Research Square

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Sociodemographic and Health-Related Characteristics of a Safety-Net Patient Population

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Research article

Keywords: Safety-net, vulnerable, underserved, health services, chronic disease, health disparities

Posted Date: November 18th, 2019

DOI: https://doi.org/10.21203/rs.2.14361/v3

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Abstract

Background Safety-net health systems are an important source of healthcare for underserved or vulnerable individuals, but definitions of safety-net institutions are largely based on patient characteristics. Some definitions may not accurately identify such institutions. Therefore, we aimed to describe the characteristics of urban safety-net patients in Texas and compare the distribution of morbidities between safety-net and general population patients. Methods We used hospital claims data from the Dallas-Fort Worth Hospital Council Foundation to create a cross-sectional cohort. Eligible patients were aged ≥18 years and Tarrant County residents in 2018. Patients were divided into two groups for comparison. The first group represented patients with hospital claims from JPS Health Network (i.e. safety-net population). The second group represented all patients with hospital claims in Tarrant County (i.e. general population). We estimated frequencies of patient characteristics. In addition, we estimated overall and payor-stratified standardized morbidity ratios (SMRs) adjusted for age, gender, and race/ethnicity to compare the prevalence of common chronic diseases between safety-net patients and patients in the general population. Results Our study population comprised 459,827 patients, of whom 74,323 (16%) were safety-net patients. Patients aged ≥65 years comprised 23% of the general population and 11% of the safety-net population. Non-Hispanic Whites comprised 52% of the general population and 29% of safety-net patients. A larger proportion of safety-net patients were uninsured compared with general population patients (safety-net: 54%; general population: 25%), but Medicaid distribution was less discrepant (safety-net: 9%; general population: 7%). Medicare was the primary payor for 24% of general population patients and 14% of safety-net patients. Safety-net patients had relative excesses of mental health and chronic conditions ranging between 5% and 230% for all selected conditions except dementia/Alzheimer's. The patterns for payor-stratified SMRs were consistent with the overall results. Conclusions We observed considerable sociodemographic diversity and a high burden of mental health and chronic conditions among safety-net patients, which may support understanding the healthcare needs of safety-net populations. Our findings raise questions about definitions of safety-net institutions based on Medicaid distribution alone and the transportability of findings from studies in which safety-net populations are unrepresented.

Background

The definition of safety-net institution may have considerable impact not only on health services reimbursement but also on understanding the healthcare needs of safety-net populations. Safety-net institutions are commonly defined according to the distribution of hospital- or health system-level characteristics such as the disproportionate share index, Medicare and uninsured caseload, and cost of uncompensated care [1]. Hospitals or health systems in the top quartile of each state based on these measures are considered safety-net institutions [1]. Nevertheless, this approach may be problematic for several reasons [2]. Foremost, homogeneity is assumed within each quartile [2]. Therefore, a hospital at the upper end of the quartile is assumed to be the same as a hospital at the lower end of the same quartile, which may be unrealistic. In addition, comparison between states is challenging because

quartiles will be based on the distribution of measures within each state. Similar problems can arise with comparisons, even within each state, if the distributions of these measures change over time.

A simple distinction originally proposed by the Institute of Medicine was that core safety-net institutions, by mission or legal mandate, offer health services regardless of an individual's ability to pay [3]. This distinction could have considerable impact on the case-mix of a safety-net institution, but limited information is available about the characteristics of this population. A systematic assessment of people receiving care in a core safety-net health system may provide insight about consistency with common definitions of safety-net and contribute to understanding the healthcare needs of this population. Therefore, we aimed to assess the characteristics of patients at a core safety-net health system in Texas and compare the distribution of morbidities between safety-net patients and patients in the general population.

Methods

Study setting

JPS Health Network (JPS) is core safety-net health system and a member of America's Essential Hospitals, which is an organization of over 300 hospitals and health systems across the United States (U.S.) with a mission to serve vulnerable populations [4]. The network has a well-defined urban catchment area that encompasses Tarrant County, Texas, which is part of the Dallas-Fort Worth metropolitan area. Tarrant County covers 902 square miles and is the third largest county in Texas with a population of 2.1 million people and an overall poverty of 13.5% [5, 6]. The network includes a 573-bed academic teaching hospital in Fort Worth, Texas and over 40 satellite community health and school-based clinics distributed across the county. JPS is the county's only safety-net health system and provides comprehensive health services including inpatient, outpatient, and specialty services. Specialty services include Level 1 services for trauma and stroke, an accredited comprehensive Community Cancer Program, and a comprehensive HIV clinic (Healing Wings Clinic) supported by the Ryan White HIV/AIDS Program.

Data source and eligibility criteria

We used administrative claims data from the Dallas Fort Worth Hospital Council Foundation (DFWHC) regional database for this study. DFWHC data include administrative claims data from 90 member hospitals across 17 counties in the North Texas region, which represents about 95% of hospitals in the region [7]. This comprehensive database has information on patient charges, emergency department (ED) use, and sociodemographic characteristics of patients from the North Texas region [7].

Our eligibility criteria included patients aged ≥18 years who were Tarrant County residents at any point in 2018 and had a hospital encounter at any DFWHC member hospital in Tarrant County during that year. Patients without a Tarrant County zip code during 2018 were ineligible. Given that JPS is the only safety-net health system in the county, we were able to define the safety-net population as adults who generated either at least one claim for services rendered during a non-ED hospital encounter or who had claims that

exclusively originated from the ED at JPS between January 1, 2018 and December 31, 2018. General population patients were defined as adults generating at least one claim for health care services rendered during a hospital encounter at any DFWHC member hospital within Tarrant County during 2018.

Sociodemographic and health related characteristics.

Sociodemographic characteristics included age (18 – 29, 30 – 39, 40 – 49, 50 – 59, 60 – 64 or ≥65 years), race/ethnicity (Hispanic, non-Hispanic Black, non-Hispanic White, non-Hispanic Other), and gender (male or female). Health insurance status was defined as the primary payor listed on the medical claim and categorized as insured (commercial insurance, health maintenance organization and preferred provider organization insurance, workers compensation, veteran and other Federal programs insurance), uninsured (self-pay or unknown insurance status), Medicare, and Medicaid. We used the Centers for Medicare and Medicaid Services (CMS) developed list of chronic illnesses [8] for the study. The presence of a selected chronic illness in study patients was based on International Classification of Diseases, Tenth Revision, (ICD-10) codes for the first listed principal diagnosis in the medical claim for that hospital encounter (detailed in *Supplementary Table S1*). Multi-morbidity burden was defined as the presence of more than one selected chronic illness per hospital encounter and classified from zero to greater than or equal to three (0, 1, 2, or ≥3).

Data analysis

We estimated relative frequencies of sociodemographic characteristics in both safety-net patients and general population patients. In addition, we computed overall- and payor-stratified (private insurance, Medicaid, Medicare, and uninsured) standardized morbidity ratios (SMRs) and corresponding 95% confidence limits (CL) to compare the observed number of cases for a selected chronic condition among safety-net patients with the expected number of cases if patients in the general population had the same age-, gender-, and racial/ethnic distribution as safety-net patients. An SMR greater than one thus indicates the relative excess number of cases for a particular condition among safety-net patients compared with patients in the general population.

Results

Our study population comprised 459,827 patients, of whom 74,323 (16%) were safety-net patients (*Figure 1*). *Table 1* summarizes the sociodemographic characteristics of our study population by safety-net or general population status. Patients aged ≥65 years comprised 23% of the general population and 11% of the safety-net population. The majority of general population patients were non-Hispanic White (52%) and female (65%), whereas gender and race/ethnicity were more evenly distributed among safety-net patients. A larger proportion of safety-net patients were uninsured compared with general population patients (safety-net: 54%; general population: 25%). In contrast, Medicare was the primary payor for about 24% of general population patients but only 14% of patients used the safety-net health system.

Health-related characteristics

Figure 2 illustrates SMRs comparing the burden of select chronic illnesses between the general and safety-net populations. Safety-net patients had relative excesses of morbidities ranging between 5% and 230% for all but one of the conditions of interest. The top five excess morbidities among safety-net patients were major depression (SMR=3.30, 95% CL: 3.18, 3.44), schizophrenia-related disorders (SMR=2.57, 95% CL: 2.46, 2.68), human immunodeficiency virus (HIV) (SMR=2.20, 95% CL: 2.01, 2.41), chronic viral hepatitis (SMR=2.09, 95% CL: 1.96, 2.24) and chronic obstructive pulmonary disease (SMR=1.56, 95% CL: 1.51, 1.61). The combination of Alzheimer's disease and dementia was the only condition with a lower relative morbidity among safety-net patients compared with patients in the general population (SMR=0.90, 95% CL: 0.84, 0.97).

Table 2 illustrates insurance-stratified SMRs comparing the burden of select morbidities between general and safety-net populations. The patterns of relative excess morbidity observed were generally consistent with the overall population for individuals who were uninsured, Medicaid and Medicare. Safety-net patients with private insurance had relative excesses ranging between 9% and 525% for all of the chronic conditions of interest. The top five excess morbidities among privately insured safety-net patients were major depression (SMR=6.25, 95% CL: 5.81, 6.73), schizophrenia-related disorders (SMR=4.54, 95% CL: 3.99, 5.16), HIV (SMR=3.96, 95% CL 3.30, 4.74), chronic viral hepatitis (SMR=2.87, 95% CL: 2.43, 3.39) and chronic obstructive pulmonary disease (SMR=2.06, 95% CL: 1.88, 2.26).

Discussion

Texas has the highest prevalence of uninsured adults in the U.S. [9] and accounts for 31% (2.5 million) of people in the coverage gap [10]. In addition, 33% of the Texas population is underinsured [11]. Uninsured and underinsured individuals in Texas and other Medicaid non-expansion states rely on the healthcare safety-net for their needs [12, 13]. Our results suggest that safety-net patients are substantially different from the general population of patients overall and by payor status. Safety-net patients are younger, have greater racial/ethnic diversity, and are largely uninsured. In addition, safety-net patients have a substantially higher burden of mental illness and chronic conditions including HIV infection, chronic viral hepatitis, chronic obstructive pulmonary disease, cancer, and type 2 diabetes.

Prior reports have primarily focused on hospital-level comparisons using definitions of disproportionate share hospitals. These reports used hospital characteristics such as the proportion of individuals who are uninsured or the proportion of Medicaid or Medicare beneficiaries to define safety-net health systems [14-19]. These definitions do not consider underinsured individuals or high-need low income patients with non-Medicaid insurance, who comprise 28% (41 million) of the adult population in the U.S. [20, 21] and receive uncompensated or unreimbursed care. Common measures of safety-net status based on disproportionate share or Medicaid and Medicare caseload, particularly in Medicaid non-expansion states, may thus misclassify institutions [22]. Misclassification could adversely impact the financial viability of institutions with a larger share of uncompensated and unreimbursed care costs [1, 23]. Such institutions would not be able to meet the healthcare needs of vulnerable populations [1].Our findings

thus support the use of a revised definition based on uncompensated care for defining safety-net institutions [1].

We identified two prior studies with an individual-level analysis comparing safety-net populations with patients in other settings. Our results are generally consistent with the study by Balasubramanian et al. [24], who reported a greater proportion of safety-net patients had higher comorbidity scores compared with patients at non-safety-net institutions. Nevertheless, the population for this study comprised patients aged 50 – 63 years and the data were derived from both administrative claims and clinical sources including electronic health records. Our study population included all patients aged ≥18 years and was based on administrative claims data, but the observed higher morbidity among safety-net patients is consistent between studies. The study by Whitaker et al. [25] is not directly comparable with our study considering the authors focused on lower post-operative complications after colorectal cancer surgery and not the broader comparisons pursued in our study.

We observed sizable differences in the chronic disease burden between safety-net patients and general population patients by payor status. In particular, our results suggest substantially higher relative excess of mental health and chronic conditions even when comparing safety-net patients with patients in the general population by private insurance, Medicaid, and Medicare. These differences may be partially attributable to being underinsured [26], which prompted care at a safety-net health system. This finding, combined with the low frequency of Medicare beneficiaries in our population, raises further concerns about standard definitions that are used to identify safety-net institutions.

Our findings should be interpreted in the context of certain limitations. Our SMR estimates may be sensitive to outcome misclassification because of errors in coding claims and varying coding practices across participating hospitals. For example, a prior study [27] reported that administrative claims data have 61% sensitivity and 94% specificity for classifying depression when electronic health records are the reference standard. If outcome misclassification is precisely nondifferential (i.e. no variation in misclassification between safety-net patients and patients in the general population) given additional assumptions including independent errors [28], then our SMRs may underestimate the true magnitude of relative excess of depression or other conditions. In contrast, if outcome misclassification is differential, then our SMR estimates may underestimate or overestimate the true magnitude of relative excess. In addition, our SMR estimates may be sensitive to selection bias if individuals in our safety-net hospital also received care at other hospitals. This bias is related to an initial misclassification of hospital status but manifests as selection bias because the individual could “participate” in both the safety-net and general population of patients. The consequence may bias SMRs toward the null, which would underestimate the magnitude of health conditions among safety-net patients. Another consideration is that claims data do not include services provided through outpatient labs or hospital-based outpatient services which limits the generalizability of these findings to those settings. Generalizability may also be limited for the observed distribution of sociodemographic and clinical characteristics observed in our study.

In summary, if the limitations of our study did not materially affect our results, then our findings provide useful evidence that can be used to better define safety-net populations in future studies. We observed considerable sociodemographic diversity and a high burden of mental health and chronic conditions among safety-net patients, which may support understanding the healthcare needs and priorities of safety-net populations. The high burden of chronic conditions extended to safety-net patients regardless of payor. The differences in characteristics between safety-net populations and patients in the general population raise questions about definitions of safety-net institutions based on Medicaid or Medicare distribution. In addition, the transportability of findings from studies in which safety-net populations are unrepresented are questionable [29-35]. Despite a Federal Act in 1993 to improve representation of vulnerable populations in research [36], little improvement has been reported [37, 38]. Vulnerable populations' lack of willingness to participate in research is a reported barrier to inclusion, but several studies have refuted this claim [39-41] Rather, logistical considerations may be a greater concern, but these issues are not insurmountable with proper planning [34, 42]. In the absence of adequate representation in research used to generate evidence for interventions and guidelines, greater attention should be given to evaluating interventions and guidelines for benefits and harms in safety-net settings.

Abbreviations

AIDS: Acquired Immune Deficiency Syndrome; CMS: Centers for Medicare and Medicaid Services; COPD: Chronic Obstructive Pulmonary Disease; CL: Confidence Limits; DFWHC: Dallas Fort Worth Hospital Council Foundation; ED: Emergency Department; HIV: Human Immunodeficiency Virus; ICD-10: International Classification of Diseases, Tenth Revision; JPS: John Peter Smith Health Network; SMRs: Standardized Morbidity Ratios; U.S.: United States

Declarations

Ethics approval and consent to participate

Not applicable

Consent for publication:

Not applicable

Availability of data and materials

The data that support the findings of this study are available from Dallas Fort Worth Hospital Council Foundation but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available. Data are however available from the authors upon reasonable request and with permission of Dallas Fort Worth Hospital Council Foundation.

Competing interests

The authors declare that they have no competing interests.

Funding: None to declare

Authors' contributions

AMA contributed to the design of the study, reviewed background literature, interpreted study results, and led the write-up and final edit of manuscript. RPO concieved study design, interpreted results, and participated in critical review and final edit of manuscript. IA contributed to literature review for study and participated in critical revision and final edit of manuscript. MJC performed data analysis, partcipated in interpretation of study results and manuscript preparation. LY, TC, BM, AWG, KC participated in interpretation of study results and participated in critical review and final edit of manuscript. All authors read and approved the final manuscript.

Acknowledgements

The authors are grateful to the Dallas Fort Worth Hospital Council Foundation for providing data for the study.

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Tables

Table 1. Sociodemographic characteristics of safety-net and general population patients in Tarrant County, 2018.

Characteristic	Safety-net *n*= 74,323 *n* (%)	General population *n* = 459,827 *n* (%)
Gender		
Female	41,724 (56)	296,987 (65)
Male	32,599 (44)	162,840 (35)
Age, years		
18 – 29	15,842 (21)	91,082 (20)
30 – 39	14,260 (19)	76,458 (17)
40 – 49	13,178 (18)	73,538 (16)
50 – 59	15,816 (21)	78,808 (17)
60 – 64	6,732 (9)	35,888 (8)
≥65	8,495 (11)	104,053 (23)
Race/Ethnicity		
Hispanic	25,169 (34)	73,120 (16)
Non-Hispanic White	21,415 (29)	240,330 (52)
Non-Hispanic Black	21,285 (29)	97,527 (21)
Non-Hispanic Other	6,454 (9)	48,850 (11)
Primary payor at first eligible claim[1]		
Insured[2]	16,817 (23)	204,561 (44)
Medicare	6,882 (14)	32,902 (24)
Medicaid	10,403 (9)	109,159 (7)
Uninsured[3]	40,221 (54)	113,205 (25)
Multi-morbidity burden[4]		
No chronic comorbidity[4]	35,675 (47)	257,503 (56)
1 comorbidity	17,094 (23)	91,965 (20)
2 comorbidities	10,405 (14)	50,581 (11)
3 comorbidities	5,203 (7)	27,590 (6)
4 comorbidities	2,973 (4)	13,795 (3)
≥5 comorbidities	2,973 (4)	18,393 (4)

[1]Claims do not include services provided through outpatient labs or Hospital-based outpatient clinics

[2]Insured includes commercial, federal, PPO, HMO, point of service, exclusive provider, liability and worker's comp programs

[3]Uninsured includes claims with no primary payor listed as well as those that were self-pay

[4]Comorbid count only includes chronic illnesses of interest

Table 2. Standardized morbidity ratios[1] for selected chronic conditions in Tarrant County safety-net patients by insurance status.

	SMR (95% CL)			
ıronic Condition	Insured	Medicaid	Medicare	Uninsured
ior Depression	6.25 (5.81, 6.73)	1.74 (1.49, 2.02)	2.51 (2.21, 2.86)	2.14 (2.03, 2.26)
ıizophrenia-related orders	4.54 (3.99, 5.16)	1.60 (1.45, 1.76)	2.31 (2.11, 2.52)	1.96 (1.84, 2.08)
'	3.96 (3.30, 4.74)	1.53 (1.20, 1.95)	2.32 (1.93, 2.79)	1.57 (1.35, 1.83)
'onic Viral Hepatitis	2.87 (2.43, 3.39)	1.30 (1.12, 1.52)	1.73 (1.50, 2.00)	1.47 (1.33, 1.63)
PD	2.06 (1.88, 2.26)	0.92 (0.84, 1.01)	1.27 (1.20, 1.33)	1.33 (1.26, 1.41)
e 2 Diabetes	1.42 (1.37, 1.48)	0.96 (0.91, 1.02)	1.09 (1.05, 1.12)	1.13 (1.10, 1.16)
lignant Cancer	1.16 (1.06, 1.27)	1.45 (1.30, 1.62)	1.19 (1.11, 1.28)	1.61 (1.51, 1.71)
ential Hypertension	1.31 (1.28, 1.35)	0.98 (0.94, 1.03)	1.06 (1.04, 1.09)	1.09 (1.07, 1.11)
'onic Kidney Disease	1.46 (1.35, 1.59)	1.03 (0.93, 1.14)	1.03 (0.98, 1.08)	1.27 (1.21, 1.34)
ɔke	1.14 (0.96, 1.37)	1.16 (0.99, 1.36)	0.99 (0.90, 1.09)	1.00 (0.90, 1.11)
'onic Ischemic Heart ease	1.09 (1.01, 1.18)	0.84 (0.75, 0.93)	0.93 (0.89, 0.98)	1.14 (1.09, 1.20)
nentia/Alzheimer's	1.30 (0.99, 1.70)	0.93 (0.74, 1.17)	0.77 (0.70, 0.84)	1.23 (1.04, 1.45)

nates are standardized for population differences in sex, race/ethnicity and age categories. COPD: Chronic Obstructive ɔnary Disease; HIV: Human Immunodeficiency Virus

Figures

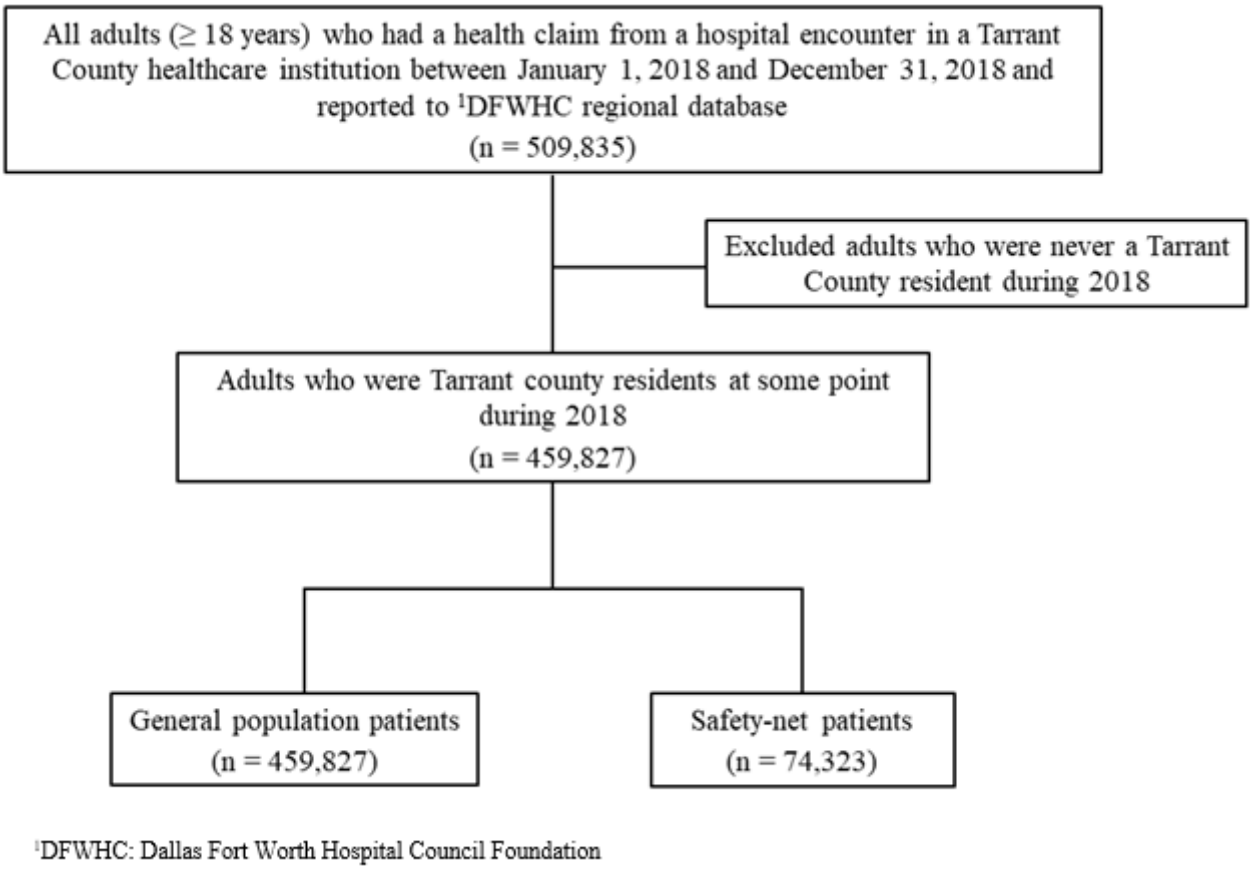

Figure 1

Selection of safety-net patients and patients in the general population.

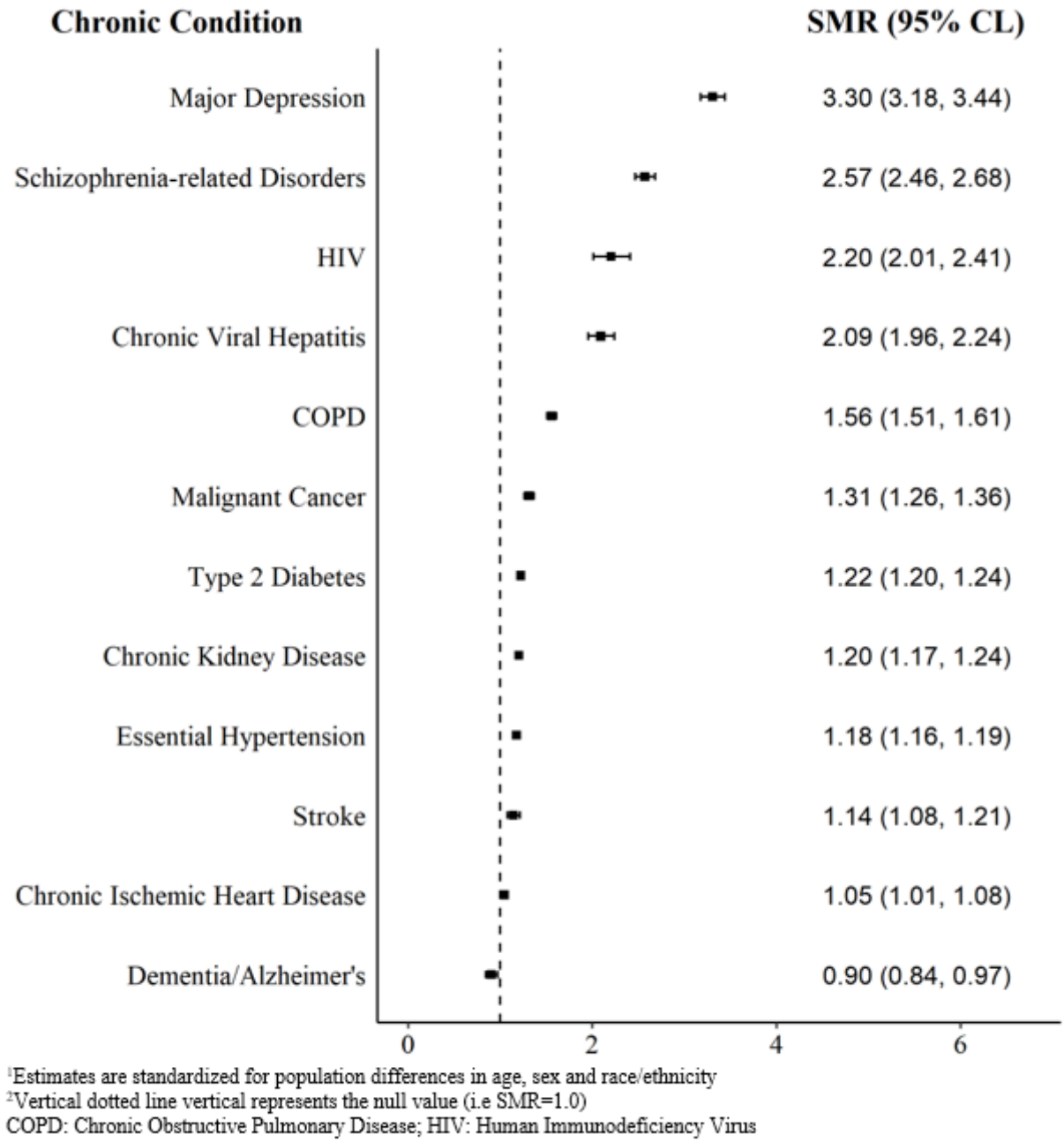

Figure 2

Standardized morbidity ratios (SMRs)1 for select chronic conditions in Tarrant County safety-net patients, 2018.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- Supplementary.pdf