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Health Disparities Among Arab-American Immigrants for HPV Vaccination as an Indicator of Cervical Cancer Prevention

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A thesis submitted in partial fulfillment of the requirements for the degree of
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ABSTRACT

Background

Arab American immigrants are an understudied minority in the United States due to their invisibility under the White racial group in census data. As such, there is little health research regarding their preventative behaviors, including for cervical cancer, a preventable but fatal illness. Human papillomavirus infection (HPV), a sexually-transmitted infection which can be prevented through the administration of a 3 regimen vaccine between the ages of 9 and 26 is the primary known cause. This study assesses the relationship between region of birth and HPV vaccination.

Methods

Utilizing data from the National Health Interview Survey (NHIS) from 2016, 2017, and 2018, we assessed the relationship between region of birth and HPV vaccination. The primary outcomes of interest were ever having received the vaccine, how many shots of the vaccine were received, and at what age the first shot of the vaccine was received. The demographic variables of interest, or covariates, were age, education level, years spent in the US, marital status, health insurance coverage, and employment status. A frequency analysis was conducted for all variables of interest and odds ratios were calculated for the primary outcomes of interest after controlling for covariates.

Results

Arab Americans had a lower odds (OR = 0.435) of ever having received the HPV vaccine compared with participants born in the US than those born in Europe or Other regions. Further, Arab Americans had a lower odds (OR = 0.122) of completing the 3-shot vaccine regimen as

well. Not a single Arab American participant reported receiving the first shot on time (below the age of 15). Due to a lack of data, the latter two outcomes were not statistically significant.

Conclusions

Overall, the Arab American minority has a significantly lower odds of ever having received the HPV vaccine than their White counterparts and a lower odds of completing the vaccine regimen or receiving the first shot of the vaccine on time. This study validates the existence of health disparities and exemplifies the need for more research targeted towards this minority group.

Key Words: HPV, cervical cancer, vaccine, Arab American

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INTRODUCTION

Background

As any minority group in the United States, specifically immigrant group, Arab Americans face unique sociocultural barriers to receiving healthcare and participating in preventative health behaviors (Dallo & Kindratt, 2015; Echeverria & Carrasquillo, 2006; Singh & Hiatt, 2006). However, unlike many other minority groups, Arab Americans are not as thoroughly studied in preventative health literature, or even health literature more generally (Abboud et al., 2017). A primary cause for this discrepancy in a lack of health knowledge is the categorization of Arab Americans as "White" in the overwhelming majority of census data (Abboud et al., 2017). This phenomenon tends to make the Arab American minority invisible in research documenting health disparities among racial and ethnic cohorts.

One of the understudied health disparities among Arab American women is cervical cancer, particularly prevention (Abboud et al., 2017). Cervical cancer is a particular concern because Arab American women have a screening rate of 87% at best which still falls below the Healthy People 2020 target of 93% screening (Dallo & Kindratt, 2015). With inadequate rates of screening, prevention is that much more important. Cervical cancer is one of the only cancers with a known primary cause, HPV infection (F X Bosch, Lorincz, Muñoz, Meijer, & Shah, 2002; Klingelhutz & Roman, 2012; Muñoz, Castellsagué, de González, & Gissmann, 2006; Nour, 2009). Cervical cancer is an aggressive disease once it takes hold of the human body, often detected in advanced stages when women typically become symptomatic (Castle et al., 2009; Klingelhutz & Roman, 2012; Lewis et al., 2010). Like most other cancers, the cells in the lining of the outer part of the cervix or in the column-shaped glandular cells that line the cervical canal, mutate to

override apoptosis, or programmed cell death, and multiply without control (F X Bosch et al.,
2002; Klingelhutz & Roman, 2012; Lewis et al., 2010). Eventually, this cluster of accumulated
out-of-control cells forms a mass, or tumor, which can break off and invade nearby tissue,
metastasizing in other parts of the body (F X Bosch et al., 2002; Klingelhutz & Roman, 2012;
Lewis et al., 2010).

Human Papillomavirus

HPV infection is the primary cause of cervical cancer (F. Xavier Bosch et al., 1995; Burd &
Dean, 2016). Human papillomavirus consists of 19 well-known strains, all of which carry varying
amounts of risk for the host (Burd & Dean, 2016; Castle et al., 2009). Of these 19 strains,
approximately 12 are classified as high risk by the International Agency for Research on Cancer,
such that the gene expression of HPV becomes deregulated and their abnormal life cycle is
associated with progression to cancer (Burd & Dean, 2016; Castle et al., 2009; Lewis et al.,
2010; Muñoz et al., 2003; Muñoz et al., 2006). HPV strains 16 and 18 are particularly identified
as carcinogenic as they are cited to cause the majority of HPV-related cancers, including
cervical, anal, vaginal, oropharyngeal, and more (Lewis et al., 2010; Muñoz et al., 2003).

HPV is a deadly virus that can result in viral infection in the host as a result of several risk
factors, including sexual relations with multiple partners, unprotected sex, smoking, lack of
access to vaccination and screening, and more (F X Bosch et al., 2002; Jain et al., 2009;
Walboomers et al., 1999). HPV is the single most common sexually transmitted infection
globally (F. Xavier Bosch et al., 1995).

HPV can be transmitted fairly easily through simple skin-to-skin sexual contact, including
genital and oral (Münger et al., 2004; Muñoz et al., 2006). Further, multiple strains of HPV can

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infect an individual at any given time (Münger et al., 2004; Muñoz et al., 2006). While most sexually active individuals will contract HPV at some point in their lives, particularly if they are subject to or participate in common risk factors, infection will only become cancerous in less than 10% of individuals (Klingelhutz & Roman, 2012; Nour, 2009). Interestingly, this still constitutes a large number of people as cervical cancer and other cancers attributed to HPV are the 4th leading cause of death in women worldwide (F X Bosch et al., 2002; F. Xavier Bosch et al., 1995; Castle et al., 2009).

In 50% of cases of HPV infection, the host immune system is able to attack and manage the virus before it leads to carcinoma within one year (F X Bosch et al., 2002; Castle et al., 2009). In 90% of cases, this occurs within two years (F X Bosch et al., 2002; Castle et al., 2009). However, in individuals with weakened immune systems or as a result of other sociocultural or environmental factors, this attack is not always possible or successful, resulting in persistent infection for years or decades which ultimately results in cancer (Castle et al., 2009; Khan et al., 2005; Klingelhutz & Roman, 2012). HPV, although not sufficient, is a necessary factor for the development of cervical cancer.

Cervical Cancer Prevention

While the onset of cervical cancer in its early-stages does not typically boast drastic symptoms, more advanced cervical cancer can be identified through excessive vaginal bleeding after intercourse or between periods or after menopause, watery and bloody vaginal discharge which may be heavy accompanied with a foul odor, and pelvic pain or abnormal pain during intercourse (Moyer & Force*, 2012; Nour, 2009; Walboomers et al., 1999). When these

symptoms arise, it is often at a stage where cervical cancer is difficult to manage and treat (Nour, 2009). As such, while preventable, cervical cancer is a silent killer.

Fortunately, despite the potentially fatal outcome of certain high-risk HPV infection, this virus is preventable through vaccination (Burd & Dean, 2016; Zhai & Tumban, 2016). The most recent, and most commonly utilized, vaccine is Gardasil-9 which is known to protect against 9 strains of HPV, including high and low risk strains (Zhai & Tumban, 2016). This vaccine can be administered in young women and girls as early as the age of 9 (Zhai & Tumban, 2016). However, Gardasil-9 does not protect against HPV infection as effectively if an individual as already been exposed to or contracted HPV ("Advisory Committee on Immunization Practices (ACIP). Quadrivalent human papillomavirus vaccine: recommendations of the Advisory Committee on Immunization Practices (ACIP)," 2019; Zhai & Tumban, 2016). As such, health professionals recommend administering the vaccine to adolescent girls before sexual activity begins ("Advisory Committee on Immunization Practices (ACIP). Quadrivalent human papillomavirus vaccine: recommendations of the Advisory Committee on Immunization Practices (ACIP)," 2019). According to the Centers for Disease Control and Prevention (CDC), which cuts off "late" at age 15 after which 3 shots are necessary for complete vaccination, the ideal age to begin the vaccine regimen is ages 11-12 ("Advisory Committee on Immunization Practices (ACIP). Quadrivalent human papillomavirus vaccine: recommendations of the Advisory Committee on Immunization Practices (ACIP)," 2019). While 13-14 is technically late, age 15 is beyond the grace period ("Advisory Committee on Immunization Practices (ACIP). Quadrivalent human papillomavirus vaccine: recommendations of the Advisory Committee on Immunization Practices (ACIP)," 2019).

Further, Gardasil-9 is an intramuscular vaccine which must be administered in a series of three injections over the course of 6 months, requiring repeated access to a healthcare facility, providers, and the appropriate resources (Zhai & Tumban, 2016). Once vaccinated, an individual can be effectively protected from HPV infection for up to 10 years (Franceschi et al., 2006; Khan et al., 2005). However, as any vaccination is not 100% effective, this alone is an imperfect method of HPV prevention. As such, routine screening for both HPV and cervical cancer is recommended in women starting at age 21 throughout their reproductive life and even after menopause (Abboud et al., 2017; Moyer & Force*, 2012).

Purpose

Cervical cancer largely affects women aged 30-50 which are arguably the most productive years of one's life (F. Xavier Bosch et al., 1995; Dallo & Kindratt, 2015; Nour, 2009). Cervical cancer, along with its treatments, has been shown to decrease quality of life in survivors and continue to cause adverse health outcomes such as changes in sexual and urinary comfort, fertility, and mental health (Abboud et al., 2017; Nour, 2009). Although rates of cervical cancer incidence have been slowly declining aby approximately 1% annually over the past two decades, rates of mortality attributed to cervical cancer have remained stoic, disproportionately affecting racial and ethnic minorities which has been well documented for Black women, Native American women, and Hispanic women (Abboud et al., 2017). These disparities seem to be related to several intersecting factors such as ethnicity and race, socioeconomic status, access to insurance, and nativity, just to name a few (Abboud et al., 2017; Dallo & Kindratt, 2015).

The United States is witnessing a growing ethnic minority of Arab Americans with Middle Eastern nativity (Echeverria & Carrasquillo, 2006; El-Sayed & Galea, 2009). However, health-seeking behaviors and preventative medicine have been largely understudied in this population due to their classification as White in census data collected by governmental agencies (Ajrouch & Jamal, 2007). This erasure has primarily been perpetuated by two sociopolitical factors. First, many Arab Americans, upon arrival to the United States in the late twentieth century and early twenty-first century, actively pursued the White categorization as a form of assimilation and belonging (Ajrouch & Jamal, 2007; Dallo, Booza, & Nguyen, 2015). Second, after the terrorist attack on September 11th, 2001, which dramatically heightened racism and fear targeted at Arab Americans and Muslims more generally, this invisibility in research and data collection adversely contributed to a lack of understanding of their health behaviors and access to care which were negatively impacted in the face of discrimination (Abu-Ras & Abu-Bader, 2008, 2009; Dallo et al., 2018; Echeverria & Carrasquillo, 2006; El-Sayed & Galea, 2009; Hassouneh & Kulwicki, 2007; Jamal A, 2008).

As such, only studies which actively seek out data on the Arab American immigrant population specifically are able to assess their health disparities compared with their White counterparts (Abboud et al., 2017; Dallo et al., 2015; Dallo & Kindratt, 2015; El-Sayed & Galea, 2009). This lack of research calls for a better understanding of health outcomes within this population. The discrimination has only serve to worsen both their mental and physical health and their ability to access appropriate and timely care without stigma or other sociocultural and political barriers (Abu-Ras & Abu-Bader, 2008, 2009; Echeverria & Carrasquillo, 2006; Hassouneh & Kulwicki, 2007). In order to address this problem, this study aims to examine HPV

vaccination among Arab American immigrants in the United States compared to their White

counterparts.

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METHODS

Research Question

This study aims to assess health disparities in cervical cancer prevention through the proxy of HPV vaccination in Arab American immigrant women in the United States compared with White women, including White women born in the United States, born in Europe, or born elsewhere. In order to do so, three primary variables of interest are assessed: ever having received the vaccine, how many shots of the vaccine were received, and at what age the first shot of the vaccine was received.

Statistical Plan

The primary researcher utilized data from the National Health Interview Survey (NHIS) collected by the U.S. Census Bureau, from data releases from the years 2016, 2017, and 2018 to conduct a secondary analysis. In summary, this is a national level database that collects cross-sectional data over the course of a year with the aim of producing a racially/ethnically representative sample. Due to sampling methods and time of day the survey is conducted, older individuals tend to be oversampled. Details of the NHIS, its sampling design and methods, and specific health topics collected were reported previously (National Center for Health Statistics, 2012a). The primary researcher combined the "Persons" dataset and "Sample Adult" dataset to obtain demographic and health data of interest. The dataset was subset by sex, age, and race to only include White females aged 21-65. This subset allows inclusion of all women eligible for a routine pap smear, or cervical cancer screening test, every three years and thus, at the age of risk for cervical cancer. As this study aims to assess cervical cancer prevention through HPV vaccination, this is the population of interest. Ultimately, we assessed 12 variables

of interest: "REGIONBR", "MRACBPI2.x", "SEX", "AGE_P.x", "EDUC1", "YRSINUS", "R_MARITL.x", "COVER", "DOINGLWA", "SHTHPV2", "SHPVDOSP", "AHPVAGE".

These variables correlate to the following demographic and health information: region of birth, race, sex, age, education level, years spent in US, marital status, health insurance coverage, employment status, if the woman has ever received an HPV vaccine, the number of HPV shots she received, and the age at which she received her first shot. These demographic characteristics have been shown in the literature as confounding variables that must be controlled for when studying HPV vaccination as an indicator for cervical cancer prevention.

In terms of analysis, the region of birth variable was recoded to isolate women born in the US, Europe, and Middle East as unique categories. All other individuals who identified as racially White and in any other region of birth were categorized as "Other". Of the 24,094 individuals included in the final dataset, after the data was subset for sex, age, and race, there were only 115 individuals that identified the Middle East as their region of birth. In each of the tables, descriptive statistics were compared for US, Europe, Middle East, and Other through a frequency analysis using the chi-squared statistic for significance. Odds ratios with accompanying 95% confidence intervals (CI) for the health outcomes of interest – ever having received an HPV vaccine, the number of HPV shots received, and the age at first shot – were calculated for Europe, Middle East, and Other utilizing the US as a reference group. We controlled for covariates, which in this case were the demographic characteristics of interest highlighted in the frequency analysis.

RESULTS

The final data utilized in this study, from the NHIS years 2016-2018, included women racially categorized as White, aged 21-65. As such, 24094 participants were included. Of these 24094 participants, 21580 recorded United States as their region of birth, 497 recorded Europe as their region of birth, and only 115 recorded the Middle East as their region of birth. Another 1902 recorded various other geographic regions, including Russia, Central America, and South America as their region of birth and were categorized as "Other".

Out of all of the study participants who were women aged 21-65 (n = 32245) but not restricted to any particular racial category, 119 women recorded the Middle East as their region of birth. As such, there were 4 women who recorded the Middle East as their region of birth but did not categorize themselves as White racially. These women were excluded from further analyses due to the primary purpose of this study to assess health disparities among Arab American women whose ethnic identity has become invisible by census categorization as White.

After conducting frequency analyses of the demographic and health information of interest against region of birth, we obtained Tables 1 and 2.

Table 1: Demographic Information of Sample Adult Against Region of Birth – Subset to Female, White, Aged 21-65*

| Characteristic | Region of Birth | | | | p-value |
	United States (n = 21580)	Europe (n = 497)	Middle East (n = 115)	Other (n = 1902)	
Age (years), mean ± SD	44.8 ± 13.2	47.0 ± 11.7	43.6 ± 12.3	43.1 ± 12.0	<0.001
Year(s) Spent in the United States, n (%)					<0.001
<5	NA	39 (7.9)	28 (24.3)	185 (10.0)	
5-10	NA	22 (4.5)	19 (16.5)	162 (8.7)	
10-15	NA	44 (8.9)	6 (5.2)	243 (13.1)	
>15	NA	387 (78.7)	62 (53.9)	1269 (68.3)	
Education, n (%)					<0.001
Less than high school	1258 (6.4)	22 (4.8)	10 (8.9)	548 (30.5)	
High school graduate	4334 (22.1)	90 (19.8)	17 (15.2)	400 (22.3)	
Some college	5346 (27.2)	99 (21.8)	21 (18.8)	282 (15.7)	
Bachelor or higher	8686 (44.3)	243 (53.5)	64 (57.1)	565 (31.5)	
Marital status, n (%)					<0.001
Married	10930 (50.7)	274 (55.2)	78 (67.8)	1033 (54.5)	
Widowed/Sep/Divorced	4873 (18.7)	67 (13.5)	19 (16.5)	414 (21.8)	
Living with partner	1719 (8.0)	29 (5.8)	0 (0.0)	133 (7.0)	
Never married	4025 (18.7)	126 (25.4)	18 (15.7)	317 (16.7)	
Health Insurance, n (%)					<0.001
Private	15420 (73.8)	360 (75.2)	72 (63.7)	929 (50.3)	
Medicaid, Other public	2690 (12.8)	44 (9.2)	18 (15.9)	317 (17.2)	
Other coverage	1101 (5.3)	39 (8.1)	5 (4.4)	80 (4.3)	
Uninsured	1700 (8.1)	36 (7.5)	18 (15.9)	520 (28.2)	
Employment Status, n (%)					<0.001
Working for pay	14996 (69.5)	340 (68.4)	57 (49.6)	1145 (60.2)	
Looking for work	575 (2.7)	15 (3.0)	6 (5.2)	68 (3.6)	
Not working for pay	6003 (27.8)	142 (28.6)	52 (45.2)	688 (36.2)	

* Numbers may not sum to totals due to missing data, and column percentages may not sum to 100% due to rounding.

This table compares the unadjusted associations between region of birth and demographic variables (n = 24094). There was a statistically significant relationship between age and region of birth such that European-born participants had the oldest average age at

approximately 47 years while Middle Eastern-born participants and participants born in Other regions had the youngest average age at approximately 43 years.

Further, there was a statistically significant relationship between region of birth and years spent in the United States such that nearly 80% of European-born participants had lived in the United States for over 15 years while just over 50% of Middle Eastern-born participants had lived in the United States for over 15 years and nearly 25% had lived in the United States for less than 5 years. Participants born in the United States were excluded from this measure in the original dataset.

In terms of education, Middle Eastern-born participants were the most highly educated group with nearly 60% of participants boasting a bachelor's degree or higher. Alternatively, more than 30% of participants born in Other geographic regions had less than a high school education. European-born participants had comparable percentages to Middle Eastern born participants such that almost 55% had received a bachelor's degree or higher followed by the United States in which approximately 45% of participants had received a bachelor's degree or higher.

Further, there was a statistically significant relationship between marital status and region of birth such that Middle Eastern-born participants had the highest percentage of married women at nearly 70% and the lowest percentage of never married women at around 15%. Interestingly, not a single one of the 115 participants recorded living with a partner while unmarried. United States-born participants, European-born participants, and participants born in Other geographic regions had similar percentages of married women at around 50-55% of participants. United States-born participants had the highest percentage of women living with a

partner while unmarried at 8% and European-born participants had the highest percentage of unmarried women at over 25%.

In terms of health insurance coverage, a majority of US-born participants, European-born participants, Middle Eastern-born participants, and participants born in Other regions had private insurance at approximately 74%, 75%, 64%, and just over 50%, respectively. However, Middle Eastern born participants and participants born in Other geographic regions had the highest percentage of individuals utilizing Medicaid or another form of public health insurance at approximately 16% and 17%, respectively. Further, these two groups had significantly higher rates of uninsured participants than their US-born and European-born counterparts at around 16% and 28%, respectively.

Finally, in terms of employment, Middle Eastern-born participants had the significantly lowest percentage of women working for pay at just below 50% and the highest percentage of women not working for pay at approximately 45%. Further, Middle Eastern-born participants had the highest percentage of women looking for work out of all the groups at over 5%.

Table 2: HPV Vaccination Status – Descriptive Statistics*

Characteristic	Region of Birth				p-value
	United States (n = 21580)	Europe (n = 497)	Middle East (n = 115)	Other (n = 1902)	
Ever received HPV Vaccine, n (%)	*(n = 20144)	*(n = 456)	*(n = 100)	*(n = 1739)	<0.001
Yes	2630 (13.1)	32 (7.0)	6 (6.0)	152 (8.7)	
No	17514 (86.9)	424 (93.0)	94 (94.0)	1587 (91.3)	
Number of HPV shots received, n (%)	*(n = 2315)	*(n = 28)	*(n = 5)	*(n = 129)	0.042
1	410 (17.7)	8 (28.6)	4 (80.0)	37 (28.7)	
2	348 (15.0)	5 (17.9)	0 (0.0)	20 (15.5)	
All	1557 (67.3)	15 (53.6)	1 (20.0)	72 (55.8)	
Age at first HPV shot (years), mean ± SD	18.7 ± 6.5	21.4 ± 8.0	19.6 ± 5.0	21.2 ± 7.7	0.381

* Numbers may not sum to totals due to missing data, and column percentages may not sum to 100% due to rounding.

This table compares the unadjusted associations between region of birth and health outcomes of interest (n = 24094). There was a statistically significant relationship between ever having received and HPV vaccine and region of birth such that United States-born participants had the highest percentage of women who had ever received the vaccine at approximately 13% while Middle Eastern-born participants had the lowest percentage at 6%.

Further, Middle Eastern-born participants had a significantly lower percentage of women who had completed the HPV vaccine regimen at just 20% compared with their White counterparts at approximately 67%, 54%, and 56% for United States-born participants, European-born participants, and participants born in Other regions, respectively. None of the Middle Eastern-born participants had received two shots and 80% had received just one.

Notably, there is a small sample size for this data such that of the 6 Middle Eastern-born individuals who reported receiving the vaccine, only 5 indicated the number of shots they received and the age at their first shot. Similarly, only 2315 out of the 2630 United-States born participants that reported receiving a vaccine also reported how many shots and age at first shot. This is true for European-born participants and participants born in Other regions at 28 out of 32 and 129 out of 152 participants, respectively. These small sample sizes compromise the significance and generalizability of this data.

Finally, the average age at which participants received their first HPV shot was not statistically different across different geographic regions of birth with United States-born participants having an average age of approximately 19, Middle Eastern-born participants having an average age of approximately 20, and European-born participants and participants from Other regions having an average age of approximately 21. All of these groups had an average age considered late by the CDC which cuts off "late" at age 15.

After calculating odds ratios with accompanying 95% CIs of the health information of interest against region of birth, we obtained Table 3.

Table 3: Associations between HPV Vaccination Status and Region of Birth – United States as reference group*

Characteristic OR (95% CI)	Region of Birth		
	Europe (n = 456)	Middle East (n = 100)	Other (n = 1739)
Received HPV Vaccine	0.503 (0.350, 0.722)	0.435 (0.186, 0.971)	0.638 (0.537, 0.757)
Completed HPV Vaccine Regimen	0.562 (0.266, 1.187)	0.122 (0.014, 1.091)	0.615 (0.430, 0.880)
First HPV Shot Before Age 15 (Not Late)	0.436 (0.103, 1.849)	NA	0.950 (0.574, 1.567)

* Numbers may not sum to totals due to missing data, and column percentages may not sum to 100% due to rounding.

This table assess the adjusted odds ratios between region of birth and health outcomes of interest, controlled for the demographic variables highlighted in Table 1. Middle Eastern-born participants had the statistically significant lowest odds of ever having received an HPV vaccine such that they had 0.435 times the odds of receiving the vaccine of United States-born participants. This is lower than European-born participants who had 0.503 times the odds of United States-born participants and participants from Other regions who had 0.638 times the odds of United States-born participants.

Further, while not statistically significant due to the small sample sizes as explained in the interpretation for Table 2, Middle Eastern-born participants had the lowest odds of completing the HPV vaccine regimen such that they had 0.122 times the odds of completing the vaccine regiment of United States-born participants. Participants from Other regions had a statistically significant lower odds of completing the vaccine regimen compared with United

States-born participants such that they had 0.615 times the odds of completing the vaccine regimen.

Finally, due to the small sample size, not a single one of the 6 Middle Eastern-born participants who reported ever having received the vaccine reported receiving the first HPV shot before the age of 15, making it impossible to calculate an odds ratio, reported as "NA". Alternatively, although not statistically significant, European-born participants and participants born in Other regions had lower odds of receiving the first HPV shot at the age of 15 than United States-born participants. While European-born participants were 0.436 had 0.436 times the odds of United States-born participants, participants born in Other regions had 0.950 times the odds of United States-born participants of receiving the HPV vaccine before the age of 15.

Overall, nativity seems to be an indicator of poorer participation in preventative health behaviors as indicated by patterns of HPV vaccination. However, these results are limited by small sample sizes and as such, are not statistically significant apart from ever having received the HPV vaccine.

DISCUSSION

Analysis

In the past two decades, tensions and discrimination surrounding the ethnic Arab minority in the United States has increased for various reasons including the events of September 11, 2001 and the worsening relations between the United States and the Middle East as a result of the Iraq war, Trump's "Muslim ban", and more (Abu-Ras & Abu-Bader, 2008, 2009; Echeverria & Carrasquillo, 2006; El-Sayed & Galea, 2009; Hassouneh & Kulwicki, 2007; Jamal A, 2008). Consequently, racism has heightened toward Arab American immigrants in the United States which has adverse mental and physical effects and can compromise access to health benefits, comfort with healthcare providers, and ultimately lead to adverse health outcomes (Abu-Ras & Abu-Bader, 2009; Hassouneh & Kulwicki, 2007; Jamal A, 2008).

Cervical cancer is a particular concern because Arab American women have a screening rate of 87% at best which still falls below the Healthy People 2020 target of 93% screening (Dallo, 2015). As such, this paper assessed HPV vaccination among Arab American immigrants in the United States compared with their other White counterparts as proxy for cervical cancer prevention.

This study, which is a secondary analysis of survey data from the National Health Interview Survey (NHIS) from the years 2016, 2017, and 2018, includes 24094 participants who identified as racially White, female, and between the ages of 21 and 65. Of these 24094 participants, 21580 recorded United States as their region of birth, 497 recorded Europe as their region of birth, and only 115 recorded the Middle East as their region of birth. Another

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1902 recorded various other geographic regions, including Russia, Central America, and South America as their region of birth and were categorized as "Other".

Further, out of all of the study participants who were women aged 21-65 (n = 32245) but not restricted to any particular racial category, 119 women recorded the Middle East as their region of birth. As such, there were 4 women who recorded the Middle East as their region of birth but did not categorize themselves as White racially. These women were excluded from further analyses this study primarily aims to assess health disparities among Arab American women whose ethnic identity has become invisible by census categorization as racially White.

Demographic Characteristics

Overall, the results posit that nativity plays a significant role in education level, marital status, health insurance coverage, and employment status, among other variables. Some of the most noteworthy results indicated that Middle Eastern-born participants had the highest percentage of individuals living in the United states for less than 5 years at 25%. This contributes to the existing literature which claims that Arab Americans are one of the fastest growing minority groups in the United States today (Dallo et al., 2015; Dallo & Kindratt, 2015; Singh & Hiatt, 2006).

Further, despite being the most highly educated group with nearly 60% of participants having a bachelor's degree or higher, Middle Eastern-born participants had the higher percentage of participants looking for work, at approximately 5%. Further, compared to their White counterparts, Middle Eastern-born participants had the lowest percentage of women working for pay, just below 50%.

Further, Middle Eastern-born participants had the highest percentage of married women at nearly 70% and the lowest percentage of never married women at around 15%. Interestingly, not a single one of the 115 participants recorded living with a partner while unmarried. While not explicitly assessed through this study, previous literature shows a more conservative culture among Arab Americans with regard to sexual activity which is further supported by this statistic (Abboud, Jemmott, & Sommers, 2015; P, 2008).

Finally, Middle Eastern-born participants did not fare as well their US-born or European-born counterparts in terms of health insurance coverage such that approximately 16% of participants relied on Medicaid or another form of public health insurance rather than private insurance and another 16% were uninsured. In contrast, only 8% of US-born and European-born participants reported being uninsured.

Health Outcomes

The results regarding our health outcomes of interest, ever having received an HPV vaccine, number of shots received, and age at first shot, also showed disparities across varying regions of birth. There was a statistically significant relationship between ever having received and HPV vaccine and region of birth such that United States-born participants had the highest percentage of women who had ever received the vaccine at approximately 13% while Middle Eastern-born participants had the lowest percentage at just 6%. When adjusted for the demographic characteristics outlined in Table 1, Middle Eastern-born participants had the statistically significant lowest odds of ever having received an HPV vaccine such that they had 0.435 times the odds of receiving the vaccine of United States-born participants. This is lower than European-born participants who had 0.503 times the odds of United States-born

participants and participants from Other regions who had 0.638 times the odds of United States-born participants.

Further, when unadjusted, Middle Eastern-born participants had a significantly lower percentage of women who had completed the HPV vaccine regimen at just 20% compared with their White counterparts at approximately 67%, 54%, and 56% for United States-born participants, European-born participants, and participants born in Other regions, respectively. None of the Middle Eastern-born participants had received two shots and 80%, or 4 out of 5, had received just one. After adjusting for the demographic variables in Table 1, the odds of completing the HPV vaccine were lowest for Middle Easter-born participants such that they had 0.122 times the odds of completing the vaccine regiment of United States-born participants.

Finally, while all the groups had similar average ages of receiving the first vaccine, this age was above the CDC recommended cut off for receiving the vaccine "late" at age 15. In terms of differing odds, due to the small sample size, not a single one of the 6 Middle Eastern-born participants who reported ever having received the vaccine reported receiving the first HPV shot before the age of 15, making it impossible to calculate an odds ratio, as the technical odds for receiving the first shot before the age of 15 for United States-born participants are infinitely higher than for Middle Eastern-born participants according to this sample.

Notably, there is a small sample size for this data such that of the 6 Middle Eastern-born individuals who reported receiving the vaccine, only 5 indicated the number of shots they received and the age at their first shot. Similarly, only 2315 out of the 2630 United-States born participants that reported receiving a vaccine also reported how many shots and age at first shot. This is true for European-born participants and participants born in Other regions at 28

out of 32 and 129 out of 152 participants, respectively. These small sample sizes compromised the significance and generalizability of this data overall which in turn affected our ability to calculate and interpret odds ratios for the health outcomes of interest.

Conclusions

Ultimately, this study posits that nativity is an indicator of poorer participation in preventative health behaviors as indicated by patterns of HPV vaccination. However, these results are limited by small sample sizes and as such, are not statistically significant outside of ever having received the HPV vaccine. While Arab American women were more highly educated than any other category, they had the lowest rates of health insurance coverage and employment. While not explicitly assessed in this study, these results hint at social, cultural, economic, and political factors which may be affecting access to preventative health care, and may be affecting overall health outcomes as a result, within this population.

Limitations

Despite the inclusion of three years of data, there are only 115 women included in the primary category of interest, Middle East as region of birth. Further, only 100 of these women reported any data regarding HPV vaccination status. Similarly, for all other categories of region of birth, only a fraction of the participants reported any data regarding HPV vaccination. As such, there is very little data at our disposal for the overall assessment of health outcomes across these populations which limits our ability to obtain statistical significance in the final evaluations.

Further, this study only assessed cervical cancer prevention through the proxy of HPV vaccination status and does not analyze cervical cancer screening and the benefits of early

detection on cervical cancer incidence. Due to a lack of health information in the 2016 and 2017 datasets regarding cervical cancer screening, a more comprehensive assessment of overall prevention of cervical cancer mortality was not conducted.

Finally, due to a lack of data, overall rates of HPV vaccination in the United States among Arab Americans generally were not assessed due to a lack of information on ethnicity explicitly. Rather, this study was limited to Arab American immigrants specifically as the researchers had to utilize Middle Eastern nativity as a proxy for Arab American categorization.

Future Directions

The limited research conducted with this population calls for a better understanding of preventative health behaviors among Arab American immigrants. In particular, there needs to be more research regarding access to HPV vaccination due to its function as a primary contributor to cervical cancer prevention. The purpose of this study is to quantify the disparities in access to HPV vaccination among Arab American immigrants with the hope that this research may be utilized to inform interventions that bridge the disparities in access to cervical cancer prevention through HPV vaccination or even simply identify that these disparities exist to begin with, highlighting a gap in health literature.

In the future, these questions can also be expanded to individuals with United States nativity who ethnically identify as Arab American. Ultimately, this study is not only a call to action for more comprehensive and ethnically-inclusive health literature, but also for more inclusive categorization in census data and thoughtful assessments of the varying lived experiences in the United States.

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