transformation for median patient age and macroeconomic measures.

Finally, we fit a separate logistic regression model using patient level data available in SEER to determine whether 1) insurance status was independently associated with CM and 2) the effects of insurance status and