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Cancer Screening Differences Among Muslims and Non-Muslims: Insights from the Chicago Multiethnic Prevention and Surveillance Study.

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Running Head: Cancer Screening Disparities Between Muslims and Non-Muslims in Chicago

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Abstract:

Background: While cancer screening disparities along socioeconomic and racial/ethnic lines are well studied, differences based on religious affiliation are under-researched. Though diverse in terms of race/ethnicity, Muslim Americans appear to share values and beliefs that similarly inform their health and healthcare seeking behaviors. Cancer screening disparities among Muslim Americans are also understudied.

Methods: To examine differences in cancer screening behaviors based on Muslim affiliation, we analyzed data from a longitudinal cohort study examining lifestyle, healthcare access, environmental, and genetic factors on the health of Chicagoans.

Results: Of 7552 participants, 132 (1.7%) were Muslim. Between Muslim and non-Muslims, there were no significant differences in prostate, cervical, and breast cancer screening rates, but Muslims were less likely to undergo colorectal cancer screening. When differences in obesity and insurance status were accounted for in a multivariate regression model, religious affiliation was no longer significantly associated with screening rates.

Discussion: Religious values can influence cancer screening behaviors, hence tracking cancer screening along religious lines may illuminate previously unknown disparities. Our analysis of a predominately African American cohort of Chicagoans, however, did not reveal religious affiliation to predict cancer screening disparities.

Key Words: Islam, Religion, Cancer Disparities, African Americans, Healthcare Inequities

Background:

Screening for cervical, breast, and colon cancers has been shown to be effective in identifying early-stage tumors and reducing cancer mortality [1-4]. However, there are wide disparities in cancer screening along racial and ethnic lines attributable to a host of factors. Differences in access to healthcare and education, alongside cultural barriers, all contribute to the observed disparities between majority and minority communities [5, 6]. For instance, while the black-white disparity in cancer mortality among both men and women has decreased over the last few decades, the gap for breast cancer mortality in women and colorectal cancer mortality in men has widened due to discrepancies in screening rates between races [7, 8]. Similarly, immigrants in America are often found to have lower rates of cervical, breast, and colon cancer screening than the general population due lack of knowledge of cancer screening practices, barriers to healthcare access, and fatalistic beliefs [5, 9-11].

Most cancer screening disparities research in the United States assesses screening rates by socioeconomic status, race, and ethnicity. This is based on the assumption that social experiences and cultural values impacting screening decisions are likely to be shared by individuals of the same racial or ethnic group. [5, 6, 8, 11]. This supposition, arguably, also holds true for religious communities where individuals likely both hold values and share in social experiences that impact cancer screening decisions [11-14]. However, data on cancer screening disparities along religious lines are largely unavailable, reflecting the paucity of research on the impact of religious identity, beliefs, and values in the patterning of health disparities [14]. Yet, such detailed examination would offer great insights into the obstacles religious community members face in obtaining, as well as their underlying rationale for, cancer screening. Moreover, where religious communities cut across racial, ethnic, and socioeconomic lines, such studies would allow for examining the determinants of cancer screening, as well as an evaluation of how religious identity impacts cancer disparities. This paper addresses some of these lacunae by examining cancer screening differences between Muslim and non-Muslim groups in Chicago.

There are about 3.45 million Muslims in the United States, and the population is expected to double by 2050 [15]. Within this community there is considerable racial and ethnic diversity; African

Americans and individuals of South Asian and Arab descent comprise the two largest groups, and over two-thirds of the community are immigrants [16]. Islamic teachings are known to influence attitudes toward cancer screening, and research suggests that many American Muslims use religion as a framework for interpreting health and health disorders as well as making decisions concerning health care [10, 17-20].

Illustratively, several studies have shown that Islamic values and beliefs including fatalism, concerns for privacy, and gender preference for providers contribute to reluctance to undergo mammography, cervical cancer screening, and colorectal cancer screening [11, 13, 21, 22]. Additionally, studies note that discrimination directed at a Muslim identity negatively influences adherence to cancer screening guidelines [14, 23, 24]. Consequently, prevalence studies show lower-than-average cancer screening rates among diverse groups of Muslim Americans. For example, in a study of 207 first-generation Muslim American women residing in Chicagoland with an average age of 52 years, 70% of participants reported ever having a mammogram, but only 52% reported a mammogram within the prior two years as per screening guidelines at the time [9]. Another study of African American, Arab, and South Asian Muslim women recruited from mosques in Chicago demonstrated a similar trend, showing a relatively low rate of biennial mammography (37%) as per guidelines at the time [23]. A smaller study of 53 immigrant Muslim Afghan women in California found that among the 66% of participants who had ever had a mammogram, half of these screenings had taken place more than two years ago [25]. The literature on colorectal cancer screening is more limited. One study of South Asian Muslims living in San Francisco showed that out of 32 participants, 17 (53%) reported prior colorectal cancer screening compared to the national average of 66.8% [21, 26].

As reflected above, the limited research on Muslim American screening behaviors focuses mainly on immigrant Muslims, while the 35% of Muslim Americans who are African-American remain largely unexamined [14, 27]. Our study seeks to provide more data on this under-reported population. Specifically, we assessed screening rates for cervical, breast, colon, and prostate cancers among Muslim Americans in Chicagoland and compared them with non-Muslims respondents in the same study sample.

We further sought to compare sociodemographic characteristics between the two groups and assess whether differences in those characteristics related to any observed screening disparities. Indirectly, such comparisons would allow for assessing the impact of religious affiliation on cancer screening behaviors.

Methods:

Participant Recruitment and Sample

Our study involved secondary data analysis of the Chicago Multiethnic Prevention and Surveillance Study (COMPASS). Details on the COMPASS study methodology including sampling frames, participant recruitment, key measures, and follow-up are provided elsewhere [28]. For our purposes it is worth noting that COMPASS is a longitudinal cohort study of persons residing in the Chicago metropolitan region that used three sampling strategies to maximize diversity: a population-based approach, a community-based recruitment approach, and a hospital/clinic-based recruitment approach. To be eligible for participation in COMPASS, participants had to be aged 35 years or older, able to complete the consent process and subsequent data collection interview in English or Spanish, willing to provide blood in urine and saliva samples and social security number, and reside in the appropriate census tracts in the City of Chicago. Participant data thus consisted of surveys, biospecimens, clinical measures, electronic health records, and environmental samples from the home. Addresses provided by participants were used to geocode using Google Maps Platform Geocoding API, allowing for linkage to Chicago Community Area and census tract/block, and to neighborhood contextual factors potentially relevant for health and health behavior. Again the reader is directed elsewhere for details on the parent study methodology. [28].

Of relevance to our study, questions related to screening behaviors, history of cancer, demographic factors, healthcare access, lifestyle and behavior, occupational status and stress, and additional comorbidities were obtained via a 60 to 80-minute survey.

Study Measures

The outcome measures for this study included four questions covering cancer screening status. Participants were asked whether and when they underwent a mammogram, a Pap smear, a digital rectal exam or prostate blood test, and screening for colorectal cancer (colonoscopy, sigmoidoscopy, and/or barium enema). Conventional sociodemographic items available in the COMPASS data-set such as age, gender, race/ethnicity, household income, level of education, as well as marital, employment and health insurance status were considered to be potential predictor variables. Additionally, personal health characteristics such as obesity defined as a body mass index (BMI) of >30 and history of cancer, were also included as potential predictors of screening disparities.

Data Analysis

Data from the cohort were analyzed for tabular and descriptive statistics. Means and SD were calculated for variables with a continuous distribution and proportions were calculated for variables with categorical distributions. The associations between categorical variables were tested by the use of contingency tables and the χ^2 test. The comparisons between continuous variables between groups were performed using the Student's *t*-test. Multivariable logistic regression was used to determine the adjusted association between individual factors and screening; adjusted odds ratios (OR) with 95% confidence intervals (95% CI) are reported. Notably for cancer screening behaviors that are relevant to a specific sex, e.g. mammography, rates and calculations were based on using a sex-appropriate subsample. All statistical tests were two-tailed, and *P*-values <0.05 were considered statistically significant. All data analyses were conducted using SAS software (Version 9.1; SAS Institute, Cary, NC, USA).
All study procedures and materials were reviewed and approved by the University of Chicago Biological Sciences Division Institutional Review Board Committee A (approval IRB12-1660).

Results:

Of 7552 participants in COMPASS, 132 self-identified as Muslim (1.7%). The Muslim cohort had an average age of 52.5 years, and exhibited a diverse range of income, education level, marital and employment status [See Table 1]. Of note, there were several significant differences between the Muslim

and non-Muslim cohorts. Although Black/African American participants were strongly overrepresented in both groups, the Muslim cohort contained significantly more Black/African participants and fewer white or Hispanic participants ($p < 0.001$). Additionally, the Muslim cohort was 83.3% male, which was significantly greater than the non-Muslim cohort ($p < 0.001$). Muslims in the study were also significantly less likely to have health insurance when compared to the non-Muslim cohort ($p = 0.003$). [See Table 1] With respect to participant health status indicators, there were no significant differences in current incidence of cancer or BMI. However, there was a significantly lower incidence of obesity in the Muslim cohort ($p = 0.01$) compared to the non-Muslim sample. [See Table 2] Comparing cancer screening status between the Muslim and non-Muslim cohorts, there were no significant differences in rates of prostate exams, mammograms, or pap smears. However, the Muslim cohort was significantly less likely to have undergone colorectal cancer screening ($p = 0.008$). [See Table 3] A logistic regression model seeking to explain colorectal cancer screening disparities showed that health insurance status as well as obesity were significant independent predictors of colorectal cancer screening behavior. Namely participants with health insurance as well as those who reported being obese had higher odds of obtaining colorectal cancer screening than those without insurance and those not reporting to be obese (OR 3.26, $p < 0.001$ and OR 1.16, $p < 0.006$, respectively). Religious affiliation trended towards significance with non-Muslims more likely to obtain this screening (OR 1.54, $p = 0.06$).[See Table 4]

Discussion:

Our exploratory study sought to identify the influence of religious affiliation on cancer screening practices by comparing screening rates between Muslims and non-Muslims using a Chicago-based study cohort. The overwhelming majority of study participants identified as African American, and nearly all members of the Muslim cohort identified as such. Accordingly, our study provides data on screening disparities among African American Muslims, a largely under-researched subpopulation. Our analysis revealed no significant difference in screening rates between Muslims and non-Muslims for prostate, breast, and cervical cancers. However, Muslim participants underwent significantly fewer colonoscopies

when compared to non-Muslims. Screening differences in colorectal cancer screening appeared to be driven more by insurance status and differences in obesity than by religious affiliation.

It is widely known that Islam provides a framework for interpreting health and illness and strongly influences a variety of health care behaviors and decisions among diverse groups of Muslims [10, 14, 29]. For example, Islamic ontological and ethical frameworks inform views of whether and when to seek help for health-related concerns through allopathic medicine and when to rely on other modalities of healing and healing practices [10, 29-31]. Within the cancer care continuum, religion-related factors appear to influence Muslim behaviors. For example, researchers note that barriers to mammography screening among Muslims include religion-related modesty concerns and, relatedly, a preference for same-sex providers [11, 18, 32, 33]. Religion-related fatalistic beliefs are also suggested as barriers to screening for cervical and breast cancers [18, 23, 34, 35]. While there is empirical evidence to support that some religious factors problematize cancer screening, other work suggests that religious values support cancer screening. For example, the religious duty to care for one's body was central to a religiously-tailored intervention promoting mammography screening in the diverse Chicagoland Muslim community [32]. Relatedly, in a study of 5311 patients in Canada, when compared to other religious groups and non-religious groups, Canadian Muslim women were most likely to be up-to-date on breast cancer screening (85.2% in Muslims vs. 77.5% in other religious groups and 69.5% with no religious affiliation) [12]. Furthermore, in a qualitative study of Muslim community leaders in New York City, interviewees stated that Islamic values related to health prevention could support cancer screening among Muslims. Moreover, all interviewees identified the mosque as an effective location for dissemination of health information [18] which suggests that promoting cancer screening as part of a religious life may be a valuable intervention strategy. Our study adds to this literature by reporting no significant differences in breast, prostate, and cervical cancer screening rates between African American Muslims and non-Muslims. Though we did find significant disparities in colorectal cancer screening between the two groups, this difference did not appear to be driven independently by religious affiliation. Our results this

further add to the mixed empirical picture of how religious identity and values may problematize, or alternatively promote, cancer screening.

Our data generates several hypotheses for further study. On a population level we found significant differences between the non-Muslim and the Muslim group only in colorectal cancer screening, hence we may ask if Muslims perceive breast, cervical, prostate cancer and colorectal screening differently? From a religious lens, we would hazard that there is no grounding for such a difference. Factors such as modesty concerns, fatalistic beliefs, or the duty to one's body all similarly impact the belief structure around cancer screening in general. Yet, there is some preliminary work to suggest that notions of personal hygiene and cleanliness may make Muslims less likely to undergo colonoscopy [21]. Further study on the salient beliefs that inform African American Muslim behaviors towards cancer screening, and in particular colorectal cancer screening, is needed to further elucidate the relationships between religion and screening behavior. Another interesting line of inquiry is whether there are other social factors that have a greater impact on Muslims' colorectal cancer screening than on other cancer screening behaviors. For example, medical mistrust and prior experiences of discrimination are known to negatively impact African American and Muslim American cancer screening behaviors [10, 36], perhaps there is an additional intersectional impact of these factors upon Muslim African Americans. Additionally, a study of Somali Muslim men residing in Minnesota showed that the men expressed a fear of being stigmatized if they were found to have cancer, which deterred them from cancer screening [6]. Our dataset did not measure such factors, but we intend to test such relationships in future studies.

With respect to predictors of cancer screening, we sought to assess whether sociodemographic differences drove any observed differences between Muslim and non-Muslim cohorts. Muslims were less likely to be obese than non-Muslims, and obesity was positively associated with colorectal cancer screening. We may postulate that the lower rate of obesity in Muslims could create a false sense of security about health status which may generate a decreased urgency for colorectal cancer screening. Hence lower screening rates in the Muslim group. Alternatively, since obesity is a well-established risk factor for colorectal cancer [34] primary care physicians may counsel patients with this risk factor on the

benefits of screening more so than those who are not obese. Relatedly, Muslims were less likely to have health insurance than non-Muslims, and having health insurance was associated with greater rates of colorectal cancer screening. Compared to the non-Muslim cohort, a larger proportion of the Muslim cohort identified as Black/African American. Indeed, at every income level, Blacks are more likely to be uninsured when compared to Whites with a higher rate of insurance loss during their lifetimes [37, 38]. Lack of health insurance is a well-reported cause of lower colorectal cancer screening rates [39, 40]. Again the lower rates of insurance appear to drive group differences in colorectal cancer screening. Thus, at least in our study, sociodemographic differences appear to impact cancer screening disparities more so than religious affiliation.

Our findings must be interpreted in light of several limitations and be considered as exploratory. First, our sample size is quite modest (132 Muslims), out of which only 22 were female. Thus, our reported screening prevalence rates should not be generalized to African American Muslims broadly. Moreover, our assessment of screening practices for female-specific cancers such as breast cancer and cervical cancer is limited by small sample size. Furthermore, given the small sample size and variances in national mammography screening guidelines we were unable to comment on age-appropriate screening behaviors. Secondly, like all survey-based studies, we gathered a limited number of variables among which to test associations, and survey-items were based on self-report, as such, a myriad unmeasured factors or participant characteristics may influence the data patterns we observed. Nonetheless, our work does, however modestly, add to a body of literature on cancer screening disparities, and sets up larger-scale observational studies to systematically examine relationships between social and religious factors and cancer screening.

Figures:

TABLE 1
Sociodemographic Characteristics of Study Participants

	Muslims (n = 132)	Non-Muslims (n = 7420)	p-value
Age (SD)	52.5 (10.1)	53.9 (11.0)	0.13
Gender (n=7383)[+]			<0.001*
Male	110 (83.3%)	3566 (49.1%)	
Female	22 (16.7%)	3685 (50.8%)	
Race/Ethnicity (n=7145)[+]			<0.001*
Black/African American	109 (99.1%)	6065 (86.2%)	
White	1 (0.9%)	503 (7.1%)	
Hispanic	0 (0.0%)	467 (6.6%)	
Income (n=6368)[+]			0.34
> $34,999	10 (9.4%)	873 (13.9%)	
Between $25,000 & $34,999	10 (9.4%)	385 (6.1%)	
Between $15,000 & $24,999	19 (17.9%)	1128 (18.0%)	
< $15,000	67 (63.2%)	3876 (61.9%)	
Education (n=7350)[+]			0.85
College or more	9 (6.9%)	609 (9.5%)	
Some college	45 (34.3%)	2111 (32.9%)	
High school	34 (26.0%)	1998 (31.1%)	
Less than high school	43 (32.8%)	2501 (39.0%)	
Health Insurance Status (n=6831)[+]			0.003*
Yes	95 (78.5%)	5880 (87.6%)	
Marital Status (n=7309)[+]			0.51
Married	31 (23.5%)	1316 (18.1%)	

Separated	11 (8.3%)	438 (6.0%)	
Divorced	17 (12.9%)	1011 (13.9%)	
Widowed	11 (8.3%)	540 (7.4%)	
Live With A Partner But Unmarried	5 (3.8%)	368 (5.1%)	
Single But Never Married	55 (41.7%)	3506 (48.3%)	
Employment Status (n=7228)[+]			0.29
Work Full-Time (>=40 hours/week)	19 (14.4%)	1159 (16.3%)	
Work Part-Time (<40 hours/week)	17 (12.9%)	884 (12.5%)	
Unemployed	49 (37.1%)	2026 (28.6%)	
Retired & No Longer Work	13 (9.8%)	963 (13.6%)	
Have Never Worked	6 (4.5%	341 (4.8%)	
Disabled & Unable to Work	26 (19.7%)	1512 (21.3%)	
Homemaker	2 (1.5%)	211 (3.0%)	

Note. Continuous variables are reported as mean (standard deviation). Categorical variables are reported as count (percentage). +Row numbers may not add up to total n as 'other' and 'prefer not to say' responses not reported in table. *Statistically significant at p <= 0.05. SD = standard deviation.

TABLE 2
Health Status Indicators of Participants

	Muslims	Non-Muslims	p-value
History of Cancer			0.85
Yes	9	439	
No	111	6160	
BMI			0.054
< 25	50 (38.8%)	2286 (32.6%)	
25 to < 30	44 (34.1%)	2010 (28.7%)	
30 to < 40	29 (22.5%)	2091 (29.8%)	

>= 40	6 (4.7%)	624 (8.9%)	
Obesity			0.01*
Yes	35 (27.1%)	2715 (38.7%)	
No	94 (72.9%)	4296 (61.3%)	

Note. Values are reported as count (percentage). +Row numbers may not add up to total n as 'other' and 'prefer not to say' responses not reported in table.*Statistically significant at p <= 0.05. BMI = body mass index.

TABLE 3
Cancer Screening Indicators of Participants

	Muslim	Non-Muslim	p-value
Prostate Cancer Screening (prostate exam)			0.17
Yes	34 (33.7%)	1357 (41.7%)	
No	61 (60.4%)	1811 (55.7%)	
Don’t Know	6 (5.9%)	83 (2.6%)	
Colorectal Cancer Screening (colonoscopy)			0.008*
Yes	27 (23.3%)	2152 (32.7%)	
No	87 (75.0%)	4402 (66.9%)	
Don't Know	2 (1.7%)	24 (0.4%)	
Breast Cancer Screening (mammogram)			0.75
Yes	17 (73.9%)	2602 (76.8%)	
No	6 (26.1%)	787 (23.2%)	
Cervical Cancer Screening (pap smear)			0.52
Yes	22 (95.7%)	3310 (97.7%)	

No	1 (4.3%)	78 (2.3%)

Note. Values are reported as count (percentage). *Statistically significant at p<= 0.05.

TABLE 4
Ordered Logistic Regression Analysis of Likelihood To Receive Colorectal Screening Based on Obesity & Health Insurance Status

		95 % CI		
	Odds Ratio	Lower	Upper	p-value
Health Insurance Status				
Yes	3.26	2.66	4.00	<0.001 *
Obesity				
Yes	1.16	1.04	1.30	0.006 *
Religion				
Non-Muslim	1.54	0.98	2.43	0.063

Note. *Statistically significant at p <= 0.05.

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Compliance with Ethical Standards:

This research was supported by funding from the University of Chicago Medicine Comprehensive Cancer Center and the University of Chicago Institute for Population and Precision Health. The authors have no conflict(s) of interest to disclose. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with

the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants listed in the study. All study procedures and materials were reviewed and approved by the University of Chicago Biological Sciences Division Institutional Review Board Committee A (approval IRB12-1660).

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