



Evaluating the association between the built environment and primary care access for new Medicaid enrollees in an urban environment using Walk and Transit Scores

Krisda H. Chaiyachati^{a,f,*}, Jeffrey K. Hom^b, Rebecca A. Hubbard^c, Charlene Wong^d, David Grande^{e,f}

^a VA Advanced Fellow for the Cpl. Michael Crescenz, VA Medical Center in Philadelphia, PA, United States

^b Department of Public Health, Philadelphia, PA, United States

^c Department of Biostatistics, Epidemiology, and Informatics, University of Pennsylvania, Philadelphia, PA, United States

^d Department of Pediatrics and Duke-Margolis Center for Health Policy, Duke University, Durham, NC, United States

^e Division of General Internal Medicine, University of Pennsylvania's Perelman School of Medicine, Philadelphia, PA, United States

^f Leonard Davis Institute of Health Economics, University of Pennsylvania, Philadelphia, PA, United States

A B S T R A C T

Worse health outcomes among those living in poverty are due in part to lower rates of health insurance and barriers to care. As the Affordable Care Act reduced financial barriers, identifying persistent barriers to accessible health care continues to be important. We examined whether the built environment as reflected by Walk Score™ (a measure of walkability to neighborhood resources) and Transit Score™ (a measure of transit access) is associated with having a usual source of care among low-income adults, newly enrolled in Medicaid. We received responses from 312 out of 1000 new Medicaid enrollees in Philadelphia, a large, densely populated urban area, who were surveyed between 2015 and 2016 to determine if they had identified a usual source of outpatient primary care. Respondents living at an address with a low Walk Scores (< 70) had 84% lower odds of having a usual source of care (OR 0.16, 95% CI 0.04–0.61). Transit scores were not associated with having a usual source of care. Walk Score may be a tool for policy makers and providers of care to identify populations at risk for worse primary care access.

1. Introduction

Individuals living in poverty have worse health outcomes. These outcomes are due in part to lower rates of health insurance and worse access to care (Pew Charitable Trust, 2013). Though the Patient Protection and Affordable Care Act (ACA) has decreased cost-related barriers to care through expanded insurance coverage, social factors are largely untouched and significantly influence access (Chaiyachati et al., 2016). Of the five domains of access—affordability, availability, accessibility, accommodation, and acceptability—prior studies for Medicaid enrollees have generally focused on affordability (Sommers et al., 2016; Marino et al., 2016) and availability (i.e., the supply of care) (Brown et al., 2016; Probst et al., 2009; Penchansky and Thomas, 1981). In this study we examine *accessibility* (Penchansky and Thomas, 1981)—how easily an individual can acquire a usual source of care based on the quality of their built environment using measures of public infrastructure and transportation (Syed et al., 2013): Walk Score™ and

Transit Score™.

An individual's usual source of care is a medical professional, clinic, or health center where a person would go if sick or needed health advice, other than a hospital or emergency department (Agency for Healthcare Research and Quality, 2013). Having a usual source of care is an indicator for having access to primary care and preventive screenings and treatments for chronic health conditions (DeVoe et al., 2009; DeVoe et al., 2011; DeVoe et al., 2003; Phillips et al., 2009; Corbie-Smith et al., 2002; Friedberg et al., 2010). Therefore, adequate access to a usual source of care is an important population health goal.

Accessibility is often defined by travel distance and the supply of providers using geospatial techniques. However, the built environment—the walkability of a neighborhood, the quality of the local infrastructure, and public transportation—may be important predictors of how residents in urban areas access essential services, like health care (Vlahov et al., 2007; Knuiman et al., 2014). Walkability of neighborhoods and public transit networks are key components of an

* Corresponding author at: VA Advanced Fellow, University of Pennsylvania, 423 Guardian Drive, 1303A Blockley Hall, Philadelphia, PA 19104, United States.
E-mail address: kchai@upenn.edu (K.H. Chaiyachati).

urban area's built environment, but their impact on primary care access is not well understood (Knuiman et al., 2014; Kaplan-Lewis and Percac-Lima, 2013; Silver et al., 2012; Kangovi et al., 2013; Rask et al., 1994). Understanding how patients engage with critical resources like health care, in today's urban environment is critical for advancing our understanding of primary care access for low-income populations after insurance became more widely available under the ACA.

Walk and Transit Scores (www.walkscore.com) are composite measures of walkability and public transit availability for any given US address. These Scores are free, publicly available measures that account for the local transportation infrastructure. Walk Score is unique because it also accounts for the geographic proximity and availability of commercial and public services (e.g., grocery stores, schools, libraries, and shops) that surround a given address, novel proxies for the quality of an individual's built environment (Duncan et al., 2013; Carr et al., 2011; Carr et al., 2010; Brown et al., 2013). The objective of our study was to describe the association between Walk and Transit Scores, as measures of their local infrastructure and availability of public transportation, for an individual's place of residence with having a usual source of care.

2. Methods

2.1. Overview

We assess having a usual source of care by surveying new Medicaid enrollees in a large, densely populated urban area after they gained insurance, reducing the substantial insurance barrier to accessible health care. For each respondent, we determined their Walk and Transit scores. We hypothesized that individuals living at an address with worse public infrastructure and poorer access to public transportation, as reflected by lower Walk and Transit Scores, would be less likely to have a usual source of care.

2.2. Study sample

We conducted a survey of new Medicaid enrollees in Philadelphia, Pennsylvania from November 2015 to February 2016. We obtained a list of individuals who received Medicaid application assistance from Benefits Data Trust (BDT), a comprehensive benefits access program located in Philadelphia. Among its services, BDT provides Medicaid application assistance to low-socioeconomic status (SES) adults enrolled in other public benefit programs (e.g., food stamps, public housing, etc.).

Given the nature of our convenience sample, our study included individuals who were 18–64 years old, able to read English, living in Philadelphia (based on their mailing address), and who completed an application for Medicaid through BDT prior to November 2015. We invited a convenience sample of 1000 individuals to participate in a mailed survey between November 2015 and February 2016. Of the 1000 individuals invited, BDT could confirm through state records that 764 were enrolled in Medicaid coverage. The remaining ($n = 236$) had completed applications for Medicaid, but BDT was not yet able to confirm their enrollment status at the beginning of the survey period.

Individuals first received a letter informing them of the upcoming survey. One week later, the survey, consent forms, and pre-paid return envelope were mailed with a \$2 cash participation incentive. A reminder postcard was sent approximately 3 weeks later, followed one week later by a second copy of the survey. Individuals who did not respond to the mailed survey received a follow-up phone call and were offered the opportunity to complete the survey by phone. All participants who completed the survey received a \$10 gift card.

2.3. Measures

2.3.1. Survey instrument

The survey (Appendix Fig. 1) included demographic (age, race,

ethnicity, sex, education, income, employment status), health (self-rated health), and access to care questions. The access to care questions were adapted from the Access to Care section of the 2013 Medical Expenditure Panel Survey's Household Component, a large-scale survey assessing perceived and actual health services used by families and individuals (Agency for Healthcare Research and Quality, 2013). The usual source of care question was the following: "Is there a particular doctor's office, clinic, health center, or other place that you usually go if you are sick or need advice about your health?"

We also included transportation related questions adapted from the 2010 Community Health Database Household Survey and transportation related surveys of low-income populations (Silver et al., 2012; Public Health Management Corporation, 2014). Questions about usual modes of travel to usual care were asked, but only asked to those who stated they had a usual source of care. Given the lag between applying for Medicaid and enrollment for approximately one-third of the sample, participants were asked to confirm whether they were enrolled at the time of completing the survey. We pilot tested the instrument for readability and question clarity with a convenience sample of 5 Medicaid enrollees and modified the instrument based on feedback prior to inviting the 1000 individuals to participate.

2.3.2. Geospatial and neighborhood data

We geocoded survey participants who consented to the use of their residential address using ArcMap 10.3. ArcMap was then used to merge the geocoded survey participants' addresses with census tract level data on crime. Crime and resultant safety is correlated with perceptions of neighborhood walkability and individual behaviors within their built environment (e.g. waiting at certain bus stops) differently based on perceived safety (Barnett et al., 2017; Foster et al., 2014). Crime data is not incorporated into Walk or Transit Scores and were obtained for 2015 from a publicly available data set from Open Data Philly—a free, open access portal containing Philadelphia-based, municipal and non-municipal data sets that are routinely updated (Azavea, n.d.). We used census tract as an approximation for neighborhood within Philadelphia's urban environment (Brown et al., 2016). Crime data were merged to calculate the crime rate per 1000 individuals within a given census tract.

2.3.3. Walk Score & Transit Score

Walk Score has been found to be a valid and reliable estimate of the availability and walkability to local resources for a given address (Carr et al., 2011; Carr et al., 2010). Walk Score is calculated using a geography-based algorithm which creates a normalized score between 0 and 100 based on a) the length of walking routes to a wide range of amenities (e.g., grocery stores, stores, schools, parks, etc.) using multiple application program interfaces (API's) (e.g., Google™) which are routinely updated, b) population density, c) block lengths, and d) intersection density (Carr et al., 2010). Transit Score has been validated as a reliable estimate for transit availability for any given address (Duncan et al., 2013). The Transit Score algorithm similarly creates a normalized score between 0 and 100 based on the "usefulness" of public transit for any given address based on a) publicly available transit routes, accounting for frequency, route type (e.g., rail, bus, subway, etc.), and b) distance to the nearest public transit stop. Scores provide an absolute score to measure the predicted walkability and transit usefulness for a given geographic address based on local features, not necessarily whether individuals who reside at a specific address walk or use public transportation. The normalized score results in the same built environment features that produce a given score in one city will result in an equivalent score in a comparable urban environment or rural town, so long as the same environment features used in the algorithms are present. Scores were obtained by entering an individual's residential address into www.walkscore.com and manually abstracting their Scores within three months of the survey period ending.

2.4. Data analysis

For all analyses, we limited our sample to survey respondents who confirmed they were currently insured by Medicaid and who volunteered the use of their home address for geocoding. To evaluate whether those who volunteered the use of their address differed from those that did not, we conducted bivariate analyses of respondent demographic characteristics (age, sex, race, ethnicity, education, income, employment, and crime within their census tract) and self-reported health status in relation to volunteering a home address. We were unable to conduct an analysis of survey responders versus non-responders due to restrictions on data access from our research partner, BDT.

Our primary analysis was the association between Walk Score or Transit Score and individuals reporting that they had a usual source of medical care. For these analyses, we excluded individuals who did not respond to the usual source of care question. We examined the association between Walk Score and Transit Score and having a usual provider, separately for each Score. Then we tested the same association using multivariable logistic regression models with pre-specified covariates thought to confound the relationship between an individual's choice to live in a specific location (therefore impacting the Score of their residential address) and having a usual source of care: age, sex, self-rated health, education, employment, violent crime, and non-violent crime.

In logistic regression analyses, we modeled Walk Score and Transit Score using a three-level categorical variables: a) ≤ 70, b) 71–85, c) 86–100. Therefore, reported odds ratios reflect the ratio of the odds of having a usual source of care for an individual with a Score (Walk or Transit) within a category in relation to the odds of having a usual source of care for an individual with a Score in the highest category of between 86 and 100. Additionally, we calculated an omnibus p-value for including either Walk or Transit Score in the adjusted model using the likelihood ratio test.

Analyses were conducted between July 2016 and February 2017. A two-sided p-value of < 0.05 was considered statistically significant. All analyses were carried out using Stata (version 14.0, StataCorp LLP, College Station, TX).

2.5. Human subject protections

This study protocol was reviewed and approved by the Institutional Review Board at the University of Pennsylvania.

3. Results

A total of 312 individuals (response rate: 31%) completed the survey. Among respondents, 239 reported being enrolled in Medicaid at the time of survey completion. Our analysis included the 190 respondents who volunteered the use of their address. Respondents that did not volunteer their address (n = 49) differed (Appendix Table 1) only by racial makeup—a higher proportion of mixed race or other—compared to 190 who did volunteer their address, our cohort for this analysis.

Study participants who volunteered their address (Table 1) were predominantly female (64%), older than 35 years old (82%), African-American (62%), and non-Hispanic (86%). Most had completed high school or less (58%) and made less than \$25,000 per year (83%). Few were employed full-time or part-time (36%). The majority reported having good to excellent health (76%). Many had no insurance (71%) prior to receiving Medicaid and had their plan for less than a year (79%). Within the study cohort, 128 (67%) had a usual source of care, 41 (22%) did not, and 21(11%) did not respond. The median Walk Score was 83 (interquartile range (IQR) 77–87) and Transit Scores was 66 (IQR 58–75) for the respondents' home addresses.

In unadjusted analyses, individuals living in areas with the lowest Walk Scores (< 70) had non-significantly lower odds of having a usual

Table 1
Characteristics of study cohort.

	All (n = 190)	Usual source of care? ^a		
		No (n = 41)	Yes (n = 128)	p-Value
Demographics				
Age - no. (%)				
18–34	35 (18)	12 (29)	19 (15)	0.05
35–54	72 (38)	17 (41)	49 (38)	
55 +	83 (44)	12 (29)	60 (47)	
Female - no. (%)	122 (64)	24 (59)	88 (69)	0.23
Race - no. (%)				
White	49 (26)	14 (34)	31 (24)	0.43
African American	118 (62)	22 (54)	82 (64)	
Other or mixed	23 (12)	5 (12)	15 (12)	
Ethnicity - no. (%)				
Hispanic	18 (9)	5 (12)	11 (9)	0.55
Non-Hispanic	164 (86)	35 (85)	111 (87)	
Education level - no. (%)				
High school or less	111 (58)	27 (66)	67 (52)	0.20
At least some college	59 (31)	11 (27)	46 (36)	
Income - no. (%)				
< 15 k	112 (59)	21 (51)	82 (64)	0.02
15–24 k	46 (24)	10 (24)	29 (23)	
≥ 25 K	18 (9)	9 (22)	8 (6)	
Employment - no. (%)				
Employed (full or part-time)	68 (36)	12 (29)	48 (38)	< 0.01
Unemployed or laid off	51 (27)	18 (44)	24 (19)	
Other	71 (37)	11 (27)	56 (44)	
Self-reported health rating - no. (%)				
Good to excellent	145 (76)	31 (76)	98 (77)	0.90
Poor or fair	44 (23)	9 (22)	30 (23)	
Had previous insurance - no. (%)				
Yes	50 (26)	8 (20)	37 (29)	0.23
No	135 (71)	32 (78)	87 (68)	
Length of time with current insurance - no. (%)				
0–6 months	78 (41)	20 (49)	52 (41)	0.51
6–12 months	73 (38)	13 (32)	49 (38)	
> 12 months	36 (19)	6 (15)	26 (20)	
Walk Score and Transit Score				
Walk Score of residential address				
By categories of Walk Score - no. (%)				
< 70	28 (15)	11 (27)	15 (12)	0.07
71–85	102 (54)	19 (46)	73 (57)	
86–100	60 (32)	11 (27)	40 (31)	
Transit Score of residential address				
By categories of Transit Score - no. (%)				
< 70	106 (56)	25 (61)	71 (55)	0.89
71–85	78 (41)	15 (37)	52 (41)	
86–100	6 (3)	1 (2)	5 (4)	
Crime				
No. per 1000 individuals within census tract where participants lived				
Crime				
Violent crime, median (IQR)	28 (17–42)	31 (16–44)	28 (18–42)	0.96
Non-violent crime, median (IQR)	42 (29–51)	42 (28–50)	42 (29–51)	0.56
Other crime, median (IQR)	42 (25–75)	45 (25–75)	42 (26–75)	0.93

^a Survey respondents who did not complete the usual source of care question were excluded from the analysis (n = 21).

source of care (OR 0.38, 95% CI 0.13–1.04) compared to those living in areas with the highest walk scores (> 85) (Table 2). Similarly, those living in areas with intermediate Walk Scores (71–85) did not differ significantly from those in areas with the highest walk scores. After adjusting for individual socio-demographic factors, self-rated health status, and area-level crime, individuals living in areas with low Walk Scores (< 70) had 84% decreased odds of having a usual source of care (OR 0.16, 95% CI 0.04–0.61) compared to those living in high Walk Score areas (> 85). Overall, Walk Score was significantly associated with having a usual source of care in the multivariable model ($p = 0.01$).

Lower Transit Scores were not associated with having a usual source of care in either unadjusted or adjusted analyses. Overall, Transit Score was not significantly associated with having a usual source of care in the multivariable model ($p = 0.58$).

4. Discussion

Our study of new Medicaid enrollees in Philadelphia suggests that greater walkability to local resources as reflected by higher Walk Score is associated with having a usual source of care, whereas Transit Score is not. These findings suggest that the built environment may be an important factor influencing access to primary care. Previous studies of Walk Score and Transit Score have demonstrated the association with walkability and accessibility of neighborhood resources (Duncan et al., 2013; Carr et al., 2011; Carr et al., 2010; Brown et al., 2013; Tuckel and Milczarski, 2015; Hirsch et al., 2013), reductions in weight and prevalence of obesity (Creatore et al., 2016; Wasfi et al., 2016), less diabetes (Creatore et al., 2016), and improved physical activity levels (Hajna et al., 2016a; Hajna et al., 2016b). Our study explores the novel association between these Scores and primary care accessibility.

We believe Walk Score had a significant association with health access in our urban environment because it accounts for the relationship between an individual's home and the accessibility of other local resources (e.g., food and clothing). Resource poor areas are more likely to have worse infrastructure (e.g., broken sidewalks and damaged steps) compared to resource rich areas, creating physical barriers which impede walkability and create a deterrent for leaving home (Carr et al., 2010; Clarke et al., 2011; Clarke and George, 2005). Given that Walk Scores are calculated based on the density and proximity of facilities, understanding how individuals perceive the accessibility of many key resources (e.g., grocery store, shops, laundromats, and pharmacies) may be important and may correlate with perceived accessibility of health care. Further studies are needed, particularly ones focusing on the interaction between actual travel mode choices, Walk Scores, and having a usual source of care.

Contrary to our hypothesis, we did not observe a relationship between Transit Score and having a usual source of care. Transit Score is determined by the availability of public transportation routes and stops. Because the Score does not account for how patients usually travel or

the travel experience, this measure may not accurately depict the relationship between transportation and having access to a usual care provider. For example, having access to a car or shorter travel times are associated with improved access to health care services (Silver et al., 2012; Coughlin and King, 2010).

Our study should be interpreted in the context of several limitations. First, given the observational nature of our study, our results are measures of association, not causation. Second, our findings may not be generalizable to all Medicaid beneficiaries or all vulnerable populations given this was a convenience sample from one urban area (e.g., travel modes and acceptable travel distances may be different in non-urban areas) and individuals were required to read English (e.g., we excluded patients who communicate primarily in Spanish). Similarly, we had a modest response rate. However, our response rate is an improvement compared to contemporary surveys of Medicaid patients, a traditionally difficult-to-reach population (Barnett and Sommers, 2017). Third, additional unobserved confounders could impact the relationship between Walk or Transit Scores and access. For example, we lacked individual comorbidity, disability data, or how those surveyed typically travel (e.g., walking or public transportation) to access other necessary resources like groceries. We did ask patients about their typical travel mode to a usual care provider in our survey. However, the question could only be answered by those with a usual source of care, not those without. Similarly, private vehicle ownership or access is not accounted for in our model, either through the survey or in how Transit Scores are calculated. Additionally, as informed by Penchansky's model, measuring and controlling for additional influencers of access – like availability and affordability – may confound the relationship between these Scores and our primary outcome of identifying a usual source of care. Indeed, accessibility is one of many factors influencing health outcomes for poor Americans. Future studies should consider measuring the impact of these confounders on our findings. Fourth, the variation in Transit Scores was concentrated among those with lower scores, perhaps resulting in a non-significant finding. A larger sample, which potentially captures individuals who live in higher Transit Score areas would be needed to confirm our findings. Finally, the Scores' algorithms have limitations. Neither Score accounts for crime, neighborhood aesthetics, weather, traffic patterns, or topography. These factors may differentially affect the walkability and transit network around a given address and therefore the ability to access a usual source of care.

Nonetheless, our study indicates that Walk Score could be a tool for urban planners, public health officials, and health care leaders to identify populations at risk for worse primary care access. In addition, the association of Walk Scores and worse primary care access points to potential interventions that could be tested to engage vulnerable populations in care, either by addressing neighborhood level factors that create barriers (perceived or real). Our findings may lend credit to urban planning efforts that strategically redesign low Walk Score neighborhoods by increasing the availability of mixed land use areas (e.g., concentrated city blocks with housing units, a healthcare practice,

Table 2

Adjusted and unadjusted models for the relationship between Walk or Transit Score and having a usual source of care.

	Unadjusted model			Adjusted model ^a			LR test
	OR	(95% CI)	p-Value	aOR	(95% CI)	p-Value	p-Value
Walk Score categories							0.01
< 70	0.38	(0.13–1.05)	0.06	0.16	(0.04–0.63)	0.008	
71–85	1.06	(0.46–2.44)	0.90	1.02	(0.38–2.76)	0.97	
86–100	–	–	–	–	–	–	
Transit Score categories							0.59
< 70	0.57	(0.06–5.10)	0.61	1.04	(0.09–12.41)	0.98	
71–85	0.69	(0.08–6.40)	0.75	1.65	(0.13–20.15)	0.70	
86–100	–	–	–	–	–	–	

Abbreviations: OR - odds ratio; aOR - adjusted odds ratio; LR - likelihood ratio.

^a Adjusted models include covariates for age, gender, race, self-rated health, education, employment, violent crime, and non-violent crime.

and a grocery store) using “smart growth” principles or create these “pedestrian pockets” near transit stops. Alternatively, providers of care could provide home visiting programs or telephone appointments for patients with poor healthcare access, based on a low Walk Score (Seiger Cronfalk et al., 2017; Bashshur et al., 2016). For insurers, Walk Score could be used to identify individuals that may benefit from door-to-door transportation services like taxis or rideshare programs (Powers et al., 2016).

Our study offers evidence that the built environment, as measured through Walk Score, may impact health care access. Walk Score is free and publicly available, a potentially useful tool for public health officials and policymakers to identify a non-financial barrier to care. Additional research is needed to validate our findings in other urban environments and to explore if the relationship between Walk Score as a proxy for the built environment and primary care access is causal. Understanding this relationship will be important when considering how to improve primary care access and the health of low-income populations by modifying the built environment or bringing health care to the homes of patients with significant environmental barriers.

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.pmedr.2017.12.001>.

Conflict of interest statement

This work was supported by the American Dental Association (ADA). Two of the authors (KHC and JKH) received training support from the Veterans Health Administration (VHA) and Robert Wood Johnson Foundation (RWJF) during data collection and initial drafts of the manuscript. The ADA, VHA, and RWJF had no role in the study design, collection, analysis, interpretation of the data, writing the report, or the decision to submit the report for publication.

Financial disclosure

None of the authors have any financial disclosures.

References

- Agency for Healthcare Research & Quality, 2013. Medical expenditure panel survey topics: access to health care. http://meps.ahrq.gov/mepsweb/data_stats/MEPS_topics.jsp?topicid=1Z-1, Accessed date: 4 January 2016.
- Azavea. n.d. Open Data Philly. <https://www.opendataphilly.org/>. Accessed January 4, 2016.
- Barnett, M.L., Sommers, B.D., 2017. A national survey of medicaid beneficiaries' experiences and satisfaction with health care. *JAMA Intern Med.* 177 (9), 1378–1381. <http://dx.doi.org/10.1001/jamainternmed.2017.3174>.
- Barnett, D.W., Barnett, A., Nathan, A., et al., 2017. Built environmental correlates of older adults' total physical activity and walking: a systematic review and meta-analysis. *Int. J. Behav. Nutr. Phys. Act.* 14 (1), 103.
- Bashshur, R.L., Howell, J.D., Krupinski, E.A., Harms, K.M., Bashshur, N., Doarn, C.R., 2016. The empirical foundations of telemedicine interventions in primary care. *Telemed. J. E Health* 22 (5), 342–375.
- Brown, S.C., Pantin, H., Lombard, J., et al., 2013. Walk Score (R): associations with purposive walking in recent Cuban immigrants. *Am. J. Prev. Med.* 45 (2), 202–206.
- Brown, E.J., Polsky, D., Barbu, C.M., Seymour, J.W., Grande, D., 2016. Racial disparities in geographic access to primary care in Philadelphia. *Health Aff (Millwood)*. 35 (8), 1374–1381.
- Carr, L.J., Dunsiger, S.I., Marcus, B.H., 2010. Walk score as a global estimate of neighborhood walkability. *Am. J. Prev. Med.* 39 (5), 460–463.
- Carr, L.J., Dunsiger, S.I., Marcus, B.H., 2011. Validation of Walk Score for estimating access to walkable amenities. *Br. J. Sports Med.* 45 (14), 1144–1148.
- Chaiyachati, K.H., Grande, D.T., Aysola, J., 2016. Health systems tackling social determinants of health: promises, pitfalls, and opportunities of current policies. *Am. J. Manag. Care* 22 (11), e393–e394.
- Clarke, P., George, L.K., 2005. The role of the built environment in the disablement process. *Am. J. Public Health* 95 (11), 1933–1939.
- Clarke, P.J., Ailshire, J.A., Nieuwenhuisen, E.R., de Kleijn-de Vrankrijker, M.W., 2011. Participation among adults with disability: the role of the urban environment. *Soc. Sci. Med.* 72 (10), 1674–1684.
- Corbie-Smith, G., Flagg, E.W., Doyle, J.P., O'Brien, M.A., 2002. Influence of usual source of care on differences by race/ethnicity in receipt of preventive services. *J. Gen. Intern. Med.* 17 (6), 458–464.
- Coughlin, S.S., King, J., 2010. Breast and cervical cancer screening among women in metropolitan areas of the United States by county-level commuting time to work and use of public transportation, 2004 and 2006. *BMC Public Health* 10, 146.
- Creatore, M.I., Glazier, R.H., Moineddin, R., et al., 2016. Association of neighborhood walkability with change in overweight, obesity, and diabetes. *JAMA* 315 (20), 2211–2220.
- DeVoe, J.E., Fryer, G.E., Phillips, R., Green, L., 2003. Receipt of preventive care among adults: insurance status and usual source of care. *Am. J. Public Health* 93 (5), 786–791.
- DeVoe, J.E., Tillotson, C.J., Wallace, L.S., 2009. Usual source of care as a health insurance substitute for U.S. adults with diabetes? *Diabetes Care* 32 (6), 983–989.
- DeVoe, J.E., Tillotson, C.J., Lesko, S.E., Wallace, L.S., Angier, H., 2011. The case for synergy between a usual source of care and health insurance coverage. *J. Gen. Intern. Med.* 26 (9), 1059–1066.
- Duncan, D.T., Aldstadt, J., Whalen, J., Melly, S.J., 2013. Validation of Walk Scores and Transit Scores for estimating neighborhood walkability and transit availability: a small-area analysis. *GeoJournal* 78 (2), 407–416.
- Foster, S., Knuiman, M., Villanueva, K., Wood, L., Christian, H., Giles-Corti, B., 2014. Does walkable neighbourhood design influence the association between objective crime and walking? *Int. J. Behav. Nutr. Phys. Act.* 11, 100.
- Friedberg, M.W., Hussey, P.S., Schneider, E.C., 2010. Primary care: a critical review of the evidence on quality and costs of health care. *Health Aff (Millwood)*. 29 (5), 766–772.
- Hajna, S., Ross, N.A., Joseph, L., Harper, S., Dasgupta, K., 2016a. Neighbourhood walkability and daily steps in adults with type 2 diabetes. *PLoS One* 11 (3), e0151544.
- Hajna, S., Kestens, Y., Daskalopoulou, S.S., et al., 2016b. Neighbourhood walkability and home neighbourhood-based physical activity: an observational study of adults with type 2 diabetes. *BMC Public Health* 16, 957.
- Hirsch, J.A., Moore, K.A., Evenson, K.R., Rodriguez, D.A., Diez Roux, A.V., 2013. Walk Score (R) and Transit Score (R) and walking in the multi-ethnic study of atherosclerosis. *Am. J. Prev. Med.* 45 (2), 158–166.
- Kangovi, S., Barg, F.K., Carter, T., Long, J.A., Shannon, R., Grande, D., 2013. Understanding why patients of low socioeconomic status prefer hospitals over ambulatory care. *Health Aff (Millwood)*. 32 (7), 1196–1203.
- Kaplan-Lewis, E., Percac-Lima, S., 2013. No-show to primary care appointments: why patients do not come. *J. Prim. Care Community Health* 4 (4), 251–255.
- Knuiman, M.W., Christian, H.E., Divitini, M.L., et al., 2014. A longitudinal analysis of the influence of the neighborhood built environment on walking for transportation: the RESIDE study. *Am. J. Epidemiol.* 180 (5), 453–461.
- Marino, M., Bailey, S.R., Gold, R., et al., 2016. Receipt of preventive services after Oregon's randomized Medicaid experiment. *Am. J. Prev. Med.* 50 (2), 161–170.
- Penchansky, R., Thomas, J.W., 1981. The concept of access: definition and relationship to consumer satisfaction. *Med. Care* 19 (2), 127–140.
- Pew Charitable Trust, 2013. Philadelphia 2013: the state of the city. http://www.pewtrusts.org/~media/legacy/uploadedfiles/wwwpewtrustsorg/reports/philadelphia_research_initiative/philadelphiacitystatisticspdf.pdf, Accessed date: 4 January 2016.
- Phillips, R.L., Dodoo, M.S., Green, L.A., et al., 2009. Usual source of care: an important source of variation in health care spending. *Health Aff (Millwood)*. 28 (2), 567–577.
- Powers, B.W., Rinefort, S., Jain, S.H., 2016. Nonemergency medical transportation: delivering care in the era of Lyft and Uber. *JAMA* 316 (9), 921–922.
- Probst, J.C., Laditka, J.N., Laditka, S.B., 2009. Association between community health center and rural health clinic presence and county-level hospitalization rates for ambulatory care sensitive conditions: an analysis across eight US states. *BMC Health Serv. Res.* 9, 134.
- Public Health Management Corporation, 2014. 2014–2015 Household Health Survey Documentation. Accessed January 4, 2016.
- Rask, K.J., Williams, M.V., Parker, R.M., McNagny, S.E., 1994. Obstacles predicting lack of a regular provider and delays in seeking care for patients at an urban public hospital. *JAMA* 271 (24), 1931–1933.
- Seiger Cronfalk, B., Fjell, A., Carstens, N., et al., 2017. Health team for the elderly: a feasibility study for preventive home visits. *Prim. Health Care Res. Dev.* 1–11.
- Silver, D., Blustein, J., Weitzman, B.C., 2012. Transportation to clinic: findings from a pilot clinic-based survey of low-income suburbanites. *J. Immigr. Minor. Health* 14 (2), 350–355.
- Sommers, B.D., Blendon, R.J., Orav, E.J., Epstein, A.M., 2016. Changes in utilization and health among low-income adults after Medicaid expansion or expanded private insurance. *JAMA Intern. Med.* 176 (10), 1501–1509.
- Syed, S.T., Gerber, B.S., Sharp, L.K., 2013. Traveling towards disease: transportation barriers to health care access. *J. Community Health* 38 (5), 976–993.
- Tuckel, P., Milczarski, W., 2015. Walk Score (TM), perceived neighborhood walkability, and walking in the US. *Am. J. Health Behav.* 39 (2), 242–256.
- Vlahov, D., Freudenberg, N., Proietti, F., et al., 2007. Urban as a determinant of health. *J. Urban Health* 84 (Suppl. 3), i16–26.
- Wasfi, R.A., Dasgupta, K., Orpana, H., Ross, N.A., 2016. Neighborhood walkability and body mass index trajectories: longitudinal study of Canadians. *Am. J. Public Health* 106 (5), 934–940.