The Intersectionality of Social Determinants of Health and Transportation Inequities: Investigating Health Outcomes among Women in the United States

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Abstract

The purpose of this investigation was to examine the intersectionality of various health-related factors leading to health disparities in relation to transportation barriers among women in the US. Beginning in 2017, over 1000 women completed an online anonymous survey capturing information about health and transportation. Results indicated that women who do not own a personal vehicle are more likely to live in unsafe neighborhoods, with poorer neighborhood and housing quality, higher levels of neighborhood litter, and lower levels of perceived wellness.

**Introduction**

In 2010, The World Health Organization (WHO) published the Social Determinants of Health (SDH) Framework outlining the multifaceted approach to understanding health inequities (Solar & Irwin, 2010). Although research and public awareness of health disparities across the U.S. has gained increasing awareness, the intersection of women’s health, racial/ethnic minority status, and transportation barriers has yet to be investigated within the SDH framework (Cho, Crenshaw, and McCall 2013; Crenshaw 1989).

Among SDH’s complex web of factors, transportation barriers have been identified as predictors of health disparities (Syed, Gerber, & Sharp, 2013). Moreover, data suggest that the longer life expectancies for females compared to males makes transportation dependence a greater issue for longer in their lives (Choi, Mezuk, Lohman, Edwards, & Rebok, 2012).

Also, we know that minority women are more at-risk for transportation deficiency (Kim, 2011) and poor health outcomes (Beckie, 2012; Wang & Beydoun, 2007; Ward et al., 2004). As individuals age, an increase in transportation barriers complicate opportunities for self-management and healthcare visits (Adorno, Fields, Cronley, Parekh, & Magruder, 2016). This investigation will explore the extent of transportation inequities across the complex SDH model and its relationship with health outcomes experienced by women.

**Methods**

Adult females (18 and over) who live in the U.S. were recruited through online with no financial incentives. The survey was distributed across social media websites (Facebook and Twitter), advertised across the Internet discussion boards on Reddit.com, and several listserv groups for three months beginning in 2017. Utilizing SPSS-24 (IBM, 2016), various health-related factors were analyzed to test for the impact of transportation barriers through a multiple linear regression.

**Measures**

The key outcome was overall *perceived health*, and researchers used *The Perceived Wellness Survey (PWS*) to measure this variable (Adams, Bezner, Garner, & Woodruff, 1998). The PWS (Adams et al., 1998) is 36-item survey contained six subscales with six questions per subscale: Psychological, emotional, social, physical, spiritual, and intellectual wellness. A 6-point Likert scale was available for each question (1, Very strongly disagree to 6, Very strongly agree).

The primary predictor variable was *transportation barriers*. The researchers used *car ownership* as a proxy indicator of transportation barriers due to the recognition that car ownership in the United States is a fundamental transportation resource. Car ownership was dichotomized as a Yes/No response to the question: *Do you drive a personal automobile?*

Additional variables included designed to capture respondents’ built environments were *housing quality* and *neighborhood safety*. *Housing quality* was captured through the values of*Excellent (mint condition, one minor fault), Good (good except minor isolated repairs), Mixed (mix of well and poorly maintained items), and Poor or very poor (obvious and significant neglect).* This variable was calculated as a continuous variable by scoring the participant with one point for each increasing risk from excellent (0) to Poor or very poor (3). *Neighborhood safety* was measured as Extremely safe (0), Very safe (1), Somewhat safe (2), Very unsafe (3), and Extreme unsafe (4). Neighborhood safety was measured as Excellent (mint condition, one minor fault, 0), Good (good except minor isolated repairs, 1), Mixed (mix of well and poorly maintained items, 2), and Poor or very poor (obvious and significant neglect, 3). Neighborhood litter captured as no litter (0), predominantly free of litter except for some small items (1), widespread distribution of litter with minor accumulations (2), and heavily littered with significant accumulations (3).

**Results**

The average age of the sample was 33.22 years (*SD*=10.97), with a range between 18 and 84 years (*N*=1028). The majority (84.2%) of the respondents were White non-Hispanic (*n*=868). There was not a significant association between racial categories (White, Black, and Latina) and car ownership (*Χ2*(2)=2.87, *p*=0.238). Sexual minority women, however, had significantly higher percentages of not owning a car than their heterosexual peers (60% *vs.* 40%, (*Χ*2(1)=53.38, *p*<0.001), accounting for 23% of the variance (*r2*=0.229).

An independent samples t-test revealed that women with a car reported statistically more health diagnoses (*M*=2.34, *SD*=2.30) than women without a car (*M*=1.90, *SD*=1.72), *t*(250.95)=-2.75, *p*<0.001). Specifically, there was a significant association between women with high blood pressure/hypertension and car ownership (*Χ2*(1)=4.01, *p*=0.045) with 84% of women with hypertension owning a car. There was also a significant association between women with high cholesterol and car ownership (*Χ2*(1)=4.48, *p*=0.034) with 84% of women with high cholesterol owning a car. Similarly, there was a significant association between women with obesity and car ownership (*Χ2*(1)=7.75, *p*=0.005) with 84% of car owning women diagnosed with obesity.

Self-reported height and weight was tested to understand current BMI as a health risk. Women who did not own a car had significantly lower percentages of being overweight (19% *vs.* 26%) or obese (19% *vs.* 33%), and higher percentages of being at a healthy weight (52% *vs.* 38%), *Χ*2(3)=34.39, *p*<0.001. Car ownership accounted for 17% of the variance in BMI (*r2*=0.167).

As displayed in *Table 1. PWS Score and Subscales by Car Ownership*, women who owned a car had significantly higher levels of perceived wellness (*M*=13.18, *SD*=3.14) than those who did not (*M*=11.42, *SD*=3.27, *t*(974)=-6.12, *p*<0.001). The PWS subscales revealed corresponding directions as well. Compared to women who do not own a car, those who drive a personal vehicle have statistically significant higher levels of psychological wellness (3.97 *vs.* 3.47, *t*(1007)=-6.59, *p*<0.001), social wellness (4.08 *vs.* 3.73, *t*(1007)=-4.58, *p*<0.001), physical wellness (3.66 *vs.* 3.36, *t*(1009)=-3.71, *p*<0.001), spiritual wellness (3.93 *vs.* 3.34, *t*(1001)=-6.47, *p*<0.001), intellectual wellness (4.39 *vs.* 4.18, *t*(1007)=-3.38, *p*=0.001), and emotional wellness (3.78 *vs.* 3.25, *t*(1009)=-6.36, *p*<0.001).

Table 1. PWS Score and Subscales by Car Ownership

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Car Ownership | N | Mean | SD |
| Perceived Wellness Score | No | 141 | 11.42 | 3.27 |
| Yes | 835 | 13.18 | 3.14 |
| Psychological | No | 147 | 3.47 | 0.91 |
| Yes | 862 | 3.97 | 0.85 |
| Social | No | 146 | 3.73 | 0.95 |
| Yes | 863 | 4.08 | 0.83 |
| Physical | No | 148 | 3.36 | 0.94 |
| Yes | 863 | 3.66 | 0.91 |
| Spiritual | No | 148 | 3.34 | 1.11 |
| Yes | 855 | 3.93 | 1.01 |
| Intellectual | No | 149 | 4.18 | 0.78 |
| Yes | 860 | 4.39 | 0.68 |
| Emotional | No | 148 | 3.25 | 1.04 |
| Yes | 863 | 3.78 | 0.92 |

Women who did not own a vehicle reported significantly poorer quality of housing (*t*(182.51)=4.69, *p*<0.001), living in less safe neighborhoods (*t*(1008)=2.89, *p*=0.004), worse neighborhood conditions (*t*(1006)=3.23, *p*=0.001), and reported higher levels of neighborhood litter (*t*(1008)=2.76, *p*=0.006). See Table 2 Owning a Personal Car by Risk Scores for more details.

Table 2. Owning a Personal Car by Risk Scores

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Personal Car | N | Mean | SD | t, df, p |
| Moderate Exercise Risk Score | No | 139 | 2.09 | 1.36 | -2.31, 998, p=0.021 |
| Yes | 861 | 2.36 | 1.26 |  |
| Vigorous Exercise Risk Score | No | 139 | 3.30 | 1.00 |  |
| Yes | 860 | 3.21 | 1.05 |  |
| Fast Food Risk Score | No | 139 | 1.23 | 1.05 |  |
| Yes | 863 | 1.40 | 1.01 |  |
| Sweetened Drink Risk Score | No | 139 | 0.47 | 0.79 |  |
| Yes | 862 | 0.51 | 0.86 |  |
| Fruit and Vegetable Risk Score | No | 139 | 1.12 | 0.99 |  |
| Yes | 860 | 0.98 | 0.89 |  |
| Tobacco Use Score | No | 145 | 0.46 | 0.91 |  |
| Yes | 864 | 0.58 | 0.92 |  |
| Mouth Condition Risk Score | No | 138 | 1.75 | 1.18 | 4.15, 998, p<0.001 |
| Yes | 862 | 1.35 | 1.02 |  |
| Alcohol Score | No | 145 | 2.25 | 1.96 | -2.02, 1008, p=0.043 |
| Yes | 865 | 2.63 | 2.10 |  |

A linear regression was conducted to estimate a regression model that best predicts PWS scores among surveyed women based on high blood pressure/hypertension, high cholesterol, obesity housing quality, neighborhood condition, neighborhood litter, neighborhood safety, and personal car ownership. The results of the analysis revealed that five of the six factors were significant predictors of PWS scores (*F*=30.21, *p*<0.001). With a beta of -0.856, housing quality emerged as the strongest predictor of PWS, accounting for 7% of the variance in PWS scores. The second strongest predictor of PWS was owning a personal vehicle (*b*=1.66, *p*<0.001), accounting for 2.5% of the variance. The third strongest factor was having a medical diagnosis of obesity (*b*=-0.879, *p*=0.001, *r2*=0.112), the forth-strongest factor was neighborhood safety (*b*=-0.495, *p*<0.001, *r2*=0.123), and a diagnosis of high cholesterol was the fifth and final factor (*b*=-1.153, *p*=0.001, *r2*=0.133). The total model accounted for 13.3% of the variance in PWS scores. Higher PWS scores are a function of better housing quality, owning a personal vehicle, not having a medical diagnosis of obesity, and car ownership.

**Conclusion**

This study evaluates the complexities of transportation barriers and the impact on health and living situation for women in the US. Car ownership emerged as an important factor for harsher living conditions but lower BMI and health diagnoses displaying the complicated nature of the social determinants of health.

Although online data collection led to limitations in the generalizability of these findings, this study provides a platform for future research. Engaging minority women is essential to truly understand the impact of transportation barriers. Future studies may also benefit from specific age cohort recruitment to know how age impacts these effects.

**Implications for Social Work**

Social workers are in a critical position within communities to address transportation barriers. The results of this study indicate that women who are without a personal vehicle may also face risks in their living conditions. Although the health factors need further exploration, social workers should address transportation barriers with their clients to understand where interventions should begin to take place.

Social workers are also essential to policy development and implementation. If car ownership is associated with poorer living conditions, social workers will play a pivotal role in increasing fair access to car ownership opportunities such as equal pay in the workplace.

As transportation research continues to develop insight into the structural barriers faced by clients, social workers can work with community and transportation stakeholders to increase awareness of the implications of these barriers. Spreading this knowledge may increase activity to break down transportation obstacles.

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