Differences in the Effects of the Great Recession on Health Outcomes among Minority Working-Age Adults

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Received: 25 April 2014 / Revised: 21 August 2014 / Accepted: 22 August 2014 / Published online: 11 September 2014
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Abstract

Introduction We examined the effects of the Great Recession (December 2007–June 2009) among vulnerable adults who may be at high risk of poor health and low access to health care.

Methods Our primary outcomes of interest were self-reported health status (fair/poor versus good/very good/excellent), and foregoing needed health care due to cost in the past 12 months.

Results Racial and ethnic minorities, except Asians, experienced higher rates of poor/fair health and higher rates of forgone medical care than did White adults. Hispanic and AIAN adults experienced differential effects of the Great Recession, as compared to White adults.

Conclusions Understanding how vulnerable populations react in times of economic flux will enable policy makers to identify strategies/policies to lessen the burden experienced by vulnerable adults.

Keywords Racial and ethnic minority • Recession • Health • Access to care

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The sustained economic downturn of December 2007–June 2009, also known as the Great Recession (hereafter, the Recession) [1], had drastic effects on working adults. In the USA, the annual average unemployment rate, 6.0 % in 2003, rose to a high of 9.6 % in 2010 [2]. Prior to the Recession, the unemployment rate for Black individuals exceeded those rates for White and Asian individuals ([3], p. 1) specifically, the unemployment rate for Black adults has consistently been double that for White adults for at least 60 years [4]. Labor force participation rates were lowest for American Indian and Alaska Native (AIAN) individuals, followed by Black individuals in 2011 [1].

The employment gap also affects one's health insurance status via employer-sponsored health insurance. Employer-sponsored health insurance serves as the largest source of health insurance for adults (under 65) in the USA [5]. The loss of employment may result in the loss of health insurance for millions of Americans. Among families experiencing job loss by one or more workers in 2010, 47 % also reported loss of employer-sponsored health insurance [6]. Before, during and after the Recession, White individuals had lower rates of being uninsured when compared to Black, Asian, and Hispanic individuals [7–9]. Being uninsured is one barrier to accessing health care, while the cost of health care is another.

The number of working age adults (ages 19–64) who reported cost-related access problems for healthcare increased from 64 million in 2005 to 75 million individuals in 2010 ([6],

p. XII, Exhibit ES-3), Medical debt was also growing for those under 65 [10], especially in the Recession [11], where those with medical debt were also more likely to forgo needed care than those without such debt (2007–2010) [10]. The number of individuals reporting having any bill problem or medical debt, was up by 15 million from 2005 to 2010 ([6], p. XII, Exhibit ES-3) These financial pressures may lead to health-related issues as well.

Financial stressors may be associated with poor quality of life for many. Persons over 50 years of age who were delinquent in their mortgage were more likely to report depressive symptoms than those not delinquent on their mortgages [12]. Unemployment has been associated with poor life evaluation, being worried and being sad during the Recession ([13], p. 16, 39–40). In addition, poor health outcomes (e.g., higher rates of diabetes and hypertension) have been shown to be higher in firms with higher rates of layoffs or downsizing [14]. In a small study in Philadelphia, individuals undergoing home foreclosure were at higher risk than others in the same community for lacking health insurance and prescription non-adherence due to cost; at the same time, Black individuals were more likely to be in the foreclosure group [15]. Historically, disparities in health, utilization and access, have been present for vulnerable populations. When compared to White populations, non-White populations in the US are more likely to report having unmet health needs, and “to forgo needed medicines” ([16], p. 1305).

Examining self-reported health status adults aged 25–74 for the years 1988–2007, Braveman and colleagues found that, when compared to White populations at any level of educational attainment, Black, Hispanic, Native Hawaiian/Pacific Islander, and Asian populations have higher rates of below excellent/very good health status ([17], Table 2). Various measures of health (i.e., self-reported health including quality of life, depression, and having depressive symptoms) differ across racial/ethnic groups (i.e., Native American and Alaskan Native populations) [18–20].

Racial/ethnic disparities in the proportions of adults who lacked health insurance were consistent across the Recession, even as rates of insurance varied. In 2004, a greater proportion of American Indian (35 %) and Hispanic (35 %) adults under age 65 lacked health insurance than similar non-Hispanic Black (18 %), Asian (16 %), and non-Hispanic White (12 %) non-elderly adults ([21], p. 55). The proportion of persons who lack health insurance increased throughout the Recession [22].

Social Determinants of Health

The social–ecological model proposed by McLeroy et al. [23] and the conceptual framework for action on the social determinants of health proposed by Solar and

Irwin [24] both stress the importance of one’s environment for health. Individual and community environmental and sociodemographic characteristics play an important role in personal health. An individual’s environment includes socio-demographic characteristics of neighborhoods, or states and rurality [25].

Income, education, and employment are examples of social determinants of health that may be related to health effects in times of economic decline. Minority populations within the USA tend to fare worse in such social determinants. This is true for educational attainment ([26–28], p. 5), health literacy [29], income ([27], p. 13), and poverty rates [30]. Differences in wealth between racial and ethnic groups are closely tied to disparities in self-reported health [31]. Thus, minority adults may be at greater risk of having poor health and have greater barriers in seeking care.

Purpose

The study of past economic crises and population health during these events has been highlighted as a means to better understand and prepare for future crises [32]. We examined whether adverse economic changes from the Recession were associated with adverse changes in health care utilization and health outcomes, and whether these changes were greater among minority populations. We measured whether the Recession and subsequent recovery had differential effects on general health status and cost-related forgone medical care among non-White working-age adults, compared to White working-age adults.

Methods

Population Studied

The target population was non-institutionalized working aged adults (ages 18–64) residing in the USA between the years 2004 and 2010. Individual level information is taken from the Behavioral Risk Factor Surveillance System (BRFSS). The base number of observations, before applying inclusion criteria, for each year under study are 303,822 for 2004, 356,112 for 2005, 355,710 for 2006, 430,912 for 2007, 414,509 for 2008, 432,607 for 2009, and 451,075 for 2010 [33] (Centers for Disease Control and Prevention, 2000–2011).

We restricted samples to those aged 18–64 years of age. Only observations with complete data for race, sex, education, insurance status, employment status, place of residence (i.e., rural vs. urban), diabetes status, and disability status were retained (1,823,347 observations, with per-year numbers ranging from 214,633 to 287,730; see Table 1).

Table 1 Race/ethnicity identification of working age adults, BRFSS 2004–2010, with complete data on race, sex, education, insurance status, employment status, diabetes status and disability status

	2004	2005	2006	2007	2008	2009	2010
Race							
Hispanic							
<i>n</i>	15,671	18,396	18,139	25,033	22,879	23,150	24,540
%	15.16	15.49	15.69	16.40	17.17	16.71	15.95
SE	0.201	0.190	0.213	0.193	0.185	0.180	0.156
AIAN							
<i>n</i>	3,719	4,478	4,051	4,862	4,497	4,522	4,574
%	1.13	1.13	1.18	1.21	1.09	1.10	1.15
SE	0.042	0.041	0.050	0.045	0.038	0.038	0.042
Asian							
<i>n</i>	2,695	4,677	4,379	5,002	5,177	5,674	5,861
%	2.67	2.94	2.96	3.46	3.28	3.64	3.98
SE	0.092	0.086	0.098	0.102	0.091	0.099	0.096
Black							
<i>n</i>	19,198	20,826	20,933	24,980	24,509	25,086	26,100
%	10.50	10.28	9.99	10.26	10.54	10.90	10.59
SE	0.124	0.120	0.126	0.125	0.126	0.137	0.115
White							
<i>n</i>	173,350	1995,23	194,706	227,853	217,419	217,407	219,481
%	70.54	70.17	70.18	68.67	67.92	67.65	68.34
SE	0.216	0.202	0.227	0.207	0.201	0.203	0.182
Total	214,633	247,900	242,208	287,730	274,481	275,839	280,556

Note: *n* is not weighted for the complex sampling frame of the BRFSS

Note: Percentages are weighted for the complex sampling frame of the BRFSS

Dependent Variables

The primary outcomes of interest were general health status (fair or poor versus good, very good, or excellent) [34] and forgone medical care due to cost (time in the past 12 months when one needed to see a doctor but could not because of cost).

Individual Independent Variables

Race and ethnic categories are included in our analyses at the individual-level, and are based on the individual's reported preferred race/ethnicity category. Categories include: American Indian or Alaska Native (AIAN), White, Black or African American, Asian, and Hispanic with varying sample sizes for each year under study.

Individual Level Control Variables

Insurance status is included (2005 BRFSS codebook: "Do you have any kind of health care coverage, including health insurance, prepaid plans such as HMOs, or government plans such as Medicare") to assess differences across insurance status.

Income was coded as annual household income from all sources into categories: less than \$15,000, \$15,000 to less than \$25,000, \$25,000 to less than \$35,000, \$35,000 to less than \$50,000, \$50,000 or more, and don't know/not sure/missing.

The don't know/not sure/missing category was included in analyses to reduce the bias associated with the high rates of failing to report income in the BRFSS (approximately 13 % reflecting the weighted percent taken from BRFSS codebook in 2004 and 2010).

Education was recorded in categories: did not graduate high school, graduated high school, attended college or technical school, or graduated from college or technical school.

Employment status was recorded in categories: employed (employed for wages, self-employed), unemployed (out of work for more than 1 year, out of work for less than 1 year), other (a homemaker, a student, retired, unable to work).

We included indicators of disability and diabetes status in our analysis. This reduces the effect of confounding due to the link between disease/disability status and race ([35], p. 1240). Diabetes is more prevalent among Black and AIAN individuals than all other races [36, 37]. The diabetes indicator included all respondents reporting they had diabetes, with the exception of: (1) *yes, but female told only during pregnancy*, (2) *pre-diabetes or borderline diabetes*, and (3) *don't know/not sure, refused, not asked, or missing*. For disability, indication was defined as the response *yes* versus non-indication *no (not disabled)*, while removing from analyses responses for *refused* and *don't know/not sure*.

We used county-level information to ascertain rurality. This information was linked to our individual data via federal

information processing standards codes (FIPS Codes) present in both the BRFSS and the Area Resource File (ARF 2010–2011). Urban Influence Codes (UICs) were used to identify rural/urban sub-groups. We specify UICs at 1 or 2 as urban and 3–12 as non-urban (defined as rural in the current analysis). We treat this as a fixed effect at the person-level as this classification is the same for any individual within each county and does not vary within the county. Because BRFSS public use data suppress county identifiers for low-population counties with a population below 10,000, we also include “missing” as a non-interpretable category under rurality, to reduce data loss for multivariable analysis.

Contextual Control Variables

Measures of state socio-economic characteristics related to the Recession may serve as unmeasured confounders between states. We include two state-level characteristics in our fully adjusted logistic regression models: annual poverty rates, measured at the state-level (2010–2011) [38, 39], and unemployment rate for 2004–2010 derived from the Bureau of Labor Statistics Local Area Unemployment Rates for states [40].

Analysis

We present results from bivariate and multivariate analyses. In addition to summary statistics, we use logistic regression to assess the likelihood of reporting poor/fair health (versus good, very good, or excellent) and separately reporting forgone medical care in the past 12 months due to cost (versus not). We account for the complex sampling frame of the BRFSS in all analysis using appropriate survey procedure in SAS 9.4 (SAS Institute, Cary, NC).

In all multivariable analyses, including those which assess whether differential effects of the Recession were experienced by racial and ethnic minorities as compared to Whites, we included pre-disposing and enabling factors based on our theoretical model adapted from the WHO’s Conceptual Framework for Action on the Social Determinants of Health. We also included need characteristics of disability and diabetes status in the model. Our final model included individual covariates as well as state-measured annual poverty rates and unemployment rates (see Table 4). Institutional Review Board (IRB) approval was granted by the University of South Carolina.

Results

Population Characteristics and Pre-Recession Differences

Working-age adults tapped by the BRFSS were primarily White individuals followed by Black, Hispanic, Asian, and

AIAN adults (see Table 1). Table 2 highlights race-based disparities in the social determinants of health averaged across the entire study period (2004–2010). Individuals reporting the lowest income category (at below \$15,000 annual income) included a low of 4.72 % for Asian adults, followed by White (6.47 %), Black (17.43 %), Hispanic (18.95 %), and AIAN adults (19.71 %). Hispanic adults were most likely to report less than a high school education (28.77 %), followed by AIAN individuals (16.17 %, averaged across the study period). Hispanic adults were most likely to lack health insurance (31.71 %) followed by AIAN (27.89 %) and Black adults (21.41 %) in comparison to White (12.30 %) and Asian adults (10.14 %). The highest rates of reporting being unemployed or having diabetes were among AIAN (11.53 % unemployment and 13.70 % diabetes), followed by Black (10.31 % unemployment and 13.30 % diabetes) and Hispanic (8.28 % unemployment and 9.31 % diabetes) adults (see Table 2). AIAN individuals also experienced the highest rates of disability at 28.48 %, averaged across the study period.

Table 3 presents self-report poor/fair health, by race and year (2004–2010). The proportion of adults reporting fair or poor health was approximately 14.00 % (range 13.69–14.21 %) throughout the study period. Asian and White individuals were least likely to report poor/fair health status across all years under study. In contrast, Hispanics and AIAN individuals had the highest rates of reporting poor/fair health status, followed by Black individuals across all years under study. Almost one in four Hispanic individuals and only a slightly lower rate of AIAN individuals reported poor/fair health status. Overall, the proportions of respondents noting poor/fair health status among Hispanic, AIAN individuals were approximately double that of White individuals.

The percentage reporting forgone medical care due to cost was approximately 15 % (range 15.01–15.32 %) from 2004 to 2007, while this rate increased to approximately 16 % in 2008 and approximately 17 % in both 2009 and 2010 (see Table 3). Asian and White individuals had the lowest rates of reporting forgone medical care across each year of the study period, while Black, Hispanic, and AIAN individuals had the highest rates (Table 3). While this varied somewhat, approximately one in four Hispanic and AIAN adults reported forgone medical care in the past 12 months due to cost throughout the study period. In contrast, only 1 in 10 Asian or White individuals reported forgone medical care.

Multivariate Analyses

Self-Reported Health Status In fully adjusted analysis that does not include the interaction of race/ethnicity and the Recession timeline, we find that Hispanic (OR=2.12, CI 2.045–2.194), AIAN (OR=1.42, CI 1.305–1.536), Asian (OR=1.34, CI 1.223–1.465), and Black (OR=1.36, CI 1.318–1.409) adults were more likely to report fair/poor health

Table 2 Race-based differences in determinants of health status and health use, working age adults, 2004–2010 BRFSS

	White		African American		Asian		AIAN		Hispanic	
	%	SE	%	SE	%	SE	%	SE	%	SE
Sex										
Male	39.75	0.041	31.34	0.114	42.67	0.270	40.23	0.280	36.71	0.121
Female	60.25	0.041	68.66	0.114	57.33	0.270	59.77	0.280	63.29	0.121
Age										
19–43	37.07	0.040	45.25	0.122	54.62	0.272	46.93	0.285	57.77	0.124
44–64	62.93	0.040	54.75	0.122	45.38	0.272	53.07	0.285	42.23	0.124
Income										
Missing/don't know	9.31	0.024	10.15	0.074	11.23	0.172	9.74	0.169	12.07	0.082
<\$15,000	6.47	0.020	17.43	0.093	4.72	0.116	19.71	0.227	18.95	0.099
\$15,000–25,000	10.58	0.026	21.34	0.101	8.66	0.154	22.23	0.237	24.87	0.109
\$25,000–35,000	9.51	0.024	13.55	0.084	8.32	0.151	12.71	0.190	12.50	0.083
\$35,000–50,000	15.08	0.030	13.74	0.085	12.54	0.181	13.16	0.193	11.39	0.080
>\$50,000	49.05	0.042	23.79	0.105	54.54	0.272	22.44	0.238	20.23	0.101
Education										
Some high school	5.09	0.018	12.34	0.081	3.21	0.096	16.17	0.210	28.77	0.114
High school graduate	27.29	0.037	35.23	0.117	14.41	0.192	34.33	0.271	29.41	0.115
Some college	28.27	0.037	27.98	0.110	19.10	0.215	30.67	0.263	21.90	0.104
College graduate	39.35	0.041	24.45	0.106	63.28	0.263	18.83	0.223	19.91	0.101
Insurance										
Not insured	12.30	0.027	21.41	0.101	10.14	0.165	27.89	0.256	31.71	0.117
Insured	87.70	0.027	78.59	0.101	89.86	0.165	72.11	0.256	68.29	0.117
Employment										
Unemployed	5.01	0.018	10.31	0.075	5.76	0.127	11.53	0.182	8.28	0.069
Neither employed or unemployed	23.69	0.035	26.69	0.109	20.32	0.220	29.57	0.260	29.98	0.115
Employed	71.30	0.038	63.00	0.119	73.92	0.240	58.90	0.281	61.74	0.122
Rurality										
Rural	24.57	0.036	15.32	0.089	14.27	0.191	33.76	0.270	15.28	0.091
Missing	12.67	0.028	12.34	0.081	7.28	0.142	30.26	0.262	21.97	0.104
Metropolitan	62.76	0.040	72.34	0.110	78.45	0.225	35.98	0.274	62.75	0.122
Disability										
Disabled	21.52	0.034	21.27	0.101	8.38	0.151	28.48	0.257	16.13	0.093
Not disabled	78.48	0.034	78.73	0.101	91.62	0.151	71.52	0.257	83.87	0.093
Diabetes										
Diabetes	7.02	0.021	13.30	0.083	6.08	0.131	13.70	0.196	9.31	0.073
No diabetes	92.98	0.021	86.70	0.083	93.92	0.131	86.30	0.196	90.69	0.073

Note: Analysis is weighted for the complex sampling frame of the BRFSS

AIAN indicates American Indian/Alaska Native

status when compared to White adults. We also find that individuals in both the Recession (OR=0.94, CI 0.910–0.967) and the Recovery (OR=0.90, CI 0.861–0.934) were less likely to report fair/poor health status than those in the pre-Recession timeline, after controlling for all other terms in the model. Factors associated with a higher likelihood of reporting fair/poor health status included being poorer (OR=3.43, CI 3.290–3.571 for less than \$15,000; OR=2.57, CI 2.473–2.660 for \$15,000 to less than \$25,000; OR=1.97, CI

1.893–2.047 for \$25,000 to less than \$35,000; OR=1.48, CI 1.432–1.536 for \$35,000 to less than \$50,000; all compared to the highest income category at greater than \$50,000), residing in a rural versus urban area (OR=1.09, CI 1.061–1.113), having lower education than the highest level (OR=3.69, CI 3.540–3.838 for did not graduate high school; OR=2.04, CI 1.975–2.096 for graduated high school; OR=1.52, CI 1.474–1.566 for attended college or technical school; all compared to graduated from college or technical school), lacking health

Table 3 Self-reported health status and foregone care among working age adults, by race/ethnicity 2004–2010 BRFSS.

Percent of respondents reporting:	2004		2005		2006		2007		2008		2009		2010	
Race	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE
Fair, poor health status														
Hispanic	26.03	0.007	25.43	0.006	24.32	0.007	25.51	0.007	22.62	0.005	22.60	0.005	22.32	0.005
AIAN	22.88	0.014	22.87	0.015	22.31	0.015	21.74	0.012	21.90	0.013	22.97	0.012	25.63	0.017
Asian	7.02	0.009	7.19	0.007	7.67	0.009	8.59	0.009	7.91	0.007	7.53	0.006	7.53	0.006
Black	16.85	0.005	17.33	0.004	16.93	0.005	18.19	0.005	18.19	0.005	18.05	0.005	19.11	0.004
White	10.30	0.001	10.89	0.001	10.60	0.001	10.94	0.001	11.06	0.001	10.87	0.001	11.10	0.001
Average, all races	13.69	0.002	14.02	0.001	13.73	0.002	14.21	0.001	13.90	0.001	13.77	0.001	13.94	0.001
Forgoing care due to cost														
Hispanic	21.72	0.006	24.14	0.006	23.37	0.007	24.22	0.006	24.66	0.006	26.84	0.006	26.07	0.005
AIAN	24.54	0.016	23.24	0.015	21.15	0.014	24.40	0.016	23.10	0.015	24.12	0.012	27.52	0.016
Asian	11.05	0.011	10.59	0.009	10.26	0.011	10.27	0.010	12.03	0.013	12.34	0.011	12.29	0.008
Black	20.04	0.005	19.64	0.005	19.40	0.005	20.91	0.005	21.53	0.005	23.23	0.006	23.31	0.005
White	12.50	0.001	12.29	0.001	12.24	0.002	12.17	0.001	12.64	0.001	13.36	0.001	13.38	0.001
Average, all races	15.07	0.002	15.26	0.001	15.01	0.002	15.32	0.001	15.93	0.002	16.96	0.002	16.76	0.001

Note: Analysis is weighted for the complex sampling frame of the BRFSS

insurance (OR=1.32, CI 1.277–1.357), having a disability (OR=6.45, CI 6.301–6.596), and having diabetes (OR=3.93, CI 3.811–4.057), even after controlling for all other terms in the model.

Forgone Medical Care In fully adjusted analysis that does not include the interaction of race/ethnicity and Recession timeline, we find that Hispanic (OR=1.07, CI 1.032–1.103), AIAN (OR=1.26, CI 1.162–1.359), and Black (OR=1.15, CI 1.116–1.186) adults were more likely to report fair/poor health status when compared to White adults. We also find that individuals in both the Recession (OR=1.11, CI 1.079–1.143) and the Recovery (OR=1.11, CI 1.066–1.153) were more likely to report fair/poor health status than those in the pre-Recession timeline, after controlling for all other terms in the model. Factors associated with a higher likelihood of reporting poor/fair health status included being poorer (OR=3.61, CI 3.465–3.752 for less than \$15,000; OR=3.64, CI 3.520–3.767 for \$15,000 to less than \$25,000; OR=2.90, CI 2.801–3.010 for \$25,000 to less than \$35,000; OR=2.15, CI 2.075–2.216 for \$35,000 to less than \$50,000; all compared to the highest income category at greater than \$50,000), having lower education than the highest level (OR=1.28, CI 1.234–1.335 for did not graduate high school; OR=1.14, CI 1.107–1.171 for graduated high school; OR=1.25, CI 1.214–1.284 for attended college or technical school; all compared to graduated from college or technical school), lacking health insurance (OR=5.21, CI 5.086–5.341), having a disability (OR=2.76, CI 2.695–2.825) and having diabetes (OR=1.27, CI 1.226–1.316), even after controlling for all other terms in the model.

Adjusted Analysis of Change Across the Recession Period (Interaction of Race and Time)

We present predicted probabilities in Figs. 1 and 2 for vulnerable populations. These probabilities are generated from the fully adjusted model with the interaction of race/minority status and were calculated for different racial/ethnic minority groups and White adults while holding all other variables at their reference levels: the lowest income category, lowest education level, unemployed, residing in rural areas, not having disabilities or diabetes, being insured, and at the average value of all continuous model covariates.

Self-Reported Fair or Poor Health Status

Table 4 presents the fully adjusted analysis for the interaction of race/ethnicity and the Recession timeline. Changes over time across populations are expressed as the interaction between race and time and are graphically expressed in Fig. 1. Paradoxically, all groups were less likely to report fair/poor health status during the Recession period, AIAN adults were differentially affected ($p<0.05$) compared to White adults by the Recession with regard to reporting fair/poor health when comparing prior to the Recession to the post-Recession period. Here, AIAN experienced a lower likelihood of reporting fair/poor health status from prior to the Recession to the post-recession period. Hispanic adults were also differentially affected ($p<0.05$) as compared to White adults by the Recession when comparing the pre-Recession timeline to the post-Recession. Here, Hispanic adults experienced a lower likelihood of reporting fair/poor health status in the Recession than

Fig. 1 Predicted probability plot for poor or fair self-reported health (interaction of recession time-frame and race/ethnicity)

in the pre-Recession. However, Hispanic adults experienced a higher likelihood of reporting fair/poor health than did White adults. No other differences (with regard to interactions) were found, after adjusting for all other terms in the model.

Self-Reported Forgone Medical Care in the Past 12 Months Due to Cost

Table 4 and Fig. 2 present the fully adjusted analysis for the interaction of race/ethnicity and the Recession timeline. When examining changes over time across populations (the interaction between race and time), AIAN adults were differentially affected ($p < 0.05$) by the Recession timeline as compared to

White adults with regard to forgone medical care when comparing the pre-Recession timeline to the Recession. Here, the likelihood of reporting poor/fair health status was lower among AIAN adults from prior to the Recession to the Recession. No other differences (with regard to interactions) were found after controlling for all other terms in the model.

Discussion

Racial and ethnic minority adults (except for Asian adults) were adversely affected by low income, low education, being uninsured, and having higher unemployment rates than White

Fig. 2 Predicted probability plot for forgone medical care (interaction of Recession time-frame and race/ethnicity)

Table 4 Change in health status and forgone medical care among working age adults across the Recession period, 2004–2010

	Fair/poor health status		Foregone medical care	
	Estimate	SE	Estimate	SE
Intercept	<i>-0.521</i>	0.037	<i>-1.158</i>	0.036
Fixed effects				
Race				
Hispanic	<i>0.352</i>	0.019	<i>-0.028</i>	0.019
AIAN	<i>0.049</i>	0.039	<i>0.130</i>	0.038
Asian	<i>-0.046</i>	0.037	<i>-0.025</i>	0.039
Black	<i>-0.016</i>	0.019	<i>0.041</i>	0.018
White (ref.)	–		–	
Time period				
Pre (ref.)	–		–	
During	<i>-0.024</i>	0.019	<i>0.025</i>	0.020
Post	<i>-0.013</i>	0.023	<i>0.070</i>	0.022
Time-period×race				
Pre×White	–		–	
During×White	–		–	
Post×White	–		–	
Pre×Hispanic				
During×Hispanic	<i>-0.042</i>	0.026	<i>0.021</i>	0.026
Post×Hispanic	<i>-0.113</i>	0.029	<i>-0.003</i>	0.029
Pre×AIAN	–		–	
During×AIAN	<i>-0.065</i>	0.052	<i>-0.122</i>	0.051
Post×AIAN	<i>0.142</i>	0.064	<i>0.081</i>	0.064
Pre×Asian				
During×Asian	<i>0.036</i>	0.051	<i>0.063</i>	0.059
Post×Asian	<i>-0.015</i>	0.056	<i>-0.0003</i>	0.055
Pre×Black				
During×Black	<i>0.027</i>	0.026	<i>0.036</i>	0.026
Post×Black	<i>0.018</i>	0.030	<i>-0.025</i>	0.029

Note: Italicized data indicates significant ≤ 0.05 (p value)

Fully adjusted analysis controls for sex, age, income, education, insurance status, employment, rurality, disability, diabetes status, state poverty rate and state unemployment rate, the Recession time-frame, and the interaction of race by recession time frame

adults throughout 2004–2010. In particular, Hispanic and AIAN adults faced severe disparities followed by Black adults. This is in contrast to White and Asian adults who were *relatively* less affected by these key social determinants of health. Asian individuals were less affected by the Recession relative to other groups, which may be reflective of measured differences across income, education, and insurance status. For example, Asian adults had incomes higher than that of all other racial and ethnic groups prior to and during the Recession [41, 42]. In addition, half of Asian American adults had at least a bachelor's degree (higher than White individuals at approximately 33 %) and the vast majority of Asian adults (approximately 86 %) had a high school diploma or higher

education [43]. Furthermore, Asian individuals had lower levels of being uninsured than all other racial and ethnic groups except for White individuals in 2011 and 2012 [44]. Thus, improvements with regard to these key social determinants of health and access to health care are important factors to consider for policy makers.

There were differential effects across racial groups when compared to the pre-Recession time period of 2004–2007 for both self-reported health status and reporting forgone medical care in the past 12 months due to cost. We measured changes from prior to the Recession to after the Recession; however, AIAN adults experienced a lag (i.e., greater change from the Recession to the Recovery) where a sharp rise in fair/poor health status (from 22 % in 2008 to 26 % in 2010) was measured from the Recession to the Recovery. This is also true for forgone medical care, where the rate of reporting forgone medical care rose to approximately 28 % in 2010 from 23 % in 2008. Thus, AIAN adults were particularly affected by the Recession. However, among all racial and ethnic groups, the rate of reporting forgone medical care was higher in 2010 versus 2004. Differences in forgone medical care across the Recession are consistent with previous research that identifies drops in utilizing medical services among minority and White adults including visits to physicians and inpatient visits [45].

Our analysis adjusts for spatiotemporally clustered events (separated into three periods, pre-Recession, Recession, and Recovery) and across seven years of study. Identifying potential sources for clusters of events is a common theme in epidemiological investigations [46]. However, we include potential environmental/contextual factors for their potential moderating effect on the outcomes of interest. In addition, we have included several years of observation leading up to the Recession in an attempt to improve our “inferential power” regarding our conclusions ([47], p. 484).

Moving forward, researchers must identify policies that may serve to lessen the burden of economic downturns. Investigations into state policies should be conducted to determine what, if any, safety nets or coverage options may make a difference for individuals suffering throughout these economic times. In particular, investigations into whether different Medicaid policies for individuals including parents and historically uncovered childless adults [48] may lessen forgone medical care is of key interest to policy makers. The passing of the Affordable Care Act includes plans to expand Medicaid eligibility to millions of vulnerable individuals, as measured through annual income levels for eligibility. Understanding if and how such state policies affect vulnerable individuals' merits further research.

Limitations

The strength of using the BRFSS data is in the ability to identify race/ethnicity into more than the widely used White,

Black, Hispanic, and other. Using data from 2004 to 2010, allows us to identify trends across time. This includes a period spanning before the Recession, up to the Recession, during and into the economic Recovery. Such data allow us to identify differences between race/ethnicity and within race across rurality. Our data contain unlinked individuals (not the same across time as with a longitudinal design). The data used in this analysis is cross-sectional in nature; however, we used several consecutive years of data to identify trends across time. In addition, the data cannot be linked from year to year based on the same individuals. Identifying change over time for specific persons is outside the scope of this analysis. However, the objective was to assess changes in estimates for racial and ethnic groups and not specific individuals over time.

Conclusions

The Great Recession affected the health and utilization of health care for both racial and ethnic minority and White adults; however, racial and ethnic minority populations experienced greater burden than did White adults. Understanding what happened to millions of Americans throughout the Recession is a critical step in the process of identifying targets for future policy makers and researchers. The Affordable Care Act (2010) has measures that may benefit millions of vulnerable individuals in need of medical care, but who may forgo such care due to cost. Understanding whether more generous Medicaid eligibility for working-age adults can lessen accessibility gaps in medical care remains to be seen. Furthermore, the importance of having safety net providers and/or paths to medical insurance for vulnerable individuals (e.g., Medicaid) losing employer-sponsored health insurance during economic downturns [49] is in need of further study.

Conflict of Interest All authors declare that they have no conflict of interest.

Informed Consent All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000 (5). Informed consent was obtained from all patients for being included in the study.

Animal Studies No animal or human studies were carried out by the authors for this article.

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