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Health Risks and Chronic Health Conditions among Arab American and White Adults in Northern California

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Objectives: To characterize the prevalence of chronic cardiovascular conditions and risk factors among Arab American adults stratified by sex and compare these with non-Hispanic Whites.

Design: Cross-sectional study using electronic health record data from visits between January 2015 and December 2016. Age-adjusted prevalence estimates were calculated for men and women and compared using generalized linear models.

Setting: Kaiser Permanente health plan in Northern California.

Participants: Non-Hispanic White (N=969,566) and Arab American (N=18,072) adult members.

Main Outcome Measures: Sex-stratified prevalence and prevalence ratios of diabetes, pre-diabetes, hypertension, and hyperlipidemia diagnosed by December 2016 and of obesity, ever smoking, and current smoking status.

Results: Arab American men had a significantly higher prevalence of ever smoking (41.8 vs 40.8%), diabetes (17.3 vs 12.5%), and hyperlipidemia (40.8 vs 34.7%) than White men, but a significantly lower prevalence of obesity (34.4 vs 37.8%) and hypertension (30.5 vs 33.3%). Arab American women had a significantly higher prevalence of diabetes (11.1 vs 8.7%) and hyperlipidemia (31.5 vs 28.3%) than White women but significantly lower prevalence of obesity (31.0 vs 34.2%), ever smoking (24.8 vs 34.5%), and hypertension (25.8 vs 28.4%).

Conclusions: Hospital and health systems should intentionally collect data on Middle Eastern and North African ethnicity in electronic health records to identify and reduce the disparities this minority group faces. *Ethn Dis.* 2021;31(2):235-242; doi:10.18865/ed.31.2.235

Keywords: Health Disparities; Chronic Disease; Arab Americans; Risk Factors; California

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Introduction

Arab Americans are a minority group in the United States (US) with ethnic origins in Arabic speaking countries in the Middle East and North Africa. California has become home to one of the largest groups of Arab Americans since early immigration waves in the 1880s. It is estimated that 820,000 Arab Americans live in California, representing 2% of the adult population of the state.[1] Recent evidence from the California Health Interview Survey suggests that Arab Americans in California have a higher risk of some chronic health conditions than non-Hispanic Whites and that patterns previously observed in the health of other minority groups do not seem to hold for Arab Americans.[2]

Understanding and quantifying Arab American health needs is complicated by a lack of racial and ethnic identifiers on many standardized forms used by the federal government, health insurers, health care providers, and public service agencies.[3] Decennial Census and National Health Interview Survey forms rely on country of birth to capture Arab Americans born outside of the United States (first generation immigrants) but often miss those who are born in the United States to Arab immigrants (second generation immigrants) or US-born Arab Americans with Arab ancestry (third generation immigrants). Further, much of our understanding of Arab American health relies on convenience sample surveys that identify Arab Americans in ethnic enclaves or in areas where Arab Americans are known to reside. In one of the first studies of its kind, a recent analysis using data from a Michigan-based hospital identified Arab Americans and compared their health indicators with those for Whites in the same hospital.[4] This study found that Arab American men and women had a higher prevalence of diabetes and hypertension than Whites. The study also found significant differences between Arab American men and women on chronic disease prevalence[4] as has a study examining mental health outcomes using EHR data.[5]

Aiming to contribute to our understanding of Arab American health, we used electronic health record (EHR) data for adult members of a large Northern California health plan to characterize the prevalence of chronic cardiovascular conditions and risk factors in Arab American adult men and women and compared these with non-Hispanic Whites. Health plan-based samples provide a comprehensive picture of health in a particular region and are a low-cost means of accessing rich data on large populations.[6]

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Methods

Setting

Kaiser Permanente Northern California (KPNC) is an integrated health care delivery system that provides outpatient, inpatient, and ancillary health care services to more than 3.2 million adults in the San Francisco and Greater Bay Area of California. The sociodemographic and health characteristics of the KPNC adult membership are similar to those of the insured population of Northern California.[7]

Study Population

Data for Arab American and non-Hispanic White adults used for this study came from a larger adult race/ethnicity cohort described in detail elsewhere.[8] First and last names, race/ethnicity, and preferred written and spoken language (REL) data were available for the entire cohort. However, because KPNC primarily uses the Office of Management and Budget (OMB) minimum categories to capture race/ethnicity[9] for the EHR in the outpatient setting, members of Arab American/North African ethnicity are coded using the White and Other race categories.

We used two methods to identify Arab Americans in the cohort. First, we used individual member's ethnicity reported in the EHR or available from previous studies. If ethnicity was characterized as Arab or originating from one of 22 Arab League countries, or preferred written or spoken language was Arabic, those individuals (excluding Armenians, Iranian/Persians, and Turks) were classified as Arab American. Second, we used an Arab surname algorithm previously validated using a cancer registry in California[10] to identify potential Arab Americans in the cohort, with subsequent review of first name and other REL data for each individual to eliminate those with questionable Arab ethnicity.

Overall, 25,603 adults were classified as Arab American in the study sample. Due to the focus of our study on chronic health outcomes, which are more likely to develop with older age, we restricted our sample to the 18,072 Arab Americans aged 35-84 years. Of these, 26.6% (n=4,815) were identified from EHR ethnicity data, 1.6% (n=287) from Arabic language, 1.5% (n=268) from self-reported patient survey data, and 70.3% (n=12,702) from surname. The non-Hispanic Whites in our study sample (n=969,566) had been identified previously based on race and ethnicity data from the EHR and research sources.

EHR-Derived Variables

Sex at birth, age, smoking status, obesity, and chronic condition variables were created from EHR and registry data. Individuals were classified as having diabetes mellitus (DM) if they were in the KPNC Diabetes Registry, which identifies people using inpatient and outpatient diagnosis codes, lab test results, and pharmacy data (see Karter et al for specifica-

Table 1. Prevalence of risk factors and chronic health conditions among Arab American and White men and women aged 35-84 years, 2016.

	All		Men		Women	
	Arab Americans	Whites	Arab Americans	Whites	Arab Americans	Whites
	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)
Ages 35-84/All						
Risk Factors						
Obesity (BMI ≥30)	32.8 (32.0, 33.6)	35.9 (35.8, 36.0)	34.4 (33.2, 35.5)	37.8 (37.6, 37.9)	31.0 (29.9, 32.2)	34.2 (34.0, 34.4)
Current smoking	10.0 (9.5, 10.4)	8.9 (8.9, 9.0)	13.3 (12.6, 14.0)	10.4 (10.3, 10.5)	6.5 (5.9, 7.0)	7.6 (7.5, 7.7)
Ever smoking	33.4 (32.7, 34.1)	37.4 (37.4, 37.5)	41.8 (40.7, 42.8)	40.8 (40.7, 41.0)	24.8 (23.9, 25.7)	34.5 (34.3, 34.6)
Chronic conditions						
Diabetes	14.3 (13.7, 14.8)	10.5 (10.4, 10.5)	17.3 (16.6, 18.1)	12.5 (12.4, 12.6)	11.1 (10.4, 11.7)	8.7 (8.7, 8.8)
Prediabetes	10.1 (9.6, 10.5)	8.8 (8.8, 8.9)	11.4 (10.8, 12.1)	10.1 (10.1, 10.2)	8.6 (8.0, 9.2)	7.7 (7.6, 7.7)
Hypertension	28.2 (27.6, 28.8)	30.7 (30.6, 30.8)	30.5 (29.6, 31.3)	33.3 (33.2, 33.5)	25.8 (25.0, 26.7)	28.4 (28.3, 28.5)
Hyperlipidemia	36.3 (35.7, 37.0)	31.3 (31.3, 31.4)	40.8 (39.8, 41.7)	34.7 (34.6, 34.8)	31.5 (30.6, 32.4)	28.3 (28.1, 28.4)

tions).[11] The specific ICD-9 and ICD-10 outpatient visit and problem list codes appearing in the EHR between January 2015 and December 2016 that were used to classify individuals as having pre-diabetes, hypertension, and hyperlipidemia can be found in Gordon et al.[8] BMI was calculated using the valid 2016 EHR-entered weight closest to December 1, 2016, and valid EHR-entered height closest to the date closest to the weight. Individuals were considered obese if they had a BMI ≥30 kg/m^2. Smoking status (current or ever smoker) was based on EHR tobacco use data on the visit date closest to December 1, 2016. Those who did not have usable smoking status data from 2015 or 2016 but who had information in their EHR during the three previous years or first three months of 2017 that indicated they had never smoked were coded as never smokers. Approximately 3.9% of Arab American men aged 35-64 years, 1% of men aged 65-84 years, and 1% of women in both groups were missing smoking status. Approximately 30% of adults aged 35-64 years and 24% of adults aged 65-84 years did not have usable BMI data, with no significant difference between Arabs and Whites. Heart disease was examined as an outcome in the 65-84 age group due to low incidence in younger age groups.

Analysis

Study data were analyzed using SAS version 9.4 (SAS Institute, Cary, IN, 2013). We used Proc Surveyreg, with a log-binomial model for dichotomous outcomes, to produce prevalence estimates with 95% confidence intervals for smoking, obesity, and the health conditions for Arab American and White men and women age-standardized to the 2016 US Census. Estimates for Arab American and White men and women aged 35-84 years (Overall prevalence) were age-standardized using five age groups (35-44 years, 45-54 years, 55-64 years, 65-74 years, and 75-84 years). Prevalence estimates for smoking, obesity, and health conditions were additionally calculated for men and women ages 35-44 ("younger" group), 45-64 ("middle-aged" group), and 65-84 years ("older" group). We used Proc Genmod[12] to calculate sex-specific age-adjusted prevalence ratios (PR) for Arab Americans compared with Whites. All differences mentioned in the text are statistically significant at P<.05.

Ethical Review

All procedures were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000. This study was approved by KPNC's institutional review board. The IRB waived the requirement to obtain informed consent.

Results

Sample Characteristics

Our sample consisted of 18,072 Arab Americans and 969,566 non-Hispanic Whites aged 35-84 years. The Arab American group

Table 2. Prevalence of risk factors and chronic health conditions among Arab American and White men and women stratified by age groups (35-44, 45-64, and 65-84), 2016

	All		Men		Women	
	Arab Americans	Whites	Arab Americans	Whites	Arab Americans	Whites
	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)
Ages 35-44/Younger group						
Risk Factors						
Obesity (BMI ≥30)	30.8 (29.2, 32.3)	34.8 (34.5, 35.0)	34.7 (32.5, 37.0)	36.8 (36.4, 37.2)	26.7 (24.6, 28.7)	33 (32.6, 33.4)
Current smoking	11.8 (10.9, 12.7)	10.1 (10.0, 10.2)	17.0 (15.6, 18.5)	13.0 (12.8, 13.2)	6.4 (5.5, 7.4)	7.3 (7.2, 7.5)
Ever smoking	27.3 (26.0, 28.5)	31.5 (31.3, 31.7)	36.7 (34.8, 38.5)	35.6 (35.3, 36.0)	17.5 (16.0, 19.0)	27.6 (27.3, 27.9)
Chronic conditions						
Diabetes	3.6 (3.1, 4.2)	2.9 (2.8, 3.0)	4.7 (3.9, 5.5)	3.2 (3.1, 3.4)	2.5 (1.9, 3.1)	2.6 (2.5, 2.7)
Prediabetes	4.5 (3.9, 5.0)	2.7 (2.6, 2.8)	5.3 (4.5, 6.1)	3.1 (3.0, 3.2)	3.6 (2.8, 4.3)	2.3 (2.2, 2.4)
Hypertension	5.8 (5.2, 6.5)	8.2 (8.1, 8.4)	7.0 (6.0, 7.9)	9.8 (9.6, 10.0)	4.5 (3.7, 5.4)	6.8 (6.6, 7.0)
Hyperlipidemia	10.6 (9.8, 11.5)	7.3 (7.2, 7.4)	15.1 (13.8, 16.5)	9.9 (9.7, 10.1)	6.4 (5.5, 7.4)	4.9 (4.8, 5.1)
Ages 45-64/Middle-aged group						
Risk Factors						
Obesity (BMI ≥30)	34.5 (33.3, 35.6)	38.4 (38.2, 38.5)	36.7 (35.1, 38.3)	40.7 (40.5, 41.0)	32.1 (30.5, 33.7)	36.2 (36.0, 36.4)
Current smoking	11.0 (10.4, 11.7)	9.9 (9.8, 10.0)	14.1 (13.1, 15.2)	11.3 (11.1, 11.4)	7.6 (6.8, 8.4)	8.6 (8.5, 8.7)
Ever smoking	32.4 (31.4, 33.4)	35 (34.9, 35.2)	39.3 (37.9, 40.7)	36.9 (36.7, 37.1)	24.9 (23.6, 26.2)	33.3 (33.1, 33.5)
Chronic conditions						
Diabetes	12.7 (12.0, 13.4)	9.6 (9.5, 9.6)	15.8 (14.7, 16.8)	11.4 (11.3, 11.6)	9.3 (8.5, 10.2)	7.9 (7.7, 8.0)
Prediabetes	10.2 (9.6, 10.8)	8.3 (8.2, 8.4)	11.9 (11.0, 12.8)	9.8 (9.7, 9.9)	8.3 (7.5, 9.1)	6.9 (6.8, 7.0)
Hypertension	23.4 (22.5, 24.2)	26.7 (26.6, 26.8)	25.8 (24.6, 27.0)	29.8 (29.7, 30.0)	20.6 (19.4, 21.7)	23.8 (23.6, 23.9)
Hyperlipidemia	33.6 (32.4, 34.5)	27.1 (27.0, 27.3)	39.3 (37.9, 40.6)	31.4 (31.3, 31.6)	27.3 (26.0, 28.6)	23.1 (23.0, 23.3)
Ages 65-84/Older group						
Risk factors						
Obesity (BMI ≥30)	31.3 (29.6, 33.1)	32.1 (31.9, 32.3)	29.5 (27.1, 31.9)	33 (32.7, 33.2)	33.1 (30.7, 35.6)	31.4 (31.2, 31.7)
Current smoking	6.1 (5.4, 6.9)	6.0 (5.9, 6.1)	8.1 (6.8, 9.4)	6.2 (6.1, 6.4)	4.3 (3.3, 5.2)	5.8 (5.7, 5.9)
Ever smoking	41.2 (39.6, 42.8)	47.8 (47.7, 48.0)	51.4 (49.1, 53.8)	53.4 (53.2, 53.7)	31.7 (29.5, 33.8)	43.2 (43.0, 43.5)
Chronic conditions						
Diabetes	27.3 (25.9, 28.8)	19.5 (19.4, 19.6)	32.4 (30.2, 34.6)	23.3 (23.1, 23.6)	22.6 (20.7, 24.5)	16.3 (16.2, 16.5)
Prediabetes	15.2 (14.0, 16.3)	15.7 (15.6, 15.9)	16.3 (14.6, 18.0)	17.5 (17.3, 17.7)	14.1 (12.5, 15.7)	14.2 (14.1, 14.4)
Hypertension	58.9 (57.4, 60.5)	59.9 (59.8, 60.1)	61.7 (59.5, 64.0)	62.5 (62.2, 62.7)	56.3 (54.1, 58.5)	57.8 (57.6, 58.0)
Hyperlipidemia	65.9 (64.4, 67.4)	62.3 (62.2, 62.5)	67.9 (65.8, 70.1)	64.7 (64.4, 64.9)	64.0 (61.9, 66.2)	60.4 (60.2, 60.6)
Coronary artery disease	7.6 (6.8, 8.5)	6.0 (5.9, 6.1)	11.2 (9.8, 12.7)	8.5 (8.4, 8.7)	4.2 (3.3, 5.2)	3.7 (3.6, 3.8)
Heart failure	6.5 (5.7, 7.4)	6.3 (6.2, 6.4)	7.6 (6.3, 8.8)	7.5 (7.4, 7.6)	5.6 (4.6, 6.7)	5.0 (4.9, 5.1)

was younger than the White group, with 29.0% vs 18.3% in the younger age group, 51.0% vs 49.3% in the middle-aged group, and 20.0% vs 32.5% in the older age group. Approximately half of both groups (51.8% of Arab Americans and 47.2% of Whites) were male. Nearly all adults in both groups (95.8% of Arab Americans and 98.9% of Whites) had English indicated as their preferred spoken language, with 4.2% of Arab Americans preferring Arabic.

Risk Factors

Obesity

Overall obesity prevalence was 32.8% (95% CI: 32.0%, 33.6%) for Arab Americans and 35.9% (95% CI: 35.8%, 36.0%) for Whites (Table 1). Younger and middle-aged Arab American men had higher obesity prevalence than Arab American women in the same age groups, but in the older age group, Arab women had higher obesity prevalence than Arab American men (Tables 1, 2). Arab American men (34.4% vs 37.8%) and women (31.0% vs 34.2%) had a lower prevalence of obesity than Whites overall (Table 1) but not among women in the older age group (Table 2). The age-adjusted obesity prevalence ratio comparing

Arab Americans to Whites were significantly lower for Arab American men (PR: .92, 95% CI: .88, .94) and women (PR: .90, 95% CI: .87, .93).

Smoking

Prevalence of current smoking was significantly higher in Arab American men than White men overall (13.3% vs 10.4%) (Table 1) and in all three age groups (Table 2). Overall age-adjusted prevalence of ever smoking was significantly higher for Arab American than White men (41.8% vs 40.8%, PR: 1.02, 95% CI: 1.00, 1.05), but further analysis showed that this difference was only significant in the younger and middle-aged groups. Among women, prevalence of current smoking (6.5% vs 7.6%) and ever smoking (24.8% vs 34.5%) was significantly lower in Arab Americans than Whites, respectively, overall and in all three age groups (Table 2).

Chronic Conditions

Diabetes and Pre-Diabetes

Prevalence of diagnosed diabetes was significantly higher in Arab American men (17.3% vs 12.5%, PR: 1.39, 95% CI: 1.33, 1.45) and women (11.1% vs 8.7%, PR: 1.26, 95% CI: 1.18, 1.34) compared with Whites overall (Table 1) and in all three age groups (Table 2). Similarly, prevalence of pre-diabetes was higher for Arab Americans than non-Hispanic Whites overall (10.1% vs 8.8%) (Table 1) and in the younger and middle-aged groups. The disparity in prevalence of diabetes between Arab Americans and Whites increased with age. Across all age groups, the prevalence of diabetes and pre-diabetes in both Arab American and Whites was higher in men than women (Table 2).

Hypertension

Overall prevalence of diagnosed hypertension among both men (30.5% vs 33.3%) and women (25.8% vs 28.4%) was significantly lower in Arab Americans than in Whites (Table 1), but the disparity was largest in the middle-aged group (Table 2). The age-adjusted prevalence ratio for hypertension comparing Arab American men with White men (PR: .93, 95% CI: .90, .95) was similar to that for the comparison among women (PR: .93, 95% CI: .90, .96). Across all age groups in both Arab Americans and Whites, the prevalence of hypertension was higher in men than women (Table 2).

Hyperlipidemia

Overall prevalence of diagnosed hyperlipidemia was significantly higher for Arab Americans than for Whites among both men (40.8% vs 34.7%) and women (31.5% vs 28.3%) (Table 1). The prevalence ratio for hyperlipidemia comparing Arab Americans and Whites was larger among men (PR: 1.14, 95% CI: 1.11, 1.16) than among women (PR: 1.09, 95% CI: 1.06, 1.12). Across all age groups, Arab American and White men had a higher prevalence of hyperlipidemia than women (Table 2).

Heart Disease

Among adults aged 65-84 years, Arab American men and women had a significantly higher prevalence of diagnosed coronary artery disease than Whites (7.6% vs 6.0%), but no difference was seen for diagnosed heart failure (Table 2). Among both Arab Americans and Whites, prevalence of these conditions was higher among men than women.

Discussion

Using EHR-derived data for a cohort of Arab American and White adult members of a large Northern California health plan we aimed to quantify sex-specific differences in the prevalence of risk factors and chronic conditions between these groups. We found that Arab American men had a higher prevalence of ever smoking, currently smoking, diabetes, pre-diabetes, and hyperlipidemia than White men, but a lower prevalence of obesity and hypertension. Arab American women had a higher prevalence of diabetes, pre-diabetes, and hyperlipidemia than White women but lower prevalence of obesity, ever smoking, currently smoking, and hypertension. Overall, Arab American men had a higher prevalence of risk factors and

Overall, Arab American men had a higher prevalence of risk factors and chronic conditions than Arab American women across all age groups.

chronic conditions than Arab American women across all age groups.

Differences in risk factors and chronic health conditions between Arab Americans and Whites could occur for a number of underlying reasons. First, differences in health behaviors may exist between the two groups that could be related to sociodemographic and acculturation factors. Data from the American Community Survey showed that sociodemographic characteristics of Arab Americans differ substantially from non-Hispanic Whites with regard to the proportion of individuals living in poverty, who are unemployed, who live in large households, and have public insurance.[13] These factors could influence health behaviors that impact chronic health conditions in this population.

Second, Arab Americans may be experiencing discrimination in their daily lives that may be influencing their chronic health risks. Recent evidence suggests that experiences of discrimination and racism can increase health risks in minority populations.[14,15] Arab Americans have been found to be experiencing increasing discrimination and hate crimes due to the changes to the sociopolitical climate over the past few decades in the United States.[16] The nature of the available data in the EHR does not allow us to explore which of these mechanisms is responsible for the differences we have observed.

Two other studies have used data from a hospital EHR to compare Arab American health with the health of White Americans in Michigan.[4,5] In the study examining chronic health conditions, both Arab American men and women had higher prevalence of diabetes when compared with Whites,[4] as we found in our study. Unlike the Michigan study, our study found that hypertension prevalence was lower in Arab Americans than in Whites. Our previous work with the California Health Interview Survey, a population-based phone interview survey, also found higher odds of self-reported diabetes and lower odds of hypertension for Arab Americans vs Whites based on self-reported data.[17] Differences in the prevalence of chronic health outcomes between Arab Americans in Michigan and California may be due to regional differences in health behaviors such as smoking, diet, and physical activity and sociodemographic characteristics such as educational attainment and income or acculturation that have been observed in national health surveys. Additionally, the hospital administrative database examined in the Dallo study was smaller than KPNC, which may lead to differences in representation of the individuals examined. Further, Michigan has the highest density of Arab Americans of any state in the United States with a large number of Arab ethnic enclaves. Arab Americans living in ethnic enclaves may experience benefits that Arab Americans living in less dense areas, like Northern California, may not experience. Further work needs to be done to understand the potential reasons for geographic differences in chronic disease risk for this minority population.

Study Strengths and Limitations

Our study had several strengths. It utilized EHR data for a contemporary cohort of insured Arab American and White adults who resided in a defined geographic area and received health care from the same health plan. The large size of the study cohort enabled precise age-standardized sex-specific estimates of the prevalence of the risk factors and chronic conditions for Arab Americans in three age groups. It also provided sufficient power to test for differences in prevalence between Arab American and White men and women and between Arab American men and women within the three age groups.

We also acknowledge some limitations. First, most of the Arab Americans in our study cohort were identified using a vetted surname algorithm. We subsequently used other ethnicity, language preference, and first name data in the EHR to identify and exclude adults with questionable Arab ethnicity, but we cannot assume that our review caught everyone who should have been excluded.

Second, acculturation variables like length of time and generation in the United States were not available from the EHR data and thus could not be controlled for in the analysis. Preferred language could not be used as a measure of acculturation because only a very small percentage of Arab Americans had a preferred spoken language other than English indicated in their EHR.

Third, at the time of this study, less than 3% of KPNC adult health plan members aged 35-84 years were covered by Medicaid, the US government insurance program for very low income adults. Analysis of California Health Interview Survey data showed that compared with other insured adults, and the general population in the same geographic area, a lower percentage of adults covered by KPNC had a household income of <$35,000.[18] Thus, the results of our study may not be generalizable to "safety net" and lower-income populations, as well as to Arab American populations in other regions of the United States.

Fourth, Arab Americans in our study cohort have a diversity of national origins and cultural backgrounds, which may have resulted in masking of differences in risks and chronic disease prevalence. Because less than one-fifth of our Arab American study group was identified using race/ethnicity data, we could not examine differences in health risks and chronic conditions in specific Arab American ethnic subgroups. Further research is needed to characterize health-related differences in specific Arab American ethnic subgroups and to compare the health of Arab Americans in these ethnic subgroups with the health of Arabs in relevant countries of origin.

Conclusions

Future research is needed to enable more comprehensive and rigorous comparisons of the health characteristics of Arab Americans in different regions in the United States that also control for sociodemographic factors. This effort will require more widespread inclusion of racial and ethnic identifiers for Arab Americans in state and national health surveys and hospital and health plan EHRs. Additionally, while education and income are usually captured in health surveys, these data are seldom captured in an easily usable way, if at all, in EHRs, precluding their use for large scale EHR-based studies; research has shown that Census-derived education and income variables can add context but do not replace individual level data.[19-21] We suggest that in areas where large groups of Arab Americans live, hospital and health systems should intentionally collect data on Middle Eastern and North African ethnicity to characterize Arab American health and to identify and reduce the health disparities this minority group faces.

Conflict of Interest

No conflicts of interest to report.

Author Contributions

Research concept and design: Abuelezam, El-Sayed, Gordon; Acquisition of data: Gordon; Data analysis and interpretation: Abuelezam, Galea, Gordon; Manuscript draft: Abuelezam, El-Sayed, Galea, Gordon; Statistical expertise: Abuelezam; Administrative: Abuelezam, Gordon; Supervision: Galea

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