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Modifiable health risk factors, related counselling, and treatment among patients in health centres

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Abstract

Chronic disease burden and its related health risk factors are especially concentrated among the poor. Community health centres reach the nation's most vulnerable population. This study explored the prevalence, racial/ethnic, and gender disparities of five modifiable health risk factors and the receipt of related counselling and treatment among patients in U.S. federally qualified health centres. The 2014 Health Center Patient Survey was used for this study. We performed a cross-sectional study. Measures included tobacco use, excessive alcohol consumption, obese/overweight, high blood pressure, high blood cholesterol, and five related counselling/treatment measures. Logistic regression models were conducted to examine the multivariable-adjusted putative associations of several sociodemographic and health-related factors with modifiable health risk and counselling/treatment measures. Preliminary findings revealed differences in modifiable health risk factors across different racial/ethnic groups, while few racial/ethnic differences existed in related counselling/treatment measures. In the multivariable-adjusted logistic regression models, these differences in health risk factors were still apparent, while associations between race/ethnicity status and counselling/treatment measures were not detected. Gender was also a predictor for four types of health risk measures and two types of counselling/treatment measures. Health centre patients had high rates of modifiable health risk factors. The rates were different across race/ethnicity groups, and the differences found did not always favour non-Hispanic Whites. However, the findings reveal equitable access to related counselling/treatment service among patients across race/ethnicity groups.

Keywords

community health centres; health risk factors; preventive services; vulnerable population

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CONFLICT OF INTEREST

No conflicts of interest have been declared.

1 | INTRODUCTION

Chronic conditions are the leading causes of death and disability in the United States, which are responsible for 70% of deaths each year. Thus, treating people with chronic diseases accounts for most of our nation's healthcare costs (Centers for Disease Control and Prevention [CDC], 2017). Although chronic diseases and conditions are common, costly, and debilitating, they can often be prevented, and most chronic diseases have the same underlying risk factors: such as tobacco use, obesity, and excessive alcohol consumption (CDC, 2016a, World Health Organization [WHO], 2005). These major modifiable risk factors, in conjunction with the non-modifiable risk factors of age and heredity, explain the majority of incident chronic conditions, such as heart disease, chronic respiratory diseases, and some important cancers (WHO, 2005).

Modifiable risk factors linked to an unhealthy lifestyle have been tracked for over several decades. In the United States, around 15% of adults were current smokers, while the age-adjusted obesity prevalence was approximately 35%. Additionally, more than one in four (27.1%) reported engaging in binge drinking, and the prevalence of high blood pressure and high cholesterol was 29% and 32% among adults respectively. Multiple risk factors co-existing in the same individual are also common (CDC, 2016b, 2016c, Johnson, Hayes, Brown, Hoo, & Ethier, 2014). An associated effect has been found between health risk factors on the total chronic disease burden (CDC, 2016d). Monitoring and evaluating health-risk behaviours and providing preventive counselling/treatment to people with health risk factors is essential to reduce their risk for illness and increase protection from developing chronic conditions (CDC, 2011).

The chronic disease burden and its related health risk factors are especially concentrated among the poor. The poor are more vulnerable because of economic deprivation, limited choice of consumption patterns, psychosocial stress, unhealthy and unsafe living conditions, and lack of access to quality care (WHO, 2005). The poorest segment of the population is also more likely to maintain risk behaviour and to sustain the demand for harmful products and energy-dense foods, such as tobacco and fried foods, given their limited opportunity to substitute unhealthy habits with healthier and often more expensive choices (Drewnowski, 2004). Individuals living in disadvantaged communities are more concerned for their safety, are less likely to have adequate physical activity, which may cause them to become overweight or obese (Dias & Whitaker, 2013). Moreover, individuals living in poverty face more barriers in accessing quality care, which include financial constraints and limited transportation to health facilities.

The federally qualified health centres, also referred to as health centres (HCs), have been providing affordable and quality primary and preventive care services for medically underserved and vulnerable populations since the 1960s (Health Resources and Services Administration [HRSA], 2017a). For more than 50 years, HCs have become an essential primary care provider for America's most vulnerable populations, coordinating a wide range of medical, behavioural, dental, and patient services through an advance model focusing on coordination, comprehensiveness, and patient-centred care. Since 2000, the HCs have grown significantly and their role has also been expanded further by the Affordable Care Act

(ACA) (Paradise et al., 2017). Today, nearly 1,400 HCs operate more than 10,400 services sites that provide care to more than 24 million Americans (HRSA, 2017b).

Healthy People 2020 has identified tobacco use, nutrition and weight status, physical activity as top public health priorities. National data indicate that vulnerable groups are at higher health risk and are more likely to develop related chronic conditions (CDC, 2016b, 2016c, Johnson et al., 2014, Lebrun et al., 2013). Given that HCs serve a disproportionate number of vulnerable patients, HCs are well positioned to provide related health behaviour counselling and treatment to the vulnerable and medically underserved populations. However, there is limited evidence available regarding modifiable health risk factors, and the receipt of related counselling and treatment among patients in U.S. federally qualified health centres. A few previous studies discussed related topics (Lebrun et al., 2013; Lebrun-Harris, Fiore, Tomoyasu, & Ngo-Metzger, 2015; Lemay et al., 2003; Olomu et al., 2013); however, such studies were more likely to be conducted in a single site or only included one risk measure.

The purpose of this research was to examine the prevalence of modifiable health risk factors, and rates of receiving related counselling and treatment among patients seen at HCs, and to explore whether disparities existed among different racial/ethnic and gender groups. We also investigated if other sociodemographic and health-related characteristics were significantly associated with these measures. The results of this study provide evidence to support HCs' mission to serve the nation's vulnerable segment of the population, and attest to its mission to provide them affordable, comprehensive, and quality preventive services.

2 | METHODS

2.1 | Data

We used data from the 2014 Health Center Patient Survey, a nationally representative survey sponsored by HRSA. Conducted in 1998, 2002, 2009, and 2014, the survey provided patient-level data from in-person, one-on-one interviews with Health Center Program patients. The 2014 Health Center Patient Survey had a probability sample of 7,002 patients representing over 22 million patients seen at HCs during 2014.

The Patient Survey implemented a three-stage sampling design to obtain the sampling frame. The first-stage sampling units were HCs, second-stage sampling units were HC sites, and third-stage sampling units were patients who had at least one visit in the past 12 months to an eligible HC site. Data collection was completed between September 2014 and April 2015. The interview portion of the survey was administered using a computer-assisted personal interviews (CAPI) instrument and was conducted in one of five languages: English, Spanish, Chinese, Korean, and Vietnamese. A total of 169 HCs were recruited. Data were collected from 521 HC sites, and a total of 7,002 patient interviews were completed. The final response rate was 91.4% among patients who were confirmed to be eligible.

2.2 | Measures

2.2.1 | Modifiable health risk measures—Our primary focus was on health risk factors that were associated with elevated risks of developing major chronic diseases, given

their modifiable nature at the personal level. We examined five available modifiable health risk measures in the 2014 Health Center Patient Survey. All these measures were coded as dichotomous variables, including (a) tobacco use (coded as current smoker vs. non-smoker); (b) excessive alcohol consumption (defined as five or more drinks for men or four or more drinks for women on a single occasion, or any alcohol use by people under the age 21, or any alcohol use by pregnant women; coded as yes vs. no); (c) obesity (based on each respondent's body mass index [BMI]; a respondent will be coded as obese/overweight if his/her BMI equals to or greater than 25.0 kg/m²; a respondent will be coded as neither obese nor overweight if his/her BMI is less than 25.0 kg/m²); (d) having high blood pressure told by a doctor or other health professional (coded as yes vs. no); and (e) having high blood cholesterol told by a doctor or other health professional (coded as yes vs. no).

2.2.2 | Related counselling and treatment measures—In this study, we also included five measures related to counselling or treatment for smoking, excessive alcohol consuming, obesity, high blood pressure, and high blood cholesterol. All these measures were coded as dichotomous variables (yes vs. no), including (a) smoking cessation counselling, defined as whether a doctor or other health-care professional advised a current smoker to quit smoking cigarettes or quit using any other tobacco products during the past 12 months; (b) alcohol treatment/counselling, defined as whether people who needed treatment or counselling received the service for their use of alcohol in the past 12 months; (c) weight management counselling, defined as whether a doctor or other health professional ever approached respondents regarding weight management; (d) high blood pressure counselling, defined as whether a doctor or other health professional ever advised a respondent who had high blood pressure to go on a diet/change eating habits/cut down salt/exercise; and (e) high blood cholesterol treatment/counselling, defined as whether a doctor or other health professional ever advised a respondent who had high blood cholesterol to eat fewer high fat foods/control weight/increase exercise/take prescribed medicine to control cholesterol level.

2.2.3 | Sociodemographic and health characteristics—The main independent variables of interest were race/ethnicity (coded as non-Hispanic Whites, non-Hispanic blacks, Hispanics, and others) and gender (coded as male vs. female). We used the framework by Aday, Fleming, and Andersen (1984) to select co-variates related to the outcome variables. Other factors selected as covariates in our analyses included age (less than 65 years vs. 65 years and over), education level (more than high school, high school, and less than high school), employment status (employed vs. not employed), poverty status (200% or more than federal poverty level [FPL], 101% to 199% FPL, and less than or equal to 100% FPL), health insurance (privately obtained, Medicare, Medicaid, other public, and uninsured), census region (Northeast, South, Midwest, and West), English speaking (yes vs. no), health status (excellent/very good/good vs. fair/poor), need help with activities of daily living (ADLs) (yes vs. no), need help with instrumental activities of daily living (IADLs) (yes vs. no), number of chronic conditions (including hypertension, diabetes, asthma, congestive heart failure, coronary heart disease, angina, heart attack, chronic obstructive pulmonary disorder, depression, and HIV/AIDS; coded as none, 1, and 2 or more), types of health centre funding (Community Health Center, Public Housing Primary Care program

funding, Migrant Health Center, and Health Care for the Homeless), and number of physician visits in the past 12 months (none, one, two to three, four to five, and more than five).

2.3 | Analysis

Using a cross-sectional analysis of the data, we first described the sociodemographic and health-related characteristics of HC patients. Second, we examined the percentages of various modifiable health risk factors and related counselling and treatment measures for the total sample. We also examined those distributions by race/ethnicity and gender to determine whether there were any significant differences across groups. We conducted design-based F tests to compare the likelihood of having various modifiable health risk factors and related counselling and treatment measures among groups. Third, multivariate logistic regressions were conducted to assess associations between patients' race/ethnicity and gender and 10 outcome measures, controlling for other patients' sociodemographic and health-related characteristics. The interactions between variables were checked before entering them into the model. No presence of a significant interaction was found indicating simple effects of independent variable are the same at all levels of the other factors. All independent variables were entered into the regressions simultaneously. Using Stata/SE version 14.0 (StataCorp LP, College Station, TX, USA), statistical analyses were performed while accounting for the complex sampling design of the survey. Two-tailed p -values less than or equal to 0.05 were considered statistically significant.

3 | RESULTS

3.1 | Sociodemographic and Health-Related Characteristics of Patients at HCs

Table 1 shows the overall HC patients' sociodemographic and health-related characteristics. We excluded four respondents with missing self-reported race/ethnicity. The final sample size of this study was 6,998, representing around 22.4 million patients seen at HCs during 2014. The mean age of the respondents was 32.7 years. Weighted percentage that showed a greater proportion of patients was female (58.5%). More than 40% were non-Hispanic Whites. Hispanic and non-Hispanic Blacks represented 19.3% and 32.4% of the population. About 49.4% of the sample had less than a high school education, 22.1% had a high school diploma, while the remaining sample (29%) had more than a high school education. HC patients were more often a general low-income population (56.8% were less than or equal to 100% FPL) and more likely to be covered by Medicaid (46.7%). There were more respondents from west (31.3%) and south (29.9%). The majority of patients reported that they were English speaking (81.3%) and were in good health (67.9%). About 20% of patients reported that they needed help with ADLs, and around 27% needed help with IADLs. More than 40% of patients had two or more chronic conditions. An overwhelming majority of patients were from the HCs that received CHC funding (93.3%). Almost 40% of patients had five or more times physician visits in the past year.

3.2 | Modifiable health risk factors, related counselling, and treatment among health centre patients

Table 2 summarises the measures of modifiable health risk factors, related counselling, and treatment reported by health centre patients. Results are presented for the overall patient population and broken down by race/ethnicity and gender. With respect to tobacco use, only 26% of respondents reported their smoking status. Results showed that there were significant racial/ethnic differences in tobacco use, with higher proportions among non-Hispanic Whites than other minority groups ($p < 0.001$). Regarding the measure of excessive alcohol consumption, around 18.7% of HC patients reported excessive alcohol consumption experience. We found no significant racial/ethnic and gender disparities among HC patients for this measure. Racial/ethnic differences in obesity prevalence were observed ($p < 0.001$). About 73% of the overall sample had overweight/obesity problems. Higher proportion of non-Hispanic Whites (76.3%) than other groups reported having overweight/obesity ($p < 0.001$). Both significant racial/ethnic and gender differences were observed in the measure of high blood pressure. Compared with non-Hispanic Whites (33.6%), higher proportion of non-Hispanic Blacks (42.2%) reported having high blood pressure, while this proportion was lower among Hispanic patients (14.8%) ($p < 0.001$). There was also gender-based difference in this measure, with higher proportion of male (34%) than female (27.4%) reporting having high blood pressure ($p = 0.01$). Similar findings were also found in having high blood cholesterol, with higher proportion in males (50.5%) than females (37.1%, $p = 0.003$). The racial/ethnic difference was also significant in this measure, though results did not show disparities favouring non-Hispanic whites ($p = 0.001$).

With respect to counselling and treatment measures, there were few significant racial/ethnic differences in these measures. Overall, 76.5% of current smokers reported having a smoking cessation counselling, 71.3% of people who needed alcohol treatment/counselling reported receiving the service, and 50.2% of all respondents reported having a weight management counselling in the past 12 months. The proportions of high blood pressure counselling and high blood cholesterol treatment/counselling were both above 90%. Regarding the gender-related aspect, a significant difference was only found in the measure of weight management counselling, with a higher proportion of females (53.4%) having this service than males (45.7%, $p = 0.008$).

3.3 | Factors associated with health risk factors, related counselling, and treatment

Tables 3 and 4 present the odds ratios (ORs) and 95% confidence intervals (CI) for the adjusted effects of sociodemographic and health-related factors on the 10 outcomes of interest. Similar to the findings from the bivariate analyses, the associations between race/ethnicity and health risk factors were significant among four of five measures, after controlling for various sociodemographic and health-related factors. Specifically, racial/ethnic minority groups were found to be less likely than non-Hispanic Whites to be current smokers. The adjusted odds of obese/overweight were higher among non-Hispanic Black (OR: 1.527, 95% CI: 1.266–1.843, $p < 0.001$) and Hispanics (OR: 1.652, 95% CI: 1.378–1.980, $p < 0.001$), while lower in the group of other race/ethnicity group (OR: 0.690, 95% CI: 0.575–0.828, $p < 0.001$), compared with non-Hispanic Whites. Regarding high blood pressure, non-Hispanic Blacks (OR: 1.496, 95% CI: 1.270–1.763, $p < 0.001$) were more

likely to report having this condition, while Hispanics (OR: 0.597, 95% CI: 0.510–0.700, $p < 0.001$) were less likely to report it compared with non-Hispanic Whites. With respect to high blood cholesterol, non-Hispanic Blacks (OR: 0.764, 95% CI: 0.642–0.909, $p < 0.01$) and Hispanics (OR: 0.786, 95% CI: 0.664–0.929, $p < 0.01$) were less likely than non-Hispanic Whites to report having high blood cholesterol level. Moreover, gender was also shown to be significantly associated with four types of health risk factors. Compared with males, females were less likely to be current smokers (OR: 0.486, 95% CI: 0.429–0.552, $p < 0.001$), having excessive alcohol consumption (OR: 0.372, 95% CI: 0.310–0.446, $p < 0.001$), and having high blood pressure (OR: 0.634, 95% CI: 0.565–0.712, $p < 0.001$), while they were more likely to be obese or overweight (OR: 1.248, 95% CI: 1.097–1.420, $p < 0.01$).

Significant associations between other predictor variables and health risk measures were also observed. Results showed that respondents who had lower education level were more likely than people with higher education to use tobacco. Moreover, the not employed status was associated with higher odds of being smokers (OR: 1.183, 95% CI: 1.095–1.278, $p < 0.001$), having high blood pressure (OR: 1.313, 95% CI: 1.226–1.407, $p < 0.001$), and having high blood cholesterol (OR: 1.247, 95% CI: 1.159–1.341, $p < 0.001$). Respondents who were from midwest were associated with higher odds of having three behaviour risk factors (tobacco use, excessive alcohol consumption, and obese/overweight) than people from northeast.

With respect to counselling and treatment measures in multivariate analyses, race/ethnicity was only found to be associated with the receipt of weight management counselling, with higher odds reported by non-Hispanic Blacks (OR: 1.867, 95% CI: 1.571–2.218, $p < 0.001$) and Hispanics (OR: 1.833, 95% CI: 1.518–2.212, $p < 0.001$) than non-Hispanic Whites. No associations were found between race/ethnicity status and other counselling and treatment measures. Gender was found to be associated with two counselling/treatment measures. Among those who needed alcohol treatment/counselling, females were less likely than males to receive the service (OR: 0.507, 95% CI: 0.36–0.697, $p < 0.001$). In contrast, female respondents were more likely than males to receive weight management counselling (OR: 1.413, 95% CI: 1.251–1.597, $p < 0.001$).

Regarding other factors that associated with counselling/treatment measures, it should be noted that the number of chronic conditions and number of physician visits were found to be associated with receiving counselling and treatment. Having two or more chronic conditions was associated with higher odds of receiving smoking cessation counselling (OR: 3.622, 95% CI: 2.604–5.038, $p < 0.001$), alcohol treatment (OR: 2.507, 95% CI: 1.497–4.199, $p < 0.001$), and weight management counselling (OR: 2.913, 95% CI: 2.482–3.420, $p < 0.001$). A greater number of physician visits were linked to higher odds of receiving weight management counselling. It should also be noted that our results showed that the types of health insurance were generally not associated with receipt of counselling/treatment among HC patients. Even though a few differences in counselling/treatment measures were found across insurance groups, people with private insurance were generally not more likely than other respondents to receive counselling/treatment services.

4 | DISCUSSION

The current study presents nationally representative estimates of modifiable health risk factors, and the receipt of related counselling and treatment among patients in U.S. federally qualified health centres. Overall, the rates of four of five health risk factors (tobacco use, obese/overweight, high blood pressure, and high blood cholesterol) were remarkably higher among HC patients than the prevalence among the US general population (CDC, 2016b, 2016c, 2016d, Johnson et al., 2014), which indicated HC patients who were mostly socioeconomically vulnerable individuals, may have constrained choices of healthy lifestyle and were more likely to engage in health risk. These may be due to poverty, lower education level, limited social support and networks, psychosocial stress, and other socioeconomic factors (Braveman, Cubbin, Egerter, Williams, & Pamuk, 2010). Worse health among the most socially disadvantaged and its links with health risk behaviour suggests that additional efforts are needed to address the disproportionately higher rates of health risk among HC patients. HCs will need to proactively address the disproportionately higher rates of health risk factors and accompanied diseases among their patient populations. For example, HCs may provide education and health promotion at community events, on various modifiable health risk concerns, such as exercise, smoking cessation, and nutrition. Besides, more efforts are needed to inform, educate, and empower HC patients about their health issues.

Moreover, both bivariate and multivariate results showed that there were significant racial/ethnic differences in the prevalence of health risk factors among HC patients; however, the differences found did not always favour non-Hispanic Whites. One example was that non-Hispanic Whites were more likely than Non-Hispanic Blacks and Hispanics to report tobacco use, which was consistent with the findings from a previous national analysis (CDC, 2014). A similar result was also found in the high cholesterol measure. While the analyses of national data had revealed that Hispanics had higher rates of high cholesterol and non-Hispanic Blacks had lower rates than non-Hispanic Whites (CDC, 2016c), our HC data showed disparities between non-Hispanic White and each of two minority groups were neither favouring non-Hispanic Whites. The more severe disparities among non-Hispanic Whites appeared to stem from a higher rate of overweight/obesity among non-Hispanic White HC patients than in the nation at large. The health disparities among non-Hispanic White HC patients also suggest that race/ethnicity and socioeconomic status may be seen as the codeterminants of disparities in health. Additional support is required to strengthen the nation's information infrastructure to monitor both kinds of disparities, and research and policy initiatives should tackle both socioeconomic-and race-based health disparities.

Compared with racial/ethnic disparities found in modifiable risk factors, there were minimal racial/ethnic differences related to the receipt of counselling and treatment measures. In fact, the differences found in treatment favoured minority HC patients, rather than non-Hispanic Whites. Specifically, non-Hispanic Blacks and Hispanics were more likely than non-Hispanic Whites to receive weight management counselling. One possible reason was that it corresponded to the findings of the obese measure, with higher obesity rates among non-Hispanic Blacks and Hispanics. Results of our study demonstrated that racial/ethnic status was generally not associated with access to counselling/treatment services for health risk factors. Similar findings were also found in the relationship between insurance status and the

receipt of counselling/treatment services. These results suggest that as a key component of health-care safety-net, HCs have fulfilled an important role in eliminating disparities in equitable delivery of healthcare services despite patients' different racial/ethnic and insurance status (Lee, Liang, & Shi, 2016; Shi et al., 2017a, 2017b). Moreover, compared with other primary care settings, the provision of counselling for tobacco use, alcohol use, and obese/overweight was happening more often in HCs. For example, only 2 of 10 tobacco users nationally receive tobacco counselling during visits to their providers (Jamal, Dube, Malarcher, Shaw, & Engstrom, 2012). However, our finding showed a much higher rate at 76.5%. HRSA has engaged in several efforts to further address tobacco use, alcohol use, and other related health risk among vulnerable populations served by HCs. Beginning in 2011, all HC grantees were required to annually report related data to the agency. By tracking these measures over time, HCs were encouraged to improve related counselling and treatment of their patients (Lebrun et al., 2012).

Gender was found to be associated with four types of health risk measures and two types of counselling/treatment measures. Female HC patients were more likely to be obese than males, which was consistent with a previous study (Lebrun et al., 2013) and national findings (Flegal, Kruszon-Moran, Carroll, Fryar, & Ogden, 2016). Correspondingly, females were also found to be more likely to receive weight management counselling than males. These results indicated the obesity problems among low-income Americans, especially females are still severe; therefore, continuing efforts are critical in helping them manage their weight and develop healthy eating habits. Besides, HC providers should also be aware of monitoring and counselling mildly overweight or even normal weight individuals to maintain a healthy weight, in order to prevent future chronic diseases and comorbidities.

There were several limitations with this study. First, due to the cross-sectional nature of the 2014 Health Center Patient Survey data, we cannot infer causation from the findings. Second, like other surveys, the survey data are self-reported, which may be subject to recall or response biases. Third, due to the limitations of secondary data analysis, we cannot account for all the potential factors that may affect access to counselling/treatment services. We did not include BMI as a control variable in Table 4, due to that obese/overweight was one of the outcomes of interest in this study. In addition, dichotomising a variable may underestimate the extent of variation in outcome between groups, since considerable variability may be subsumed within each group. Individuals close to but on opposite sides of the cut point are characterised as being very different rather than very similar (Altman & Royston, 2006). Moreover, we excluded four observations with missing self-reported race/ethnicity. Although the deletion was limited to a small number of observations, it was disadvantageous to use complete-case analysis, since the assumptions of missing completely at random (MCAR) were typically rare to support. As a result, using complete-case analysis may produce biased parameters and estimates. Finally, only patients who had at least one visit in the past 12 months to an eligible HC site were randomly selected into the survey. However, those excluded patients were the most underserved patients. Future studies may include this subgroup of population in the study to make more rigorous estimations.

One uniqueness of the current study was its focus on patient-level data from a nationally representative view of HC patients. Our study is the most recent national study to assess the

differences in modifiable health risk factors and the receipt of related counselling and treatment services among patients seen by HCs, who are members of the nation's most vulnerable and medically underserved populations. We found that this patient population has alarmingly higher rates of engaging health risk behaviour than the general American population, and there are significant racial/ethnic as well as gender-related disparities among different subgroups. However, our findings indicated that federally qualified HCs play a successful role in providing them equitable access to preventive counselling and treatment service. Compared to other primary care providers in the nation, HCs also performed better on these measures. Thus, HCs are uniquely positioned to leads efforts to modify associated risk factors and control chronic diseases among this vulnerable segment of the population.

The important policy implications drawn from this study were that as a key component of healthcare safety-net, HCs have fulfilled a crucial role in reducing disparities in the delivery of health-care services despite patients' different socioeconomic status. Through the Medicaid expansion, more previously uninsured health centre patients have gained coverage and can be expected to seek care (Shin, Sharac, & Rosenbaum, 2013). Thus, the quest for care can be expected to further heighten the need for health centre resources. Current repositioning by HCs to serve vulnerable individuals and families with significant health needs seems likely to continue to increase. In addition to increasing their capacity to provide disease treatment, HCs may focus on building strong preventive services, targeted to modify associated risk factors and to control chronic diseases among the vulnerable segment of the population, which may in turn reduce downstream healthcare costs and expand the role of HCs in advancing community health.

In addition to ongoing initiatives, new policies and initiatives should emphasise community-oriented perspective, collaboration, teamwork, data systems development, decision-making supports, and patient self-management. First, initiatives should be designed to explicitly foster collaborations between HCs and other partners, such as local health departments and community partners. Community policies to make healthy choices easier, healthcare interventions for earlier diagnose of health threats, and community programs linked to clinical services will have potential to reduce the burden and sequelae of health risk factors. Second, like HRSA sponsored learning collaboratives for HCs to improve care for specific chronic diseases (Chin et al., 2007), such collaboratives can also be applied to target modifiable health risk factors which disproportionately affect vulnerable HC patient populations. Third, electronic health records (EHRs) also present potential opportunity to address health risk factors among HC patients. Most HCs had well-established EHRs as well as disease-specific registries, which would be applied to facilitate consistent data collection and analysis of patient information, to computerise prompts, and to track of patient's health risk factors and behaviour changes over time. Moreover, team-based and prevention-oriented approaches as well as recognition programs should also continue, such as the patient-centred medical home (PCMH) programs. Under this program, HCs may integrate community health workers, nutritionists, psychologists, and case managers into their primary care teams and highly involve patients in their own health management, and thus inform more effective health risk management on a broader scale.

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What is known about this topic

- Underlying chronic diseases and conditions such as tobacco use, excessive alcohol consumption, and obese/overweight are significant health risk factors.
- Engaging in health counselling/treatment greatly reduces the risk for developing chronic diseases.

What this paper adds

- The health risk burden was especially concentrated among vulnerable populations who received care in health centres.
- There were significant racial/ethnic differences in the prevalence of health risk factors; however, the differences found did not always favour non-Hispanic Whites.
- With respect to counselling and treatment services, there were few significant racial/ethnic differences, which revealed equitable access to related counselling/treatment service among patients across race/ethnicity groups.

TABLE 1

Sociodemographic and health characteristics of health centre patients in 2014

	Total
	Weighted % (SE)
Sample size (N)	6,998
Weighted population (N)	22,411,654
Age (mean, years)	32.7 (0.59)
Gender	
Male	41.47 (1.41)
Female	58.53 (1.41)
Race/ethnicity	
Non-Hispanic White	41.77 (1.44)
Non-Hispanic Black	19.29 (1.08)
Hispanic	32.43 (1.26)
Other	6.51 (0.58)
Education level	
Less than high school	49.44 (1.49)
High school	22.06 (1.23)
More than high school	28.50 (1.33)
Employment status	
Employed	36.84 (1.60)
Not employed	63.16 (1.60)
Poverty status	
Less than or equal to 100% FPL	56.79 (1.43)
101% to 199% FPL	29.38 (1.30)
200% or more than FPL	13.83 (1.04)
Health insurance	
Private	16.06 (1.04)
Medicare	8.84 (0.63)
Medicaid	46.73 (1.40)
Other public	1.42 (0.23)
Uninsured	26.96 (1.35)
Census region	
Northeast	20.27 (1.15)
South	29.89 (1.31)
Midwest	18.55 (1.18)
West	31.29 (1.23)
English speaking	
Yes	81.13 (0.98)
No	18.87 (0.98)
Health status	
Excellent/very good/good	67.86 (1.29)

	Total
	Weighted % (SE)
Fair/poor	32.14 (1.29)
Need help with ADLs	
Yes	20.42 (1.21)
No	79.58 (1.21)
Need help with IADLs	
Yes	27.33 (1.44)
No	72.67 (1.44)
Number of chronic conditions	
None	28.53 (1.49)
1	29.58 (1.53)
2 or more	41.90 (1.65)
Types of health centre funding	
Community Health Centre	93.32 (0.26)
Public Housing Primary Care	0.95 (0.06)
Migrant Health Centre	3.38 (0.18)
Healthcare for the homeless	2.36 (0.13)
Number of physician visits	
None	4.5 (0.62)
One time	8.12 (0.78)
Two to three times	25.64 (1.22)
Four to five times	22.23 (1.20)
Five or more times	39.51 (1.39)

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TABLE 2
Distribution of modifiable health risk factors, related counselling, and treatment among health centre patients

	Race/ethnicity				Gender		p value
	Total	Non-Hispanic White	Non-Hispanic Black	Hispanic	Other	Male	
Sample size	6,998	1,489	1,535	2,754	1,220	2,781	4,217
Weighted % (SE)							
Modifiable risk factors							
Tobacco use (N = 5,793)							
Current smoker	26.05 (1.44)	36.49 (2.49)	24.36(2.53)	9.8 (1.49)	18.94 (3.57)	26.31(2.28)	25.9 (1.85)
Non-smoker	73.95 (1.44)	63.51 (2.49)	75.64 (2.53)	90.2 (1.49)	81.06(3.57)	73.69 (2.28)	94.1 (1.85)
Excessive alcohol consumption (N = 2,941)							
Yes	18.66(1.69)	19.33 (2.68)	13.25 (2.44)	22.7(3.27)	12.87 (2.97)	16.86(2.10)	19.76 (2.38)
No	81.34(1.69)	80.67 (2.68)	86.75 (2.44)	77.3 (3.27)	87.13 (2.97)	83.14 (2.10)	80.24 (2.38)
Obesity (N = 6,127)							
Obese/overweight	72.58 (1.38)	76.27(2.11)	73.48 (2.91)	70.5 (2.46)	52.8 (5.10)	73.07 (2.22)	72.25 (1.75)
Neither obese or overweight	27.42 (1.38)	23.73 (2.11)	26.52 (2.91)	29.5 (2.46)	47.2 (5.10)	26.93 (2.22)	27.75 (1.75)
High blood pressure (N = 7,002)							
Yes	30.15 (1.28)	33.64 (2.38)	42.24 (2.77)	14.78 (1.30)	18.85 (2.61)	33.95 (2.12)	27.44 (1.58)
No	69.85 (1.28)	66.36(2.38)	57.76 (2.77)	85.22(1.30)	81.15 (2.61)	66.05 (2.12)	72.56(1.58)
High blood cholesterol (N = 4,698)							
Yes	42.07 (1.76)	47.11 (2.78)	35.16(3.22)	35.21(2.86)	48.47 (5.56)	50.46 (3.10)	37.11 (2.08)
No	57.93 (1.76)	52.89 (2.78)	64.84 (3.22)	64.79 (2.86)	51.53 (5.56)	49.54 (3.10)	62.89 (2.08)
Related counselling/treatment							
Smoking cessation counselling (N = 1,799)							
Yes	76.53 (2.64)	78.30(3.36)	76.67 (4.61)	62.28 (8.52)	79.68 (5.24)	73.17 (4.06)	78.91 (3.49)
No	23.47 (2.64)	21.70 (3.36)	23.33 (4.61)	37.72 (8.52)	20.32 (5.24)	26.83 (4.06)	21.09 (3.49)
Alcohol treatment/counselling (N = 294)							
Yes	71.32 (7.19)	81.32 (6.78)	61.92(15.99)	60.79 (22.80)	61.36 (19.82)	81.22 (5.88)	62.66(11.55)
No	28.68 (7.19)	18.68 (6.78)	38.08(15.99)	39.21 (22.80)	38.64 (19.82)	18.78 (5.88)	37.34 (11.55)
Weight management counselling (N = 6,994)							
Yes	50.2 (1.42)	48.87 (2.41)	57.61 (3.06)	47.92 (2.24)	48.08 (4.61)	45.74 (2.25)	53.38(1.81)

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	Race/ethnicity					Gender			
	Total	Non-Hispanic White	Non-Hispanic Black	Hispanic	Other	p value	Male	Female	p value
High blood pressure counselling (N = 2,565)									
No	49.8 (1.42)	51.13 (2.41)	42.39 (3.06)	52.08 (2.24)	51.92 (4.61)		54.26(2.25)	46.62 (1.81)	
Yes	90.16(1.26)	91.15(1.75)	90.08 (2.53)	87.18 (2.76)	88.08 (4.57)	0.584	91.37(1.66)	89.09 (1.86)	0.362
No	9.84 (1.26)	8.85(1.75)	9.92 (2.53)	12.82 (2.76)	11.92 (4.57)		8.63(1.66)	10.91 (1.86)	
High blood cholesterol treatment/counselling (N = 2,043)									
Yes	97.01 (0.73)	97.12 (1.04)	96.11 (1.92)	96.91 (1.16)	98.97 (0.82)	0.718	97.21 (1.15)	96.85 (0.93)	0.225
No	2.99 (0.73)	2.88 (1.04)	3.89 (1.92)	3.09 (1.16)	1.03 (0.82)		2.79 (1.15)	3.15 (0.93)	

Note: Bold value indicates P values <0.05.

TABLE 3
Multivariate logistic regressions: modifiable health risk factors among health centre patients

	<u>Tobacco use (N = 5,572)</u>	<u>Excessive alcohol consumption (N = 2,890)</u>	<u>Obese/overweight (N = 5,361)</u>	<u>High blood pressure (N = 7,002)</u>	<u>High blood cholesterol (N = 4,698)</u>
Odds ratio (95% confidence interval)					
Race/Ethnicity					
Non-Hispanic White	Ref.	Ref.	Ref.	Ref.	Ref.
Non-Hispanic Black	0.757(0.640,0.896) **	0.811 (0.631, 1.042)	1.527(1.266, 1.843) ***	1.496 (1.270, 1.763) ***	0.764 (0.642, 0.909) **
Hispanic	0.203 (0.169, 0.244) ***	0.835 (0.650, 1.073)	1.652 (1.378, 1.980) ***	0.597(0.510,0.700) ***	0.786(0.664,0.929) **
Other	0.463 (0.384, 0.559) ***	0.920 (0.700, 1.210)	0.690(0.575,0.828) ***	0.846 (0.710, 1.008)	0.872 (0.723, 1.052)
Gender					
Male	Ref.	Ref.	Ref.	Ref.	Ref.
Female	0.486 (0.429, 0.552) ***	0.372 (0.310, 0.446) ***	1.248 (1.097, 1.420) **	0.634 (0.565,0.712) ***	0.937(0.829, 1.060)
Age					
<65 years	Ref.	Ref.	Ref.	Ref.	Ref.
65 years and over	0.248 (0.185, 0.331) ***	0.278 (0.152, 0.509) ***	0.884(0.696, 1.122)	2.390 (1.912,2.988) ***	1.179 (0.951, 1.461)
Education level					
More than High school	Ref.	Ref.	Ref.	Ref.	Ref.
High school	1.476 (1.252, 1.739) ***	1.404 (1.115, 1.767) **	0.878 (0.743, 1.036)	0.963 (0.829, 1.119)	0.912 (0.778, 1.069)
Less than high school	1.348 (1.149, 1.582) ***	1.173 (0.934, 1.474)	0.938 (0.798, 1.102)	0.959 (0.832, 1.107)	1.133 (0.976, 1.316)
Employment status					
Employed	Ref.	Ref.	Ref.	Ref.	Ref.
Not employed	1.183 (1.095, 1.278) ***	1.008 (0.903, 1.126)	1.060 (0.981, 1.146)	1.313 (1.226, 1.407) ***	1.247(1.159, 1.341) ***
Poverty status					
200% or more than FPL	Ref.	Ref.	Ref.	Ref.	Ref.
101% to 199% FPL	1.016(0.785, 1.316)	0.837(0.596, 1.175)	0.925 (0.724, 1.182)	1.083 (0.870, 1.347)	1.086(0.864, 1.364)
Less than or equal to 100% FPL	1.515 (1.187, 1.932) **	0.945 (0.685, 1.302)	0.786(0.621, 0.995) *	1.080(0.876, 1.331)	0.907 (0.728, 1.130)
Health insurance					
Private	Ref.	Ref.	Ref.	Ref.	Ref.

	<u>Tobacco use (N = 5,572)</u>	<u>Excessive alcohol consumption (N = 2,890)</u>	<u>Obese/overweight (N = 5,361)</u>	<u>High blood pressure (N = 7,002)</u>	<u>High blood cholesterol (N = 4,698)</u>
	Odds ratio (95% confidence interval)				
Medicare	1.602 (1.235, 2.077) ***	1.125 (0.749, 1.689)	1.028 (0.803, 1.317)	1.474 (1.181, 1.841) **	1.278 (1.020, 1.603) *
Medicaid	1.535 (1.232, 1.913) ***	1.484 (1.081, 2.036) *	1.033 (0.837, 1.274)	0.833 (0.690, 1.004)	0.953 (0.782, 1.162)
Other public	1.370 (0.963, 1.949)	1.517 (0.926, 2.486)	1.408 (0.959, 2.068)	1.183 (0.867, 1.612)	1.128 (0.813, 1.565)
Uninsured	1.162 (0.915, 1.475)	1.544 (1.108, 2.151) *	0.981 (0.780, 1.234)	1.002 (0.820, 1.224)	1.067 (0.862, 1.321)
Census Region					
Northeast	Ref.	Ref.	Ref.	Ref.	Ref.
South	1.184 (0.964, 1.455)	1.374 (1.011, 1.867) *	1.223 (0.995, 1.505)	1.228 (1.022, 1.474) *	1.040 (0.859, 1.259)
Midwest	1.538 (1.232, 1.918) ***	1.561 (1.132, 2.152) **	1.422 (1.122, 1.802) **	0.908 (0.739, 1.116)	0.844 (0.678, 1.050)
West	1.207 (1.001, 1.455) *	1.254 (0.952, 1.651)	1.070 (0.893, 1.281)	0.989 (0.838, 1.166)	1.008 (0.848, 1.197)

* Note. $p < 0.05$

** $p < 0.01$

*** $p < 0.001$

TABLE 4

Multivariate logistic regressions: related counselling and treatment among health centre patients

	Smoking cessation counselling (N = 1,741)	Alcohol treatment/ counselling (N = 289)	Weight management counselling (N = 5,435)	High blood pressure counselling (N = 2,565)	High blood cholesterol treatment/ counselling (N = 1,963)
Odds Ratio (95% Confidence Interval)					
Race/Ethnicity					
Non-Hispanic White	Ref.	Ref.	Ref.	Ref.	Ref.
Non-Hispanic Black	1.141 (0.833, 1.563)	0.739 (0.504, 1.084)	1.867(1.571,2.218)***	1.317 (0.916, 1.895)	1.343 (0.669, 2.696)
Hispanic	0.875 (0.586, 1.305)	0.651 (0.389, 1.089)	1.833(1.518,2.212)***	1.080 (0.709, 1.645)	0.573 (0.286, 1.148)
Other	0.778 (0.548, 1.104)	0.835 (0.523, 1.334)	1.080(0.894, 1.303)	1.039 (0.693, 1.556)	1.180(0.515,2.703)
Gender					
Male	Ref.	Ref.	Ref.	Ref.	Ref.
Female	1.088 (0.846, 1.398)	0.507*** (0.368, 0.697)	1.413 (1.251, 1.597)***	1.004 (0.765, 1.318)	1.036(0.620, 1.729)
Age					
>65 years	Ref.	Ref.	Ref.	Ref.	Ref.
65 years and over	1.661 (0.851, 3.241)	0.063** (0.009, 0.467)	0.627 (0.502, 0.784)***	0.899(0.593, 1.363)	1.115 (0.472, 2.629)
Education level					
More than High school	Ref.	Ref.	Ref.	Ref.	Ref.
High school	0.896(0.660, 1.217)	0.869 (0.596, 1.267)	0.862 (0.740, 1.004)	1.084 (0.773, 1.520)	1.215 (0.610, 2.419)
Less than high school	1.061 (0.780, 1.443)	0.788 (0.537, 1.157)	0.789 (0.679, 0.917)**	1.045 (0.750, 1.458)	0.730 (0.396, 1.345)
Employment status					
Employed	Ref.	Ref.	Ref.	Ref.	Ref.
Not employed	0.906(0.773, 1.063)	1.194 (0.966, 1.476)	0.893 (0.831, 0.960)**	1.004 (0.845, 1.192)	1.141 (0.824, 1.579)
Poverty status					
200% or More than FPL	Ref.	Ref.	Ref.	Ref.	Ref.
101% to 199% FPL	1.593(0.981,2.584)	0.719 (0.373, 1.386)	1.236(0.992, 1.539)	1.295(0.803,2.088)	1.284 (0.530,3.112)
Less than or equal to 100% FPL	1.265 (0.809, 1.976)	0.658 (0.360, 1.205)	1.228 (0.991, 1.522)	1.265 (0.799, 2.003)	0.939 (0.398,2.212)
Health insurance					
Private	Ref.	Ref.	Ref.	Ref.	Ref.
Medicare	0.755 (0.460, 1.237)	2.299* (1.035, 5.106)	1.130(0.901, 1.418)	1.015(0.645, 1.599)	0.900 (0.369, 2.193)

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	Smoking cessation counselling (N = 1,741)	Alcohol treatment/ counselling (N = 289)	Weight management counselling (N = 5,435)	High blood pressure counselling (N = 2,565)	High blood cholesterol treatment/ counselling (N = 1,963)
	Odds Ratio (95% Confidence Interval)				
Medicaid	0.997(0.654, 1.520)	2.133 [*] (1.025, 4.438)	1.010 (0.836, 1.220)	1.154 (0.738, 1.804)	1.195 (0.517, 2.764)
Other public	0.960 (0.491, 1.876)	1.278 (0.430, 3.800)	0.772 (0.561, 1.062)	0.743 (0.375, 1.473)	0.913 (0.233, 3.574)
Uninsured	0.893 (0.565, 1.411)	1.870 (0.863, 4.051)	0.794 (0.646, 0.974) [*]	1.057(0.655, 1.705)	1.129 (0.465, 2.745)
Census region					
Northeast	Ref.	Ref.	Ref.	Ref.	Ref.
South	0.650 (0.419, 1.008)	0.915(0.541, 1.550)	0.846 (0.700, 1.023)	1.217 (0.795, 1.862)	0.792 (0.352, 1.785)
Midwest	0.667 (0.429, 1.038)	0.924 (0.556, 1.534)	0.958 (0.775, 1.184)	1.487 (0.894, 2.473)	1.191 (0.456, 3.112)
West	0.550 (0.372, 0.813) ^{**}	0.841 (0.545, 1.297)	0.824 (0.696, 0.976) [*]	0.940 (0.644, 1.374)	1.063 (0.511, 2.211)
English speaking					
Yes	Ref.	Ref.	Ref.	Ref.	Ref.
No	1.040 (0.617, 1.752)	1.294 (0.670, 2.499)	0.881 (0.738, 1.051)	0.673 (0.427, 1.058)	0.200 (0.076, 0.525) ^{**}
Health status					
Excellent/very good/good	Ref.	Ref.	Ref.	Ref.	Ref.
Fair/poor	1.114 (0.858, 1.446)	0.801 (0.574, 1.118)	1.245 (1.099, 1.410) ^{**}	1.115 (0.838, 1.482)	1.269 (0.731, 2.203)
Need help with ADLs					
No	Ref.	Ref.	Ref.	Ref.	Ref.
Yes	1.117 (0.830, 1.503)	0.867 (0.607, 1.237)	1.073 (0.923, 1.248)	1.148 (0.842, 1.566)	0.771 (0.423, 1.405)
Need help with IADLs					
No	Ref.	Ref.	Ref.	Ref.	Ref.
Yes	1.143 (0.867, 1.506)	1.500 [*] (1.072, 2.099)	0.891 (0.773, 1.027)	1.021 (0.749, 1.393)	1.314 (0.721, 2.394)
Number of chronic conditions					
None	Ref.	Ref.	Ref.	Ref.	Ref.
One	1.851 (1.347, 2.543) ^{***}	1.535 (0.895, 2.633)	1.767 (1.518, 2.058) ^{***}	0.786 (0.578, 1.068)	0.790 (0.352, 1.777)
Two or more	3.622 (2.604, 5.038) ^{***}	2.507 ^{***} (1.497, 4.199)	2.913 (2.482, 3.420) ^{***}	0.998 (0.764, 1.459)	1.767 (0.772, 4.043)
Types of health centre funding					
Community Health Center	Ref.	Ref.	Ref.	Ref.	Ref.
Public Housing Primary Care	1.009 (0.624, 1.631)	1.785 (0.918, 3.470)	0.817 (0.657, 1.017)	0.810 (0.495, 1.326)	1.872 (0.547, 6.414)

	Smoking cessation counselling (N = 1,741)	Alcohol treatment/ counselling (N = 289)	Weight management counselling (N = 5,435)	High blood pressure counselling (N = 2,565)	High blood cholesterol treatment/ counselling (N = 1,963)
Migrant Health Center	0.571 (0.327, 0.995) [*]	0.734 (0.270, 1.993)	0.922 (0.758, 1.121)	1.053 (0.604, 1.834)	3.848 (1.273, 6.166) [*]
Health Care for the Homeless	1.073 (0.812, 1.419)	4.881 [*] (3.362, 7.085)	0.790 (0.673, 0.926) ^{**}	0.828 (0.584, 1.172)	0.726 (0.386, 1.365)
Number of physician visits					
None	Ref.	Ref.	Ref.	Ref.	Ref.
One time	0.720 (0.361, 1.435)	0.426 (0.151, 1.203)	1.221 (0.850, 1.755)	0.705 (0.313, 1.586)	4.510 (0.964, 21.105)
Two to three times	0.761 (0.415, 1.398)	0.692 (0.307, 1.560)	1.501 (1.094, 2.058) [*]	1.833 (0.865, 3.883)	2.297 (0.760, 6.941)
Four to five times	1.674 (0.892, 3.139)	0.867 (0.384, 1.954)	2.097 (1.523, 2.888) ^{***}	2.195 (1.031, 4.671) [*]	3.981 (1.282, 12.368) [*]
Five or more times	1.813 (0.993, 3.312)	0.718 (0.326, 1.585)	2.224 (1.626, 3.042) ^{***}	1.633 (0.790, 3.375)	3.149 (1.086, 9.135) [*]

* Note. $p < 0.05$

** $p < 0.01$

*** $p < 0.001$