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Medicaid expansion and hospitalization for ambulatory care sensitive conditions among non-elderly adults with diabetes

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Abstract

Among non-elderly adults with diabetes, we compared hospitalizations for ambulatory care sensitive conditions from 2013 (pre-Medicaid expansion) and 2014 (post-Medicaid expansion) for 13 expansion and 4 non-expansion states using State Inpatient Databases. Medicaid expansion was associated with decreases in proportions of hospitalizations for chronic conditions (difference between 2014 and 2013 −0.17 percentage points in expansion and 0.37 in non-expansion states, p=0.04), specifically diabetes short term complications (difference between 2014 and 2013 −0.05 percentage points in expansion and 0.21 in non-expansion states, p=0.04). Increased access to care

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Author Contributions

F.L.M. contributed to the design of the study and wrote the manuscript. M.L.K. (deceased) contributed to the conception and design of the study, analyzed the HCUP-SID data, wrote part of the methods section, provided expertise on Medicaid expansion and revised prior drafts of the manuscript for intellectually important content. J.P.S. analyzed the BRFSS data, wrote part of the methods section and revised the manuscript for intellectually important content. E.B.L. contributed to the conception and design of the study, provided expertise on the analysis plan and revised the manuscript for intellectually important content. L.H. contributed to the analysis of the HCUP-SID data and revised the manuscript for intellectually important content. K.R.R. contributed to the design of the study, provided expertise on the analysis plan and revised the manuscript for intellectually important content. M.P. contributed to the design of the study, provided expertise on the analysis plan and revised the manuscript for intellectually important content. Y.L. contributed to the design of the study and revised the manuscript for intellectually important content. J.M.B. provided expertise on the analysis plan, contributed to the design of the study and revised the manuscript for intellectually important content. A.A. contributed to the design of the study and revised the manuscript for intellectually important content. A.L.C. contributed to the conception and design of the study, provided expertise on diabetes, led the study team and revised the manuscript for intellectually important content. M.L.K. (deceased), L.H. and J.P.S. had full access to the data. L.H. and J.P.S. take responsibility for the integrity of the data and the accuracy of the data analysis.

All authors excluding M.L.K (deceased) have approved the final article.

Declaration of Interest

F.L.M has no relationships to disclose, M.L.K. (deceased) received research funding from Amgen., J.P.S. has no relationships to disclose, L.H. has no relationships to disclose, M.P. has no relationships to disclose, K.R.R has no relationships to disclose, A.A. has no relationships to disclose, Y.L. has no relationships to disclose, J.M.B. has no relationships to disclose, E.B.L receives research funding from Amgen, has consulted for Novartis and has served on an advisory board for Amgen, A.L.C. receives research funding from Boehringer Ingelheim and is on the advisory board for Astra Zeneca.

through Medicaid expansion may improve disease management in non-elderly adults with diabetes.

Keywords

Medicaid; access to health care; ambulatory care sensitive conditions; diabetes; Medicaid expansion

In 2015, an estimated 9.4% of the overall United States (US) population (30.3 million people), and 6% of the 18–64 year old population, had diabetes (Centers et al., 2017). Low-income [≤ 138% of federal poverty level (FPL)] non-elderly adults are disproportionately affected; diabetes prevalence was 13.4% among individuals who receive healthcare coverage through a government-subsidized program (including Medicaid) compared to 4.6% among the privately insured ("Economic costs of diabetes in the U.S. in 2012," 2013). In this population, insurance coverage is fundamental to ensure access to care and the opportunity to manage this disease: lack of insurance coverage has been associated with poor diabetes management (Zhang et al., 2012). This has considerable consequences in terms of health and economic burden. Diabetes is expensive: healthcare costs in 2012 were estimated at $327 billion with $71.1 billion spent specifically for hospitalizations ("Economic Costs of Diabetes in the U.S. in 2017," 2018). Some of these hospitalizations can be avoided with appropriate access to care and better disease management. Diabetes is among the most common ambulatory care-sensitive conditions (ACSCs), i.e., those conditions that can be managed through high quality preventive care and treatment and for which expensive events such as hospitalizations for diabetes complications can be avoided (Bindman, Chattopadhyay, & Auerback, 2008).

Medicaid expansion in 2014 created the opportunity for more non-elderly low-income adults to be insured in some states (Kaufman, Chen, Fonseca, & McPhaul, 2015). Providing more individuals with Medicaid coverage could increase access to ambulatory care, potentially improve diabetes management, reduce preventable diabetes complications, and reduce the number of hospitalizations. In the Oregon Health Insurance Experiment, a trial that randomly assigned Medicaid coverage through a lottery system, Medicaid was associated with a higher proportion of diabetes diagnoses and increased use of diabetes medications (Baicker et al., 2013). The Medicaid expansion was also associated with increases in diabetes screening and glucose testing along with increases in the proportion of Medicaid-insured adults diagnosed with diabetes (Kaufman et al., 2015; Sommers, Blendon, Orav, & Epstein, 2016). Both Medicaid coverage and expansion have been associated with improved access to care and diabetes management as evidenced by a higher number of ambulatory care visits compared to uninsured populations (Christopher et al., 2016; Miller & Wherry, 2017). Currently, it is not clear whether the increased access to care resulting from the Medicaid expansion may have led to reduced ACSC hospitalizations for among people with diabetes.

To address this knowledge gap, we compared 2013 and 2014 hospital discharge data for non-elderly adults with diabetes in 17 US states of which 13 expanded Medicaid. We hypothesized that the Medicaid expansion would be associated with lower proportions of

hospitalizations of uninsured patients, and lower proportions of ACSC hospitalizations for uncontrolled diabetes, diabetes short term complications, diabetes long term complications, heart failure, hypertension as well as acute and chronic composite conditions (Agency et al., 2015).

Methods

This study consists of a retrospective analysis of 2013–2014 hospital discharge data for adults with diabetes. Data are summarized and compared by states that expanded and did not expand Medicaid. To examine how these states may differ, we obtained state population characteristics from the Behavioral Risk Factor Surveillance System (BRFSS). This study was approved by the Institutional Review Board of the University of Alabama at Birmingham.

Data Source and Study Populations

Health Care Costs and Utilization Project's State Inpatient Databases—Hospital discharge data were obtained from the Health Care Costs and Utilization Project's State Inpatient Databases (HCUP-SID) (Agency et al.). Data on all inpatient hospital discharges for 2013 and 2014 were obtained for thirteen states in HCUP-SID that expanded their Medicaid program under the Affordable Care Act (ACA) [AZ, CO, IA, KY, MI, NJ, NM, NY, OR, RI, VT, WA, WV] and four that did not [FL, GA, NC, WI]. Thirty states were excluded because data for the pre- and post- expansion years were not available when we began the study. Three expansion states with complete data (HI, NE, & SD) were excluded because they had small populations and very high costs to acquire the data.

From the 17 selected states, we identified all hospital discharges for persons between the ages of 18 and 64 where any of the diagnosis codes associated with the hospital stay included a diagnosis of diabetes mellitus (Table A in the Supplemental Material). The final dataset included 759,992 hospitalizations in 2013 and 765,990 in 2014 in expansion states, and 526,867 hospitalizations in 2013 and 539,878 hospitalizations in 2014 in non-expansion states.

Behavioral Risk Factor Surveillance System—Populations in the selected states were described using data from BRFSS, which surveys the noninstitutionalized adult population in all 50 states and the District of Columbia (D.C.). BRFSS survey weights account for the sampling scheme and nonresponse bias. Additional details about the BRFSS survey methodology can be found elsewhere (Centers et al., 2013). We used the BRFSS data in order to describe and compare the expansion and non-expansion states because of its comprehensive nature; public health data is available for all states. We examined the data for non-elderly adult BRFSS respondents (ages 18 to 64) from years 2013 and 2014. The final dataset included 210,353 respondents from the selected 13 expansion and 4 non-expansion states.

Study Outcomes

The outcomes of interest were the state proportion of total diabetes-related hospitalizations by insurance status (Medicaid, uninsured/self-paying, other insurance) and by ACSC (Niefeld et al., 2003). ACSC hospitalizations were those with primary discharge diagnosis codes for uncontrolled diabetes, diabetes short term complications, diabetes long term complications, heart failure, and hypertension. These were identified using the Agency for Healthcare Research and Quality (AHRQ) formulated Prevention Quality Indicators (PQIs) framework. The PQIs are a set of indicators of quality and health care access in the community setting (Agency et al., 2015). We also obtained acute composite ACSCs which included dehydration, bacterial pneumonia and urinary tract infection, and the chronic composite ACSCs which included diabetes short and long term complications, hypertension, heart failure, uncontrolled diabetes, COPD and asthma. The diagnosis codes we used are listed in Table B in the Supplemental Material.

State Demographics

From the BRFSS data, using BRFSS survey weights, we calculated the proportion of the state population by gender, race/ethnicity, age group, marital status, education, employment status, and annual household incomes. Furthermore, we obtained the proportion of the population in fair or poor health, as well as the proportion of the population who self-reported a diagnosis of diabetes, angina or coronary disease, or a history of myocardial infarction or stroke.

Statistical Analysis

State demographics were compared by expansion status using the BRFSS data. We used the HCUP-SID data to compare the proportions of hospitalizations by insurance status and by preventable ACSCs between expansion and non-expansion states, for each year. For each state, we calculated the differences between 2013 and 2014 in the proportions of hospitalizations by insurance status and for each ACSC of interest. Then, we calculated the average differences separately for expansion and non-expansion states. Lastly, we compared these average differences in the proportions of hospitalizations by insurance status and for the ACSCs between expansion and non-expansion states using t-tests to determine statistical significance. Data management was conducted using SAS version 9.2 (SAS, Institute, Cary, NC) and statistical analyses were conducted using Stata version 14.2 (Stata Corp., College Station, TX).

Results

The population in expansion states was more likely to be white and less likely to be black, to have annual household income <$25,000, and to have diabetes, compared to the population in non-expansion states (Table 1). Expansion and non-expansion states were similar on other demographics.

In 2013, about 22% and 7% of diabetes related hospitalizations in expansion states were among Medicaid beneficiaries and uninsured patients, respectively, compared to about 20% and 10% in non-expansion states. Expansion and non-expansion states had similar

proportions of hospitalizations for ACSCs: these were less than 1% for uncontrolled diabetes and hypertension, and about 5% for diabetes short and long term complications. The proportion of hospitalizations with a heart failure diagnosis was higher (4.3%) in non-expansion than expansion (3.4%) states. Overall, about 9% of diabetes-related hospitalizations were for acute composite ACSCs and 19% for the chronic composite ACSCs (Table C in the Supplemental Material).

Medicaid expansion was associated with an increase in the proportion of hospitalizations that were Medicaid-covered (difference between 2014 and 2013 was 7.04 percentage points (PP) in expansion states and 0.74 in non-expansion states, p=0.0003) and a decrease in the proportion of hospitalizations for uninsured/self-paying patients (difference between 2014 and 2013 was −4.01 PP in expansion states and −1.36 in non-expansion states, p=0.0008) (Table C in the Supplemental Material and Figure 1). Medicaid expansion was associated with decreases in the proportion of hospitalizations for chronic composite ACSCs (difference between 2014 and 2013 was −0.17 PP in expansion states and 0.37 in non-expansion states, p=0.04) and specifically for diabetes short term complications (difference between 2014 and 2013 was −0.05 PP in expansion states and 0.21 in non-expansion states, p=0.04) (Table C in the Supplemental Material and Figure 2). Medicaid expansion was not associated with a statistically significant difference in the proportions of hospitalizations for other ACSCs examined (Table C in the Supplemental Material and Figure 2).

Discussion

The current study found that in comparison to non-expansion states, there was a statistically significant increase in the proportion of hospitalizations covered by Medicaid (approximately 34,000 admissions) and a reduction in the proportion of uninsured/self-paying hospitalizations (approximately 14,000 admissions) in expansion states. The findings also showed that Medicaid expansion was associated with a statistically significant reduction in the proportions of ACSC hospitalizations for chronic conditions (approximately 2,900 hospitalizations) and specifically for diabetes short term complications (approximately 1,400 hospitalizations annually). However, there were no changes in the proportions of hospitalizations for other ACSCs including uncontrolled diabetes and acute composite conditions associated with Medicaid expansion.

The findings of this study are consistent with prior studies on the effects of Medicaid coverage among adults with diabetes. Lack of insurance and disruptions in Medicaid coverage are associated with poor glycemic control among individuals with diabetes and higher rates of hospitalizations for ACSCs (Bindman et al., 2008; Zhang et al., 2012). Medicaid expansion has been associated with increased access to care, increased rates of diabetes diagnoses and use of diabetes medications, although not with receiving American Diabetes Association-defined clinical diabetes care services (glycated hemoglobin tests twice yearly, annual eye examination, annual foot examination, and annual flu shot) (American, 2017; Baicker et al., 2013; Luo, Chen, Xu, & Bell, 2018; Miller & Wherry, 2017; Sommers, Baicker, & Epstein, 2012). Compared to no medical insurance, Medicaid coverage was associated with having at least one annual ambulatory care visit; however, Medicaid coverage was not associated with diabetes awareness or control (Christopher et al.,

2016). These studies and ours suggest that, overall, Medicaid expansion has an important impact on increased access to care and potentially a reduction in avoidable hospitalizations among non-elderly adults with diabetes. Moreover, Medicaid expansion may also improve outcomes in other chronic diseases as indicated by the significant impact we found for the composite ACSCs which included diabetes complications as well as heart failure, hypertension, COPD and asthma. In other studies, Medicaid expansion was associated with a reduction in the proportions of hospitalizations for major cardiovascular events in expansion states compared to non-expansion states (Akhabue, Pool, Yancy, Greenland, & Lloyd-Jones, 2018) and a reduction in 1-year mortality among patients with end stage renal disease who initiated dialysis (Swaminathan et al., 2018).

The observed reduction in the proportions of hospitalizations for chronic composite conditions and specifically for diabetes short term complications in Medicaid expansion states compared to non-expansion states suggest that increased access to ambulatory care through Medicaid expansion may have resulted in improved disease management and a decrease in ACSCs. Because the increase in the proportion of Medicaid hospitalizations was larger than the decrease in the proportion of uninsured/self-pay hospitalizations, these data also suggest that there is some spillover effect as people who were previously covered by other insurance are now covered by Medicaid. However, the magnitude of the differences indicates that the larger effect was to move people from no coverage to Medicaid coverage.

The strengths of the current study include representative data from inpatient hospital discharge data for the states included in the analysis. The current study should also be interpreted in light of its limitations. The statistically significant reduction in the proportions of ACSC hospitalizations for chronic conditions and diabetes short term complications may be driven by the increase in the proportion of hospitalizations for these conditions in non-expansion states and the corresponding decrease in the proportions of hospitalizations in expansion states. Since we had data on a small number of non-expansion states, it is possible that the increase in the proportions of hospitalizations in non-expansion states may be due to unknown events aside from Medicaid expansion which affected the outcome differentially between expansion and non-expansion states over time. The use of ICD-9 codes to identify participants with the conditions of interest provides less detailed information compared to clinical data. In addition, we may have missed admissions for people with diabetes for whom a diagnosis code for diabetes was not listed in the discharge data. However, this should not be an extensive problem since diabetes is an important co-morbidity that could affect the amount the hospital is paid for treating the patient. Furthermore, it is unlikely that the frequency of omitted codes would differ systematically in 2013 and 2014. The period of observation may have been too short to observe significant associations, especially between Medicaid expansion and the proportions of hospitalizations for uncontrolled diabetes and acute composite conditions. It is also possible that some of the differences observed between the expansion and non-expansion states is due to the population of the non-expansion states being largely southern, with the exception of Wisconsin. By comparison, the expansion states were largely non-southern. However, because our primary analysis compared within-state changes over time, it is unlikely that this would have a significant impact on the results. The current study had limited statistical power to detect an association between Medicaid expansion and the change in the proportion of hospitalizations for uncontrolled diabetes and

acute composite conditions as these diagnoses had low overall prevalence in this population (Amin et al., 2014; Bergamin & Kiosoglous, 2017; Stookey, Pieper, & Cohen, 2005). Data were not available for all US states, which may limit generalizability of the findings. Further, we did not have data on ambulatory care utilization. It is possible that our assumption that Medicaid expansion increases ambulatory care utilization, which then results in a decrease in proportions of hospitalizations for diabetes-related ACSCs, may not be correct.

Conclusion

Medicaid expansion was associated with a decrease in the proportion of hospitalizations for chronic composite conditions and specifically for diabetes short term complications among non-elderly adults with diabetes. This suggests that increased access to care through Medicaid expansion may improve disease management among people with diabetes.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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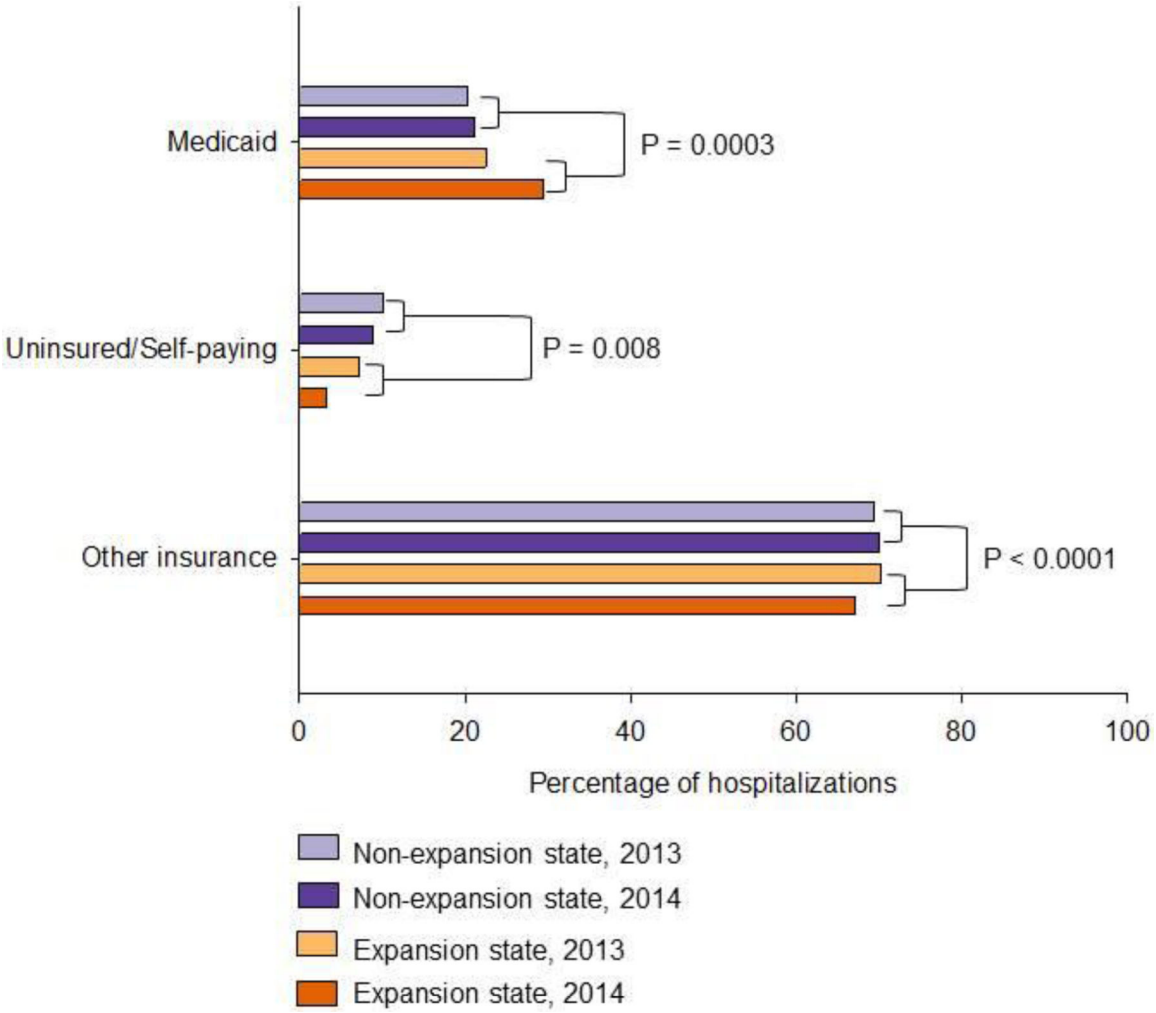

Figure 1.

Proportions of hospitalizations by insurance status among adults aged 18–64 with diabetes in selected Medicaid expansion and non-expansion states before (2013) and after expansion (2014), Health Care Costs and Utilization Project State Inpatient Databases (HCUP-SID)

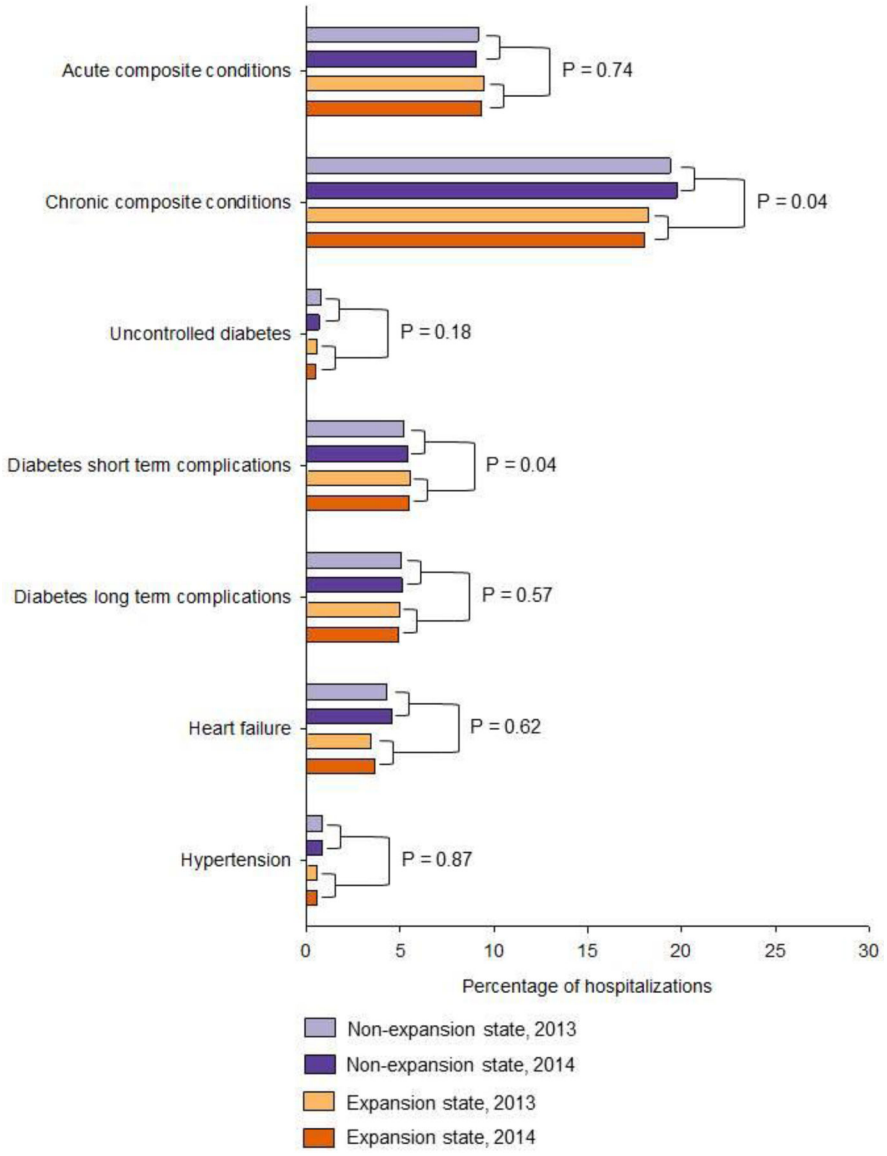

Figure 2.

Proportions of hospitalizations for ambulatory care sensitive conditions among adults aged 18–64 with diabetes in selected Medicaid expansion and non-expansion states before (2013) and after expansion (2014), Health Care Costs and Utilization Project State Inpatient Databases (HCUP-SID)

Table 1.

Characteristics of non-elderly adults in selected states by Medicaid expansion status, Behavioral Risk Factor Surveillance System (BRFSS)

Characteristics	Expansion states*	Non-expansion states‡
Population (N)		
Unweighted	155,601	54,752
Weighted	92,209,552	55,716,192
Female, (%)	50.1	50.5
Race/ethnicity, (%)		
Non-Hispanic white	65.8	59.5
Non-Hispanic black	9.2	19.4
Hispanic, any race	16.0	16.0
Other	9.0	5.1
Age, years, (%)		
18 to 29	26.1	25.8
30 to 39	20.5	20.0
40 to 49	20.5	21.0
50 to 64	32.9	33.2
Married, (%)	50.2	49.7
Education, (%)		
Did not graduate high school	13.3	14.1
High school graduate	27.2	29.3
Some college or college graduate	59.5	56.6
Employment status, (%)		
Employed	65.8	64.9
Unemployed	8.5	9.1
Out of the work force	25.7	26.0
Annual household income, (%)		
Less than $25,000	24.3	27.9
$25,000 or more	61.9	58.6
Missing/refused	13.8	13.5
Fair/poor self-reported health, (%)	15.6	16.9
Self-reported diagnoses, (%)		
Diabetes	7.0	7.8
Angina or coronary heart disease	2.5	2.7
History of myocardial infarction or stroke	3.9	4.6

*AZ, CO, IA, KY, MI, NJ, NM, NY, OR, RI, VT, WA, WV

‡FL, GA, NC, WI