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How individual and neighborhood characteristics relate to health topic awareness and information seeking

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ABSTRACT

Structural determinants of health like neighborhood are often overlooked in the context of understanding public awareness of health topics and health information seeking behaviors. Seeking health information is particularly relevant given that some communities have higher prevalence of disease than others. Using the Structural Influence Model of Health Communication (SIMHC), this paper examines how both individual and neighborhood level characteristics contribute to health communication outcomes such as being aware of health topics like cancer, obesity, and HIV, and whether or not individual seeking health-related information or coming across information in the course of their general media use. Respondents to the Southeastern Pennsylvania Household Health Survey (SEPa HHS), a county-stratified random sample of adults ages 18-75 years old, who completed the survey in 2015, were recontacted for participation in 2017. Over one-thousand respondents (n=1,005) completed the survey, and the final sample size for this analysis was 887. Individual level correlates included demographic factors and relevant lifestyle behaviors (e.g., smoking); neighborhood level variables- determined by ZIP Code- included such socioeconomic status (SES) measures as percent unemployed, percent with a high school education, and percent living in poverty. Multilevel modeling was used to determine whether there were random effects on the health communication outcomes of interest. Analyses showed our outcomes of interest did not vary across neighborhoods, whether they were treated as random or fixed effects. Different characterizations of neighborhood (e.g., census block group) and different indicators of neighborhood media environments may be more likely to demonstrate macro level effects on health communication outcomes.

Neighborhood characteristics are determinants of health behavior and, consequently, health disparities. An ecological approach to health behavior decision-making emphasizes the importance of both individual and macro level influences (Sallis et al., 2015). One's neighborhood, often defined broadly through social indicators and geographic boundaries, is one such macro level influence and offers a glimpse into the environmental context from within which to understand health outcomes. An important component to health decision making is the provision of and access to health information, which may also vary according to neighborhood level characteristics. For example, marketing of unhealthy foods and beverages are often targeted specific to minority communities (Hillier et al., 2009), and health care professionals may be more likely to address issues of prevention among some populations/neighborhoods compared to others (Zonderman et al., 2014). Thus, consideration of how both individual and neighborhood level correlates are related to health information is important to examine given disparities in screening rates and disease outcomes across a range of health issues, for example several cancer types (Singh & Jemal, 2017).

Individuals are exposed to health information from a variety of sources including their own intentional information seeking (Kelly et al., 2010; Niederdeppe et al., 2007) as well as less purposeful efforts (e.g. routine media use), a phenomenon referred to as scanning (Kelly et al., 2010; Niederdeppe et al., 2007; Shim et al., 2006). Seeking and scanning apply to media sources but also to other sources of health information such as health care professionals and family/friends. Cancer-related seeking and scanning is associated with the adoption of healthy lifestyle behaviors and increase cancer screenings such as colonoscopy and prostate exams (Shim et al., 2006). Studies suggest information seeking

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varies by cancer type (Nagler et al., 2010), and demographic characteristics like age, sex, race/ethnicity and education level (Kelly et al., 2010).

The Structural Influence Model of Health Communication (SIMHC) (Viswanath et al., 2009) provides an organizing structure that incorporates macro level and individual level processes (Fig. 1). This model focuses on how communication inequalities around issues such as access to information, attention to and processing of information, and capacity and ability to act on such information, may contribute to health outcomes and disparities. The emphasis on structural determinants, such as neighborhoods, highlights how geographic areas containing the media to which people are exposed (e.g., disproportionate junk food and sugary beverage advertising) affect how health information is processed to produce prospective health outcomes.

Using the SIMHC as a framework, we focus on how both individual and structural level factors shape health communication outcomes that often precede health outcomes. According to behavioral change theories, exposure to health information can lead to related changes in health behaviors (Hornik et al., 2013). In this paper, we examine the extent to which a series of neighborhood level indicators and individual level correlates (e.g., demographics) are associated with communication-related outcomes that are relevant to health behaviors and outcomes (Alcaraz et al., 2020). Often consideration of neighborhood level factors is limited to health outcomes and fail to assess their relationship with variables proximal to behavior, like health information seeking and/or exposure. For example, the Comprehensive Model of Information Seeking (CMIS) (Johnson & Meischke, 1993), which is used to predict and explain information seeking behaviors especially related to cancer-related topics, focuses on characteristics of the individual and the information sources but not macro level variables. Here we focus on three variations of health information seeking behavior: deliberately looking for health information (seeking), coming across health information unintentionally (scanning), and becoming aware of health issues from the media or medical providers (awareness of health topics).Using survey data collected from a random sample of adults living in a large metropolitan area with diverse social, demographic and geographic features, we examine how individual and neighborhood correlates shape or constrain three health information seeking outcomes: (1) individuals' awareness of various health topics and their (2) seeking and (3) scanning for cancer-related health information.

Methods

Participant data were collected by re-contacting a county-stratified random sample of adults ages 18–75 years (English and Spanish; random-digit dialing and the "last birthday" method was used) who completed the Southeastern Pennsylvania Household Health Survey ("SEPa HHS") in 2015 and asking them questions related to their background characteristics, cancer prevention, detection, and survivorship, and health behaviors and communication.

SEPa HHS is a recurring biennial telephone survey of individuals in the five-county Philadelphia metropolitan region (Bucks, Chester, Delaware, Montgomery, and Philadelphia), conducted by the Philadelphia Public Health Management Corporation (PHMC)'s Community Health Data Base (CHDB) (http://www.chdbdata.org/., 2019). Interviews are conducted via landline and cell phone, in English and Spanish. Households are selected using random-digit dialing methodology and respondents from the household members are selected by using the person who had the most recent birthday.

To achieve the 2017 sample, the 2015 SEPa HHS respondents (n = 10,048) were divided into smaller replicates of approximately 500 respondents between 18 and 75 years of age. Each 2017 replicate conformed to the geographic and landline/cell frame distribution (80%/20%) of the 2015 respondents. The replicates were fielded again by PHMC until a desired sample size of n = 1000 (final n = 1005) was achieved. The 2017 survey averaged 15–20 min and included items on a variety of topics related to health status and behaviors. Topics included individual health status; access and barriers to care; insurance status; personal health behaviors; history, screening, and detection for a variety of cancer types; risk perceptions, attitudes, and beliefs surrounding cancer; health literacy, communication, and information seeking; exposure to messaging from the media and medical providers; neighborhood factors and social capital; occupational information; exposure information; and demographic information. The items were drawn from established surveys [e.g., HINTS (Gage-Bouchard & Rawl, 2019; Nelson et al., 2004)].

Measures: Outcomes

Awareness of health topics

Respondents were asked the extent to which they heard about various health topics from the media and also from a medical provider in the past 6 months, with response categories of not at all, a little, some

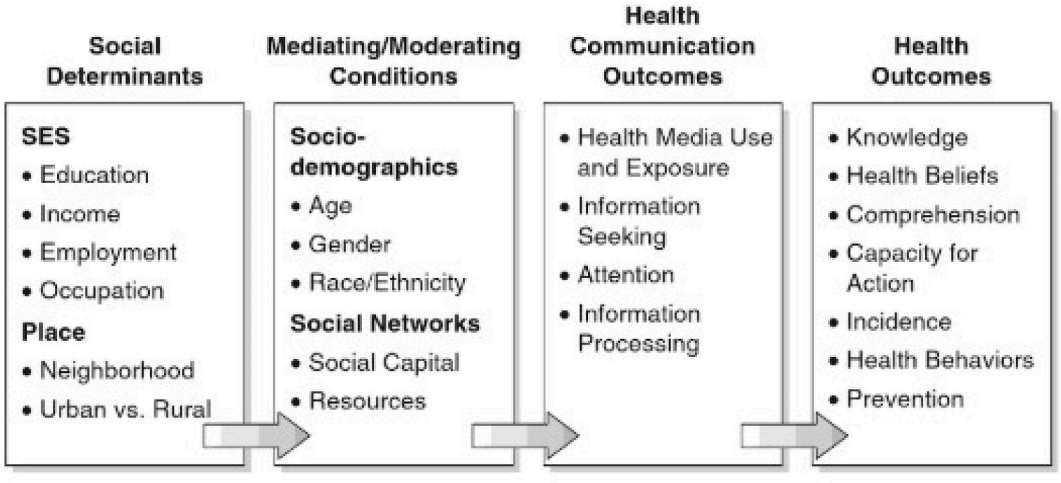

Fig. 1. Theoretical Framework based on Structural Model of Health Communication
Adapted from: Viswanath, K., et al. (2009). Media effects and population health. Media processes and effects. R. Nabi and M. Oliver. Thousand Oaks, CA, Sage: 313–329.

and a lot. The health topics asked about were: people being overweight or obsess, cancer, heart disease, role of genes in health, health care insurance coverage, possible terrorist attacks, HIV/AIDS, and getting exercise.

Seeking and scanning for health information

Respondents were asked the extent to which they sought out information on cancer screening tests or healthy lifestyles, and also the extent to which they just came across such information (Kelly et al., 2010). The measures began with "Some people are actively looking for information about cancer screening tests and health lifestyles while other people just happen to hear or come across such information. Some people don't come across information about it at all." First respondents were asked, "Thinking about the past 12 months, did you hear or come across information [i.e., scanning] about cancer screening tests or healthy lifestyles from doctors, from other people, or from the media even when you were not actively looking for it? Yes/No/Don't know or recall'' Another question about "actively looking" [i.e., seeking] was asked in the same manner. For each respondent who responded "yes" to seeking and/or scanning, we asked about scanning/seeking from specific sources (i.e., doctors; family, friends, or co-workers; television or radio; newspapers, magazines, or newsletters; internet; other sources). The final scanning and seeking measures were counts of the number of sources reported used by respondents ranging from 0 (no sources) to 6 (all sources); those with a "0" answered no or don't know to the initial measures.

Measures: Individual level

In addition to standard demographic measures of age, race, and sex, data were also collected on income and education level. *Income* was measured categorically by asking respondents about their total family income from 2014. Responses ranged from "Less than $5850" to "$250,000 or more" in 26 categories with varying increments. The mean income was 18.9 (SD 6.89); the salary range for a category of 19 is $55,400 to under $60,000; the median income was 22, with a range from $72,000 to under $75,000. *Education level* was measured by a 6-category item, from less than high school graduate, high school grad/GED, technical, trade or vocational school, some college, college graduate, and post-graduate education.

Three relevant lifestyle health behaviors were measured: *ever smoked at least 100 cigarettes*, *times a week one exercises*, and *the number of (sugary) soda drinks consumed per week*. Exercise per week was a four-category ordinal measure ranging from never to three time a week or more. The number of soda drinks per week was assessed by asking if soda was consumed more than 1 time a day, one time a day, a few times a week, a few times a month, or did not drink soda in the past month. Respondents were also asked if they were *ever diagnosed with cancer*.

Measures: Neighborhood level

For this study, the neighborhood level characteristics are analyzed at the ZIP Code geography. Each respondent is spatially linked to a selected set of measures based on their individual location. Neighborhood characteristics include socioeconomic status (SES), health care spending, and access to health care (Table 1). Specific variables for the analysis were based on both their availability in geographically-linked databases and previous literature that found associations with access to and use of health services (Cooper, 2008) and to health disparities and outcomes (Alcaraz et al., 2020). ZIP Code level SES estimates were obtained from the 2012–2016 American Community Survey (ACS) five years estimates. They include the percent Black alone (Not Hispanic or Latino), percent whose ratio of income to poverty level is under 2.0, percent unemployed, and percent with high school education. In addition to SES estimates, health related expenditure from Esri Business Analyst 2016 Consumer Spending Database was also added. This measure captures the total annual health care spending for each ZIP Code. Lastly, health care access is measured as both the driving distance and the total number of providers that are accessible within 5 miles for each respondent. Providers includes businesses listed as Offices of Physicians (NAICS code = 621111) from Esri Business Analyst 2016 Business locations database and mammography clinics from a list of FDA certified facilities. In total, there were 31 distinct geographic areas within the greater Philadelphia area for this study.

Table 1
Neighborhood characteristics for each ZIP code region (n=31).

Neighborhood level correlates		Mean (SD)
Structural[a]		(n=31)
Racial composition	%Black	.26 (.33)
Poverty	% living in poverty	.32 (.22)
SES	% unemployed	.10 (.07)
	% with a high school education	.41 (.21)
Health related[b]		
Health care expenditures	Total health care expenditure	$4,343,601 ($3,499,847) Median $3,415,317
Health care access[c,d]		
Provider proximity	Total number of facilities accessible within 5 miles of respondent's location	227.1 (178.4)
	Average travel distance of all facilities within 5 miles of respondent's location	3.32 (.499999)

[a] Source: 2012-2016 American Community Survey 5 year estimates.
[b] Source: ESRI Business Analyst 2016 Consumer Spending database.
[c] Source: ESRI Business Analyst 2016 Business Locations database.
[d] Source: FDA Certified Mammography Facilities.

Statistical analysis

Specific to this analysis, we excluded those who reported "Other" as a race (n = 50) because there were not enough respondents of races other than White or Black to allow for meaningful racial comparisons. From the sample of 954, sixty-seven additional respondents were excluded because we did not have location coordinates and therefore they had missing data on all the neighborhood level variables. The final sample used in this analysis was based on 887 respondents.

Descriptive statistics on the main outcome variables (awareness of health topics from media and medical providers, seeking for cancer-related info, and scanning for cancer-related info) were calculated. Pearson correlations were calculated between the outcome variables and the neighborhood variables of interest. Finally, multilevel regression analyses were conducted to determine if there were random effects of the neighborhood characteristics on the outcome variables (ordinal logit was used for the awareness variables; linear regression for seeking and scanning variables). The aggregating variable at the neighborhood level was ZIP Code region. The sample contained 31 ZIP Code regions with an average of 15.8 respondents per cluster. All analyses were conducted using Stata 15.0.

Results

As shown in Table 2, the sample was 41.4% male and 74.7% white, with an average age of 54.5 years (SD 11.8). Just under 12% of the sample reported a history of ever being diagnosed with cancer. Forty percent reported ever having smoked 100 cigarettes, 13.6% of the full sample are current smokers, 54.1% reported exercising at least 3 times per week, and 48.5% did not drink any soda in the past month.

Awareness of the 6 health topics (people being overweight or obese, cancer, heart disease, health insurance coverage, HIV/AIDS, getting

Table 2
Sample characteristics (n = 887).

Demographic	% or Mean (SD)
Male	41.5
Age	54.6 (11.5), Range 21–75 years
Race (n = 859, 18 missing)	
White	78.5
Black	21.5
Income (n = 723)	$71,200 to under $75,000 (Median)
Education- College degree or higher	52.9
History of cancer	
Ever diagnosed with cancer	11.4
Lifestyle behaviors	
Ever smoked at least 100 cigarettes	40.2
Current smokers	13.6
Exercise- times a week	
Never/Less than once a week	19.8
Once or twice a week	26.2
Three times a week or more	54.0
Number of soda drinks per week	
Did not drink soda in the past month	48.0
A few times a month	29.0
A few times a week	14.1
One time a day or more	8.8
Seeking of cancer screening tests and lifestyle related health information	
Count of sources	M = 0.90 SD = 1.53
0	68.4
1	6.1
2	8.0
3	7.7
4	5.4
5	3.5
6	0.9
Scanning of cancer screening tests and lifestyle related health information	
Count of sources	M = 2.44 SD = 2.11
0	35.0
1	4.4
2	9.4
3	12.3
4	17.0
5	16.4
6	5.6

Table 3
Frequency distributions of health topic awareness.

	FROM MEDIA % n = 859 or 887?	FROM MEDICAL PROVIDER % n = 859
People being overweight or obese		
Not at all	4.7	36.2
A little	12.0	18.9
Some	29.0	22.4
A lot	54.3	22.4
Cancer		
Not at all	2.5	37.2
A little	13.7	21.8
Some	31.8	20.3
A lot	52.0	20.7
Heart Disease		
Not at all	5.6	34.3
A little	18.6	21.9
Some	34.5	21.9
A lot	41.3	22.0
Health care insurance coverage		
Not at all	1.5	40.9
A little	6.0	15.8
Some	9.0	13.9
A lot	83.5	29.4
HIV/AIDS		
Not at all	23.0	68.9
A little	46.0	15.2
Some	23.5	10.0
A lot	7.6	5.9
Getting exercise		
Not at all	2.8	16.4
A little	12.1	18.0
Some	27.1	26.6
A lot	58.1	39.1

exercise) from the media and from medical providers is presented in Table 3. On average, respondents reported seeking less than 1 (SD 1.52) source of information on cancer screening, but, through scanning, came across 2.44 (SD 2.1) sources (see Table 2). However, of those who sought out information (n = 280), the average number of sources was 2.84 (SD 1.37) and 3.75 (1.38) sources for scanners (n = 577).

Table 4 presents the correlation coefficients between the dependent variables and the outcomes of interest. As shown, with only one or two exceptions seeking and scanning were not related to any of the neighborhood level indicators. Awareness of health topics from media sources was also not related to any neighborhood characteristics, however all of the neighborhood variables (except average travel distance to health care facility within 5 miles) were at least weakly correlated ($r < 0.20$) to awareness of a health topic from health care provider.

For the regression models, at first the multilevel ordinal logit models on topic awareness from media and provider were run with only a random intercept (ZIP Code region as the clustering variable). Stata automatically ran likelihood ratio tests that compared the random models to a regular regression model with fixed parameters. All the tests for each of the awareness outcomes were not significant in that the p values for the chi-square tests were >.05, indicating that the random model is not significantly different from the fixed regression. When the neighborhood variables were added as random slopes, the models did not converge. The results for the seeking and scanning outcomes followed a similar pattern. The likelihood ratio tests for the random intercept only and random slopes were all not statistically different from regular regressions.

Due to the lack of random intercepts or slopes by ZIP Code region, we ran fixed effect regression models (either ordinal logit or ordinary linear regression as appropriate) with the individual and neighborhood level covariates as predictors. We adjusted for robust standard errors by ZIP Code region and used maximum likelihood estimation. Results from these models are in Table 5. As shown (log odds are reported), respondent age (being older), sex (female), and sometimes race (being Black) were associated with an increased odds of awareness of almost all topics from the media, and with one exception, neighborhood characteristics were not. The results were different from awareness of topics by medical providers, where race (Black) and having less than a college education (with one exception) was associated with an increased odds awareness of the various health topics from providers. However, for the topic of cancer, an increase in percent unemployed and percent of high school graduates by ZIP Code region were also associated with higher odds of hearing about cancer from a medical provider.

The regression results for seeking and scanning are in Table 6. None of the individual or neighborhood characteristics were associated with seeking information on cancer screening tests or healthy lifestyles. For scanning, being younger, female, and having a college education were associated with more scanning; also, somewhat surprisingly, residence in high poverty neighborhoods was positively associated with scanning and the percent of high school graduates was negatively associated.

Discussion

The influence of geographic and social environments that characterize neighborhoods is a well-documented predictor of health outcomes (Sallis et al., 2015), including cancer related screenings and prevalence (Rao et al., 2016). The aim of this study, however, was to examine the

Table 4
Correlations among health communication outcomes and neighborhood characteristics.

	Scanning	Seeking	Awareness Obesity		Awareness Cancer		Awareness Heart Disease		Awareness Insurance		Awareness HIV/AIDS		Awareness Exercise	
			M	P	M	P	M	P	M	P	M	P	M	P
Percent Black population	.04	**.09**	.01	**.20**	-.02	**.20**	.04	**.22**	-.01	**.18**	**.19**	**.29**	.08	**.15**
Poverty	.01	**.07**	.02	**.16**	-.02	**.20**	.01	**.19**	-.08	**.14**	**.21**	**.31**	.04	**.11**
Percent unemployed	-.02	.06	-.01	**.13**	-.05	**.17**	-.02	**.12**	-.04	**.10**	**.14**	**.24**	-.02	**.09**
Percent of HS graduates	**-.07**	.04	.05	**.14**	.04	**.20**	.05	**.16**	-.11	**.12**	**.14**	**.26**	.06	**.10**
# of facilities within 5 miles	.04	.01	.03	**-.11**	.03	**-.15**	-.04	**-.16**	.09	**-.10**	**-.12**	**-.22**	-.03	**-.07**
Health care expenditure	.03	.05	.00	**.15**	.04	**.14**	.02	**.17**	.05	**.13**	**.18**	**.28**	.02	**.12**
Average travel distance within 5 miles	-.01	.02	.04	-.04	.02	-.01	.04	-.00	-.01	.03	-.00	.03	-.01	.01

M = media; P = provider; Correlations for awareness variables are polychoric.

Table 5
Ordered logit regression results for health topic awareness from media and health care providers with individual and neighborhood level covariates (fixed effects) (n = 850).

Dependent variable	Weight		Cancer		Heart disease		Insurance		Exercise		HIV	
	Log odds (SE)		Log odds (SE)		Log odds (SE)		Log odds (SE)		Log odds (SE)		Log odds (SE)	
Individual level	Media	Provider	Media	Provider	Media	Provider	Media	Provider	Media	Provider	Media	Provider
Age	**.03(.01)** ***	.004 (.01)	.01 (.01)	.01 (.01)	**.03 (.01)****	**.01 (.01)** *	-.001 (.11)	.01 (.01)	**.03 (.01)** ***	-.002 (.01)	**.02 (.01)****	.000 (.1)
Male	**-.35 (.10)*****	-.07 (.13)	**-.39 (.13)****	.22 (.12)	**-.47 (.10)*****	-.01 (.10)	.04 (.19)	**.30 (.11)** **	**-.43 (.16)****	-.11 (.14)	-.06 (.14)	.25 (.19)
White	-.34 (.31)	**-.69 (.28)** *	-.18 (.29)	**-.44 (.21)***	-.54 (.31)	**-.65 (.24)** **	**-.63 (.27)***	**-.56 (.23)** *	-.39 (.31)	**-1.01 (.22)*****	**-.65 (.29)***	**-.72 (.36)** *
History of cancer	.25 (.21)	-.11 (.20)	.31 (.23)	**.57 (.18)** **	.34 (.24)	-.07 (.23)	-.21 (.25)	.04 (.26)	-.11 (.23)	.40 (.17)	-.15 (.21)	.22 (.23)
Ever smoke	-.07 (.14)	.10 (.14)	.13 (.12)	-.17 (.14)	-.02 (.13)	.02 (.15)	.10 (.18)	-.20 (.16)	-.05 (.14)	.22 (.12)	.16 (.13)	.07 (.17)
Exercise	.07 (.09)	**-.16 (.07)** *	.01 (.11)	-.06 (.06)	-.02 (.07)	-.07 (.07)	.11 (.12)	-.14 (.08)	.02 (.09)	.03 (.08)	-.01 (.09)	-.17 (09)
Soda consumption	.14 (.10)	.02 (.08)	.11 (.08)	-.08 (.07)	.09 (.07)	.01 (.06)	-.09 (.09)	.06 (.06)	.03 (.08)	-.04 (.08)	.06 (.08)	-.01 (.07)
College +	-.12 (.13)	**-.35 (.11)** ***	-.19 (.13)	-.39 (.15)	-.14 (.13)	**-.44 (.16)** **	**.81 (.21)*****	**-.44 (.15)** **	-.21 (.17)	**-.35 (.14)** **	-.01 (.13)	**-.60 (.19)** **
Neighborhood level												
Percent Black population	-.51 (.52)	.26 (.35)	-.25 (.45)	.16 (.47)	-.35 (.45)	.23 (.34)	-.46 (.43)	.21 (.42)	.32 (.41)	-.24 (.42)	-.26 (.37)	-.16 (.35)
Poverty	-.16 (.65)	-.41 (.56)	-.27 (.77)	.07 (.60)	-.10 (.53)	-.03 (.57)	-.73 (.75)	-.25 (.44)	-.12 (.51)	-.13 (.49)	1.15 (.62)	.56 (.46)
Percent unemployed	-1.16 (1.17)	.34 (.52)	-1.79 (1.37)	**1.41 (.71)***	-2.44 (1.37)	-.49 (.71)	-1.02 (1.20)	.11 (1.01)	-2.35 (1.19)	-.57 (.95)	-.11 (1.11)	1.20 (1.17)
Percent of HS graduates	.57 (.41)	.30 (.39)	.78 (.46)	**.82 (.41)** *	.62 (.53)	.27 (.38)	.23 (.63)	.18 (.46)	.49 (.33)	.10 (.34)	-.16 (.35)	.36 (.44)
# of facilities within 5 miles	.00 (.00)	.000 (.00)	-.00 (.00)	.000 (.000)	.00 (.00)	.001 (.000)	**.002 (.001)***	.000 (.000)	-.000 (.00)	.000 (.000)	.001 (.001)	**.002 (.00)****
Average travel distance within 5 miles	.11 (.10)	-.17 (.12)	.07 (.09)	-.08 (.09)	.12 (.07)	-.04 (.07)	-.02 (.15)	.04 (.09)	-.04 (.08)	.04 (.10)	-.01 (.11)	.11 (.13)

extent to which neighborhood factors were associated with health communication outcomes such as issue awareness and information seeking behaviors, which are often contributors to health decision-making. National surveys have found associations between demographic characteristics and the type of online health information sources that people use (LaValley et al., 2017). However, in this sample, the association between neighborhood characteristics and health communication outcomes did not vary across neighborhoods when they were treated as clusters or as fixed characteristics. In some instances, individual demographics (e.g., age and sex) were related to increased awareness and/or scanning of cancer-related health information/topics.

Although none of the covariates on either the individual or neighborhood levels were associated with seeking health information, there were some correlates of information scanning. Having at least a college education, being younger, and being female was associated with scanning for cancer-related health information, that is, just coming across such information without intentionally looking for it. Also, on a neighborhood level, those in neighborhoods with a lower percent of high school graduates and higher percentage of living in higher poverty were also more likely to scan. One possible explanation might be that, with the increasing targeting of social media information, more affluent individuals obtain more information through scanning; and that informal social networks in more disadvantaged neighborhoods provide a source of information not explicitly sought out by residents. It seems the individual level and neighborhood level characteristics may work in opposite ways; the dynamic underlying these findings is unclear, and more research in this area is needed to understand why some environments are more conducive to scanning than others.

Limitations

ZIP Code region is a fairly crude indicator of neighborhood. Using

Table 6
OLS regression results for seeking and scanning with individual and neighborhood level covariates (fixed effects) (n = 850).

Dependent variable	Scanning	Seeking
Individual level	b (SE)	b (SE)
Age	**-.01 (.01)***	-.002 (.01)
Male	**-.39 (.15)****	-.24 (.15)
White	.17 (.24)	.33 (.21)
History of cancer	.44 (.19)	.09 (.18)
Ever smoke	.01 (.17)	-.17 (.11)
Exercise	.15 (.08)	.06 (.05)
Soda consumption	.02 (.08)	.05 (.09)
College +	**.18 (.17)**	.57 (.35)
Neighborhood level		
Percent Black population	.47 (.33)	.34 (.50)
Poverty	**.97 (.47)***	.34 (.50)
Percent unemployed	-1.21 (1.13)	.63 (1.34)
Percent of HS graduates	**-1.23 (.34)*****	.08 (.35)
# of facilities within 5 miles	.000 (.000)	.000 (.000)
Average travel distance within 5 miles	.004 (.11)	.04 (.07)

census tract was not feasible: there were 539 clusters with an average of 1.6 observations per cluster; and 178 clusters with an average of 4.8 observations. In multilevel models it is preferable to have fewer clusters with more observations than more clusters with fewer observations (Maas & Hox, 2005).

Conclusion

This study uniquely assessed neighborhood level differences in various health communication outcomes that precede and/or can contribute to disparities in health behaviors or disease prevalence. Here we find that some health topics receive more attention in media and through medical providers than others. We did not find support for variation in these outcomes due to neighborhood, but it is possible that a focus on more nuanced indicators of neighborhood (e.g., census block group) as well as neighborhood media environments (e.g., total ratings points for certain types of advertising) may be more appropriate for observing a link being neighborhood and health communication outcomes.

Ethnics approval

The Institutional Review Board at the University of Pennsylvania approved this study.

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Author statement

Amy Bleakley conceptualized the study, ran the analyses, and drafted the manuscript.

Vicky Tam assisted with the analyses and reviewed drafts of the manuscripts.

Julia Orchinik was involved in project administration and reviewed the manuscript.

Karen Glanz helped to conceptualize the study, led investigation of the overall project, and reviewed the manuscript drafts.

Declaration of competing interest

There are no conflicts of interest for any of the authors.

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