Title: Macroeconomic Antecedents of Racial Disparities in Psychiatric Emergency Department Visits

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ABSTRACT

Psychiatric Emergency Department (ED) usage among African Americans exceeds that of all other race/ethnicities in the US. This trend is driven by low access and utilization of specialized outpatient mental health services among African Americans. Economic downturns can exacerbate these racial disparities in psychiatric ED by increasing help-seeking for newly developed or pre-existing disorders, combined with cost-shifting from private care to public safety nets. I use repeated cross-sectional time series data for 3.2 million psychiatric outpatient (treat-and-release) ED visits from five populous states (Arizona, California, North Carolina, New Jersey, New York) over six years (2006-2011) to test whether monthly decline in aggregate employment in a Metropolitan Statistical Area precedes a rise in African American psychiatric ED visits relative to whites. I use brief exposure (monthly employment change) lags of 0 to 3 months to eliminate confounding by long-run sequelae of economic contractions and estimate proximate responses to aggregate employment decline. Results from logistic regression analyses with race as the binary outcome indicator (African American = 1, white = 0) show that the odds of psychiatric ED visits for African Americans increase two and three months after ambient employment decline, relative to whites (OR: 1.012, p value <0.01). This increase is concentrated among those who do not have private health insurance (OR: 1.013, p value <0.05). Results remain robust to sensitivity analyses and alternate estimations using linear probability models. Findings from this study can inform pro-active policy measures for anticipating and delivering mental health services to vulnerable populations in periods of macroeconomic downturns.

INTRODUCTION

African Americans exhibit higher reliance on Emergency Departments (EDs) for psychiatric care relative to all other race/ethnicities combined[1] even though epidemiologic studies do not find a higher population level prevalence of mental disorders in this group.[2] High utilization of psychiatric emergency services indicates poor service delivery by mental health systems, which ideally, are meant to reduce psychiatric emergencies through continuum of care and coverage of vulnerable socio-demographic groups.[3,4] High ED utilization also imposes a significant burden on hospitals with respect to cost, time and staff capacity.[5,6] Mental health scholars contend that the disproportionately high rates of psychiatric ED usage among African Americans may cumulatively stem from lack of access to routine care, inferior quality of care, socio-cultural factors that subdue care-seeking and higher vulnerability to disruptive ambient changes.[1] African Americans are less likely to have access to and seek outpatient care from psychiatrists or specialized mental health professionals owing to high cost of treatment and lack of (or insufficient) insurance coverage.[7,8] Those who do access specialized care are more likely to be misdiagnosed and under-treated relative to other racial/ethnic groups, and are at a higher risk of discontinuing treatment due to receipt of poor-quality care, discrimination and lack of trust in physician providers.[9-12] For instance, studies show that African Americans are less likely to be prescribed safer antipsychotics relative to whites,[13-15] and more likely to be misdiagnosed with schizophrenia than warranted by epidemiologic prevalence estimates.[13,16,17] Neighborhood disadvantage[18] and stigma attached to mental illness among African Americans[19-21] also impose formidable barriers to seeking timely and adequate care. Exogenous ambient changes such as economic downturns tend to

disproportionately and adversely affect African Americans as they often possess fewer 'socio-economic buffers' (income sources, savings and assets) that confer financial security in times of economic uncertainty, employment loss or income decline.[22,23] These factors are thought to collectively underlie the wide racial disparities in ED psychiatric visits that currently exist in the United States.

However, few studies have examined causal antecedents of racial disparities in psychiatric ED visits. Economic recessions offer a unique circumstance for understanding the extent to which African Americans' reliance on EDs for mental illness is driven by ambient macroeconomic shocks. The exogenous nature of such ecological stressors eliminates the likelihood of reverse causation as higher psychiatric ED visits are extremely unlikely to cause economic downturns. Research linking economic downturns to mental health traces its origins to the late 19th century when it was first proposed that recessions could lead to marked changes in population level psychiatric pathology.[24] Later, recessions were empirically shown to increase admissions to mental health institutions and that these impacts were not necessarily limited to those who lost employment during economic contractions, but also spilled over and negatively influenced those who remained employed.[25-27] Mental health is vulnerable to economic downturns due to a combination of stress, loss of health care access and exacerbation of pre-existing conditions following involuntary job loss, financial insecurity and speculative fears regarding future employment loss.[28] Seminal work on the relation between macroeconomic conditions and social psychopathology identifies three broad pathways: a) provocation of new psychiatric illnesses b) uncovering of mental disorders c) cost shifting from private care to safety net health care facilities (such as Emergency

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Departments).[28-30] The provocation pathway suggests that economic recessions lead to a rise in 'newly disordered' psychiatric cases.[26,31-33] Uncovering posits that recessionary shocks might make it difficult for chronically ill patients to manage their pre-existing conditions either due to reduced resources (loss of income, health insurance, inability to continue medications) or due to increased reporting arising from low societal tolerance, higher individual risk averseness and prophylactic care-seeking.[29,34-37] Economic contractions tend to increase help-seeking through a combination of provocation and uncovering.[30] Cost shifting proposes that economic contractions may reduce access to resources (such as health insurance) forcing certain sections of the population to increase their reliance on public safety-net facilities.[30,35,] Consequently, following economic decline, one would expect to observe higher utilization of safety-nets such as Emergency Departments with the most pronounced increase among those without private health insurance.

In the United States, during the time period preceding the 2008 recession (1992 to 2001), adult psychiatric ED visits rose by 28% compared to the prior decade.[38] African Americans had the highest population rates of psychiatric ED visits, followed by non-Hispanic whites. Between 2006 and 2011, ED visits rose by 53.3% among adults with mental health disorders (12 million visits in 2006, 18.4 million visits in 2011).[39] Visit rates were higher among those covered by Medicaid and Medicare compared to the privately insured or uninsured.[39] Federal spending on behavioral health increased by almost 54% from 7.2% in 2004-07 to 11.1% in 2008-09, and (as predicted by cost-shifting) was driven by a decline in private insurance coverage and a rise in federal spending on Medicaid.[40]

To my knowledge, there exist no longitudinal studies that have examined whether the hypotheses described in the foregoing hold true for African American-white racial disparities in ED utilization for psychiatric outcomes. African Americans are acutely sensitive to economic downturns. The economic recession of 2008 was associated with higher loss of employment, income and health insurance among African Americans relative to all other races combined.[41-44] Construction, manufacturing and service sectors, which were particularly hard hit, employed a large number of African Americans in temporary, low-wage positions.[45] Studies show that when such firms start to fold, African Americans are the first to be fired.[46] In addition, African Americans often face socially-imposed disadvantages during economic downturns. A variant of the uncovering pathway, referred to as 'reduced tolerance', posits that during times of economic hardship, communities at large become risk averse and less tolerant towards aberrant or deviant behavior.[28,47] Reduced tolerance invokes the frustration-aggression-displacement theory wherein communities may use certain groups as scapegoats in times of heightened ambient stress.[48] Tests of this theory show that civil commitment of African American males to mental health institutions rises during times of economic uncertainty despite higher psychological functioning relative to whites, indicating lower societal tolerance and greater selective persecution than during economic stability.[28,47] African American psychiatric ED visitors are more likely to be brought in by the police relative to other race/ethnicities[49], and in alignment with 'reduced tolerance', forced or involuntary psychiatric ED visits tend to increase with rise in unemployment.[50,51] These trends are not limited to working-age adults who are likely to be directly affected by economic downturns. African American youth and pediatric

populations also show an increase in psychiatric emergency services utilization following ambient macroeconomic shocks.[52] Taken together, there exists strong evidence of African Americans' higher exposure to the consequences of economic recessions that in turn, may elicit differential psychiatric help-seeking response and increase their reliance on safety-net systems such as Emergency Departments for mental health care relative to whites.

I aim to examine if regional employment decline (in Metropolitan Statistical Areas) during the 2008 economic recession increased racial disparities (African Americans versus whites) in ED use for psychiatric disorders. I hypothesize that metropolitan employment decline between 2006 to 2011 would precede an increase in help seeking in EDs for psychiatric outcomes among African Americans relative to Whites. I further aim to test partial support for cost shifting to determine whether help seeking among African Americans relative to whites during this time, as predicted by theory, concentrates among those without private insurance.

METHODS

Variables and Data

I retrieved psychiatric ED visit data for African Americans and whites from the State Emergency Department Database (SEDD) which is the most comprehensive census of ED visits (in participating states) in the US.[53] SEDD is sponsored by the Agency for Healthcare Research and Quality (AHRQ) and is made available for purchase under the Healthcare Cost Utilization Project (HCUP) for thirty six states in the country. It comprises

of encounter level data for all emergency department visits that did not result in hospitalization and cross-validation with hospital-level databases such as the American Hospital Association shows that almost 99% hospitals are covered in SEDD.[54] I obtained this data for six years spanning 2006 to 2011 for states with uniform, monthly reporting of ICD-9 psychiatric diagnoses, race/ethnicity, gender, insurance status of ED visitor (psychiatric), age and county. These restrictions yielded five states namely Arizona, California, North Carolina, New Jersey and New York. For analysis, I define race as a binary outcome variable (African American = 1; white = 0) to examine whether changes in exposure (area level monthly employment decline) increase the odds of a psychiatric ED visit by an African American relative to white.

I operationalize exposure as monthly change in employment = $(x_{m-1} - x_m)/(x_{m-1})$ where x_m is the number of people employed in a Metropolitan Statistical Area (MSA) in a particular month, x_{m-1} is the number of people employed in the previous month and monthly employment change in gives the percentage change in employment in a given month relative to the previous month. A positive value of this variable indicates employment decline and a negative value signifies aggregate employment gain. This specification models acute changes in a regional urban economy (MSA) in that it is zero (or of negligible value) if there is very little change in number of employed people, but high (either negative or positive) in circumstances of abrupt economic decline or expansion. Employment change accounts for changes in the civilian labor force and is well suited for modelling economic recession as 'shocks'. It represents the deviation of aggregate employment levels from their steady state (periods of non-significant economic change) when number of employed people falls sharply due to reduction in number of jobs or

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withdrawal of marginally attached workers from the labor force. Month-to-month variation in employment change overcomes the drawbacks of unemployment rate, mass layoffs and foreclosures as (a) its negative externality is not limited to only those eligible for unemployment insurance[55] or those who experience home foreclosures,[56-58] (b) represents immediate change and accounts for inflows, outflows or changes in the civilian labor force[59] and (c) does not present sizeable directional distortion during brief periods of economic expansion.[60-62] Its suitability as an indicator of the 'ripple effects' of economic recessions is evidenced by its use in literature linking economic contractions to health outcomes.[63-65] I retrieved MSA level seasonally adjusted monthly employment data from the Bureau of Labor Statistics' Local Area Unemployment Statistics (BLS-LAUS) database[66] and merged it to psychiatric ED visits from SEDD using county-MSA crosswalk files[67] deriving a total of 56 MSAs (5 states) for 72 months (2006-2011). In keeping with past research on the incubation period of increase in psychiatric symptoms, ED visits and hospitalizations following ambient shocks, I test for association between employment decline and ED visits for zero to 3 month lags. [33,34,52,68] This short lag period tests for proximate responses to exposure and avoids potential confounding by other factors that may follow monthly employment decline 'shocks' during economic recessions but take longer to manifest (such as home foreclosures).

Analysis

I estimate the following model that relates the odds of an African American psychiatric ED visit (relative to a white visit) to employment decline using logistic regression:

$$\frac{\pi(Yi,r,t,m)}{1-\pi(Yi,r,t,m)} = \exp[\beta_0 + \sum_{n=1}^{4} \beta_n X_{r,t,m-n+1} + \beta_5 * sex + \beta_6 * age + \beta_7 * age^2 + $$

$$\beta_8 * insurance + \gamma_r + \gamma_r * t + \gamma_r * m + \mu * t * m + \varepsilon] \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

where $\pi(Yi,r,t,m)$ is the probability of outcome variable Y (representing race, 1 for African American and 0 for white) for individual i in MSA r during year t and month m. $\frac{\pi(Yi,r,t,m)}{1-\pi(Yi,r,t,m)}$ is the odds ratio of a psychiatric diagnosis occurring in African Americans (Y = 1) relative to whites (Y = 0) conditional on all covariates. The set of $\sum X_{r,t,m-n+1}$ (n = 1 to 4) are the four variables of interest that represent employment change X in MSA r, year t and month m, $m-1$ (month lagged by 1, n = 2), $m-2$ (lag 2, n = 3) and $m-3$ (lag 3, n = 4) respectively. I include individual level controls for gender (females = 1), age, age squared and insurance status (private = 1, public = 2, uninsured = 3). Indicators for each MSA, γ_r , control for any time-invariant MSA level factors that may be correlated with both employment change and race differences in psychiatric ED visits. γ_r*t and γ_r*m are the vectors of MSA specific year and month fixed effects (respectively) that account for annual (e.g. closure of Emergency Departments[69]) or seasonal variations in psychiatric disorders within an MSA. $\mu*t*m$ is the combination of state, year and month indicators that absorb state level influence on employment change for each month and year in the study period. I use cluster robust standard errors to account for heteroscedasticity. I estimate separate models to test the cost shifting hypothesis by stratifying equation (1) by insurance status.

As a robustness check, I test the consistency of direction of association between the dependent and independent variables in equation (1) through a linear probability

model using OLS regression (binary outcome) with identical specification to equation (1). I also estimate separate models by age groups (<18 years, 18 to 64 years and > 64 years) to test whether groups that do not form a large part of the civilian labor force and are expected to have health insurance through CHIP, Medicare or Medicaid (i.e. <18 years and >64 years) do not show as strong an association between exposure and outcome as do individuals most likely to be directly impacted by economic decline, i.e. those between 18 to 65 years of age.

The inclusion of the year 2011 raises an important concern regarding changes in psychiatric ED visits due to insurance coverage expansion under the Affordable Care Act (ACA).[70] Studies show that after the initial provisions of mental health parity under the ACA took effect in 2010, there was a rise in ED visits among the newly insured[71,72] and among new Medicaid recipients who were not accepted by primary care physicians.[73] It is plausible that newly insured African Americans may have increased ED utilization for mental health after 2010, as suggested by findings from the Oregon health insurance experiment wherein expansion of insurance coverage coincided with a rise in overall ED visits.[74] I conduct sensitivity analysis by estimating equation (1) for all years excluding 2011 to test whether the association between employment decline and psychiatric ED visits matches results from full sample (all years) analysis. All statistical operations are conducted using Stata SE version 14.2.[75]

Results

Table 1 shows the descriptive statistics of my analytic sample. Between 2006-2001, there are a total of 472,081 psychiatric ED visits among African Americans and

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2,719,714 visits among whites, yielding a total sample of approximately 3.2 million visits. The number of visits are highest among those without private health insurance (public insurance + uninsured). The outcome variable, employment change, has a positive mean of 0.02, indicating a general period of employment decline reaching a maximum of 13.7.

Figure 1 shows state-specific trends in ED visit rates (per 100,000 population) by race. The positive slopes of ED visit rates for both races cohere with national trends in emergency department utilization for psychiatric care over the study period.[38,39] The graph lines for some states appear discontinuous or overly smoothened in Figure 1 because SEDD does not provide data for certain state-years (2006 and 2008 for North Carolina; 2010 for California; 2007 and 2008 race not reported for Arizona). Figure 2 shows the monthly mean of employment decline averaged across 56 MSAs over the study period. In figure 2, positive values (above zero) indicate aggregate employment loss and negative values indicate employment gain.

Table 2 presents the results of logistic regression analysis for outpatient psychiatric ED visits among African Americans and whites. Employment decline at zero and first month lag shows no relation with visit odds of African Americans relative to whites. However, employment decline lagged by 2 and 3 months is associated with increase in the odds of an African American psychiatric ED visit relative to white. A unit increase in employment decline two months ago (m-2) increases the odds of an African American ED visit by 1.2% (compared to white) and this association persists at exposure lag of three months but is slightly diminished in magnitude. Female sex is associated with lower odds of African American psychiatric ED visits. Compared to the privately

insured, public insurance and no insurance status predict higher African American visits relative to white.

Table 3 presents the results of logistic regression by insurance groups. The magnitude of association between odds of African American ED visits and 2nd and 3rd lags of monthly employment decline is consistent with Table 2 and of greater magnitude (1.3% at lag 2 and 1% at lag 3) among those without private insurance. Among those with public insurance only (uninsured not included), odds of African American ED visits increase by 1.7% with a unit increase in employment decline at lag 3. We observe no relation between employment decline and the odds of African American ED visits at all specified lags (0 to 3) for the privately insured.

Tables A.1 to A.3 (Appendix) present results from robustness and sensitivity checks. Coefficients from OLS regression-based linear probability models (Table A.1) show consistency with results from Tables 2 and 3 in the direction of association between employment decline and outcome. Table A.2 presents logistic regression results by age groups. As anticipated, the association between employment decline at lag 2 and increase in odds of African American psychiatric ED visits relative to whites is driven by the age group of 18 to 64 years. The magnitude of this association is similar to results from Table 2. Pediatric populations (< 18 years old) show a 4.2% increase in the odds of African American visits at employment decline at zero lag. This suggests a faster and more acute response to the exposure among children and aligns with findings from prior research on metropolitan economic decline and pediatric health.[52, 65] Table A.2 shows logistic regression results of sensitivity analysis after excluding the year 2011. Results are similar to those described in Table 2. The magnitude of association between

employment decline at lag 2 and odds of African American ED visits (relative to whites) is slightly higher than in Table 2 indicating that the initial expansion of ACA may have *reduced* racial disparities in psychiatric ED utilization.

DISCUSSION

African Americans remain a vulnerable group with respect to mental health owing to various cultural, systemic and economic factors in accessing and receiving adequate care. Their higher reliance on Emergency Departments for psychiatric disorders, relative to all other race/ethnicities in the US, portends poor continuity of treatment for patients and a higher cost burden on patients as well as emergency psychiatry services. Ambient shocks such as economic downturns may increase ED reliance for help-seeking among African Americans owing to their differentially greater vulnerability and exposure to employment loss, income reduction and related consequences of recessions. I focused on racial disparities between African Americans and whites with respect to ED psychiatric visits and tested whether a decline in aggregate employment precedes a rise in the individual level odds of African American visits relative to whites over a time period that included the 2008 economic recession. I used high quality Emergency Department data for 56 Metropolitan Areas (5 states) spanning 72 months from 2006 to 2011. Results from logistic regression analysis show that employment decline during the study period increased the odds of African American visits relative to whites two to three months after initial exposure. Furthermore, as predicted by help-seeking and cost shifting hypotheses, this effect was present only among those without private health insurance and not among the privately insured.

Strengths of this study include the use of 3.2 million psychiatric ED encounters and longitudinal analysis of repeated cross-sectional time series data. I utilized objectively defined clinical psychiatric ICD 9 diagnoses that reduce measurement errors associated with self-reported data. Brief exposure time lags rule out confounding that may arise from long-run sequelae of economic downturns. To my knowledge, there are no studies that have explored this association and determined precise temporal precedence of aggregate employment decline over rise in racial disparities in ED psychiatric visits.

An important limitation of this study is the inability to distinguish between emergent and non-emergent users of emergency departments. Aggregate employment decline may increase non-emergent ED usage (not limited to psychiatric visits only)[76], without increasing the incidence or severity of illnesses. Owing to data limitations in SEDD, I cannot identify whether the observed (relative) increase in African American visits is driven by true psychiatric emergencies or is a consequence of higher utilization by non-emergent cases. While the help-seeking and cost-shifting hypotheses that I test do not necessitate this delineation, future research can analyze emergent and non-emergent users separately to distinguish changes in aggregate incidence of psychiatric disorders from increase in usage intensity of emergency psychiatric services. In addition, I do not have information regarding voluntary or involuntary nature of the psychiatric ED visits analyzed. African Americans with mental illness are often brought to the ED coercively, either by the police or public health authorities[49], and their involuntary hospitalization to psychiatric institutions increases during economic downturns.[50,51] Availability of data on voluntary versus involuntary nature of psychiatric ED visits can

help future research examine whether such coerced and involuntary visits increase racial disparities in outpatient ED utilization during periods of ambient economic decline.

CONCLUSION

Emergency departments are quite aptly regarded as "the safety-net of safety-nets".[69] In the current context where mental illness is projected to become the leading cause of disability worldwide[77,78], crisis oriented care offered in Emergency Departments is severely limited in its ability to ensure the continuity of care and case management required for proper treatment of psychiatric conditions. High psychiatric ED reliance among African Americans reflects the inadequate reach of mental health systems in providing adequate and timely care to this group. It is plausible that this mental health services 'gap' expands during economic recessions when public health agencies face funding shortages and may have to reduce supply. My analysis shows that African Americans increase psychiatric ED utilization than do whites during times of ambient economic decline and these findings can be used to inform and develop anticipatory measures for expanding mental health services during economic crises for minority populations who are at the greatest risk of being adversely affected.

Table 1: Descriptive Statistics

Attributes	African American	White
Sample size (%)	472,081 (15%)	2,719,714 (85%)
Females	241,415	1,457,730
Males	230,666	1,261,984
Mean Age (Std. Dev.)	39.9 (16.4)	44.3 (19.5)
Private insurance	87,875	723,115
Public insurance	213,769	1,252,927
Uninsured	170,473	743,672
Mean Employment Change (Std. Dev.)	0.023 (0.5)	
Employment Change: Range	Minimum: -8.9	Maximum: 13.7

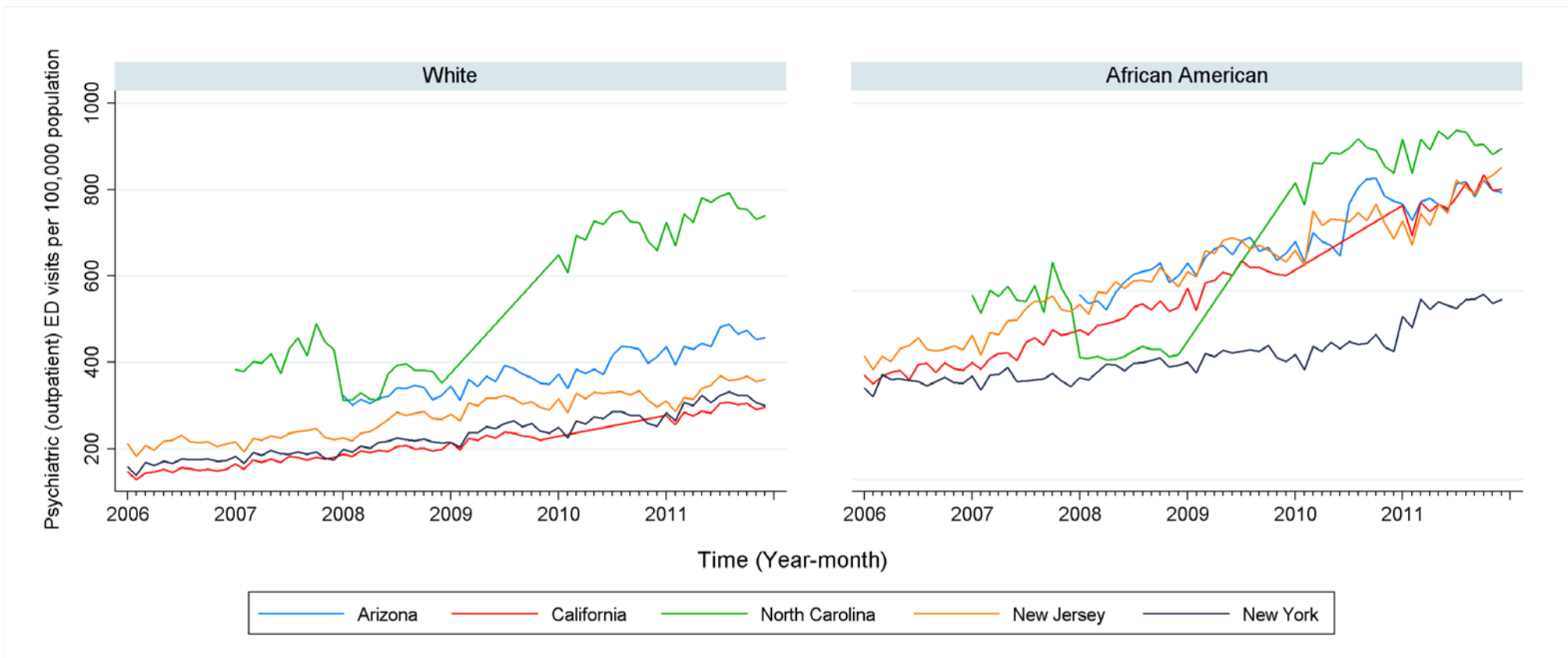Figure 1: State-specific trends in ED visit rates per 100,000 population (2006-2011), by race

Figure 2: Mean employment decline (monthly averages over 56 MSAs, 2006-2011)

Table 2: Logistic regression results (full sample, N = 3,116,880)

Variables	Odds Ratio	Standard error	95% Confidence Interval
Employment decline (lag 0)	1.004	0.005	[0.995 1.013]
Employment decline (lag 1)	1.002	0.005	[0.992 1.011]
Employment decline (lag 2)	1.012**	0.005	[1.003 1.021]
Employment decline (lag 3)	1.009*	0.005	[1.000 1.019]
Sex: Female (reference = male)	0.946***	0.003	[0.939 0.952]
Insurance status (reference = private)			
Public	2.179***	0.005	[2.159 2.200]
Uninsured	1.733***	0.005	[1.717 1.750]
Age	1.031***	0.000	[1.029 1.030]
Age squared	0.999***	0.000	[0.999 0.999]

*pvalue < 0.05; **pvalue < 0.01; ***pvalue < 0.001*

Table 3: Logistic regression results stratified by insurance status

Variables	Without Private insurance (public insurance + uninsured)			Public insurance			Private insurance		
	Odds ratio	Standard error	95% confidence interval	Odds ratio	Standard error	95% confidence interval	Odds ratio	Standard error	95% confidence interval
Employment decline (lag 0)	1.000	0.005	[0.989 1.011]	1.009	0.008	[0.993 1.024]	1.017	0.009	[0.998 1.036]
Employment decline (lag 1)	1.001	0.006	[0.990 1.012]	1.003	0.008	[0.987 1.019]	1.008	0.009	[0.989 1.028]
Employment decline (lag 2)	1.013*	0.005	[1.003 1.023]	1.014	0.007	[0.999 1.029]	1.011	0.009	[0.992 1.029]
Employment decline (lag 3)	1.011*	0.005	[1.001 1.022]	1.017*	0.008	[1.002 1.032]	1.003	0.009	[0.985 1.022]
Sex: Female (reference = male)	0.955***	0.004	[0.948 0.962]	0.959***	0.005	[0.949 0.969]	1.019*	0.008	[1.005 1.035]
Age	1.026***	0.005	[1.025 1.027]	1.023***	0.000	[1.021 1.024]	1.016***	0.001	[1.014 1.018]
Age squared	0.999***	0.000	[0.999 0.999]	0.999***	0.000	[0.999 0.999]	0.999***	0.000	[0.999 0.999]
Sample size (N)	2,319,793			1,423,416			795,568		

*pvalue < 0.05; **pvalue < 0.01; ***pvalue < 0.001

APPENDIX

Table A.1: OLS regression results from Linear Probability Models

Variables	Full sample			Without private insurance (Public insurance + Uninsured)			Public insurance			Private insurance		
	Coefficient	Standard error	95% confidence interval	Coefficient	Standard error	95% confidence interval	Coefficient	Standard error	95% confidence interval	Coefficient	Standard error	95% confidence interval
Employment decline (lag 0)	0.000	0.001	[-0.001 0.001]	(-)0.000	0.001	[-0.001 0.001]	0.001	0.001	[-0.001 0.002]	0.002	0.001	[-0.001 0.004]
Employment decline (lag 1)	0.000	0.001	[-0.001 0.001]	0.0002	0.001	[-0.001 0.002]	0.000	0.001	[-0.001 0.002]	0.001	0.001	[-0.002 0.003]
Employment decline (lag 2)	0.002**	0.001	[0.001 0.003]	0.002**	0.001	[0.001 0.003]	0.002*	0.001	[0.000 0.003]	0.001	0.001	[-0.001 0.004]
Employment decline (lag 3)	0.001*	0.001	[0.000 0.002]	0.001*	0.001	[0.00 0.003]	0.002*	0.001	[0.000 0.003]	0.000	0.001	[-0.002 0.003]
Sex: Female (reference = male)	-0.006***	0.000	[-0.007 - 0.001]	-0.005***	0.001	[-0.006 -0.005]	-0.004***	0.001	[-0.005 0.003]	0.002**	0.001	[0.001 0.003]
Age	0.002***	0.000	[0.002 0.002]	0.002***	0.000	[0.001 0.002]	0.001***	0.000	[0.001 0.001]	0.001***	0.000	[0.001 0.002]
Age squared	(-)0.00***	0.000	[(-)0.000 (-)0.000]	(-)0.00***	0.000	[(-)0.000 (-)0.000]	(-)0.00***	0.000	[(-)0.000 (-)0.000]	(-)0.00***	0.000	[(-)0.000 (-)0.000]
Insurance status (reference = private)				--	--	--	--	--	--	--	--	--
Public	0.082***	0.001	[0.081 0.083]	--	--	--	--	--	--	--	--	--
Uninsured	0.061***	0.001	[0.059 0.062]	--	--	--	--	--	--	--	--	--

*pvalue < 0.05; **pvalue < 0.01; ***pvalue < 0.001

Table A.2: Logistic regression results stratified by age groups

Variables	*< 18 years old*			*18 to 64 years old*			*> 64 years old*		
	Odds ratio	**Standard error**	**95% confidence interval**	**Odds ratio**	**Standard error**	**95% confidence interval**	**Odds ratio**	**Standard error**	**95% confidence interval**
Employment decline (lag 0)	1.042*	0.019	[1.004 1.082]	1.002	0.005	[0.992 1.012]	1.002	0.012	[0.979 1.026]
Employment decline (lag 1)	1.016	0.019	[0.979 1.055]	0.999	0.005	[0.989 1.010]	1.001	0.014	[0.973 1.029]
Employment decline (lag 2)	1.010	0.018	[0.976 1.045]	1.012*	0.005	[1.003 1.022]	1.006	0.012	[0.982 1.031]
Employment decline (lag 3)	1.029	0.019	[0.992 1.067]	1.008	0.005	[0.998 1.018]	0.996	0.012	[0.973 1.019]
Sex: Female (reference = male)	0.931***	0.015	[0.904 0.958]	0.967	0.004	[0.959 0.974]	0.861***	0.011	[0.839 0.882]
Insurance status (reference = private)									
Public	3.401***	0.018	[3.288 3.519]	2.225***	0.005	[2.203 2.247]	0.949**	0.019	[0.914 0.987]
Uninsured	2.228***	0.023	[2.129 2.331]	1.816***	0.005	[1.798 1.835]	1.521***	0.056	[1.414 1.635]
Sample size (N)	155,046			2,519,975			442,673		

*pvalue < 0.05; **pvalue < 0.01; ***pvalue < 0.001

Table A.3: Logistic regression results excluding year 2011 (N = 2,224,053)

Variables	Odds Ratio	Standard error	95% Confidence Interval
Employment decline (lag 0)	1.006	0.005	[0.995 1.017]
Employment decline (lag 1)	1.009	0.006	[0.999 1.021]
Employment decline (lag 2)	1.021***	0.005	[1.010 1.031]
Employment decline (lag 3)	1.011*	0.005	[1.001 1.022]
Sex: Female (reference = male)	0.949***	0.004	[0.942 0.957]
Insurance status			
(reference = private)			
Public	2.134***	0.006	[2.109 2.158]
Uninsured	1.698***	0.006	[1.679 1.718]
Age	1.029***	0.001	[1.028 1.030]
Age squared	0.999***	0.000	[0.999 0.999]

*pvalue < 0.05; **pvalue < 0.01; ***pvalue < 0.001*

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