



Perceived Neighborhood Safety During Adolescence Predicts Subsequent Deterioration of Subjective Health Two Decades Later; Gender Differences in a Racially-Diverse Sample

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ABSTRACT

Background: Current study aimed to investigate whether perceived neighborhood as unsafe during adolescence predicts the subsequent perceived health two decades later.

Methods: In a prospective study of an ethnically diverse urban sample (83.2% Black), conducted from 1994 to 2012, 851 adolescents were enrolled at 9th grade. Three hundred and seventy-eight participants were followed from 9th grade for 18 years. The outcome was subjective health (feeling as healthy as other people of the same age) measured at baseline (mean age 15 years) and end of follow-up (mean age 33 years). The independent variable was neighborhood perceived as unsafe measured at 9th grade. Baseline age, family structure, and parental employment were control variables. We ran logistic regressions in the pooled sample and also specific to each gender.

Results: Perceived neighborhood as unsafe at 9th grade predicted deterioration of subjective health over the next 18 years (unadjusted odds ratio = 1.742, 95% confidence interval = 1.042–2.911). This association remained significant in a multivariable model that controlled for baseline subjective health, family structure, and parental employment. The association between perceived neighborhood safety at 9th grade and subsequent deterioration of perceived health during the next 12 years was significant for females but not males.

Conclusions: Our findings suggest that perception of unsafe neighborhoods during adolescence has negative consequences years later for the health of females. Further research is needed to replicate the findings using objective measures of health.

Keywords: Adolescence, adults, life course, neighbourhood, subjective health

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INTRODUCTION

Life course epidemiologists have indicated that health during adulthood may have social antecedents much earlier in life.^[1-5] In this view, health of adults is shaped by developmental factors and processes that are experienced earlier in life.^[6-8] Results of studies

with a life course perspective have major implications for health promotion, as they suggest previously unrecognized opportunities to intervene for health promotion of populations. Specially, findings of life course epidemiological studies advocate for early health interventions.^[9]

Using a life course perspective,^[10-12] the current study uses data from a diverse population (more than 83% either African American or biracial) of youth to investigate whether or not perceived unsafe neighborhood during adolescence predicts subsequent deterioration of subjective health from adolescence to adulthood. Research has suggested that perceived neighborhood safety has implications for health, independent of age, income, and lifestyle.^[13] Neighborhood dissatisfaction has been shown to be associated with an increased prevalence of chronic conditions. Individuals who state that the social aspects of their neighborhood need improvement are more likely to report poor health.^[13] These studies suggest that similar to the objective measures of neighborhood quality,^[14,15] perceptions about neighborhood safety and quality may also have major implications for health.^[16-18]

Most research on the link between place and health has used a cross sectional design. As a result, existing knowledge is limited about the long-term longitudinal association between perceptions about neighborhood and subsequent changes in health. Previous research has shown that neighborhood characteristics (i.e. physical and social environments) and health may have reciprocal effects.^[13,19-23] Perceptions of the physical and social environments not only reflect quality of neighborhood, they may also be influenced by individual attributes such as health status.^[13] People with poor health may have higher tendencies to endorse negative views about their neighborhoods and people with pessimistic views and high neuroticism may more frequently report their health and neighborhoods as poor.^[17,24] Thus, there is still a need to study whether or not baseline perceived neighborhood quality predicts subsequent change in health, independent of baseline health status.

Using a life course perspective,^[25-30] the current longitudinal study investigates: (1) Whether perceiving neighborhood as unsafe during adolescence predicts subsequent deterioration in perceived health from adolescence to adulthood, and (2) if men and women differ in the association between perceived neighborhood safety during adolescence and subsequent change in perceived health from adolescence to early adulthood. We hypothesized that perceiving neighborhood as unsafe during adolescence would be predictive of a worse trajectory of perceived health from adolescence to adulthood. We also expected a gender difference in

the association between perceived neighborhood safety during adolescence and subsequent change in perceived health, as literature suggests that women may be more prone to the cognitive and behavioral effects of their environments.^[31-33]

METHODS

Data came from the Flint Adolescent Study (FAS), a longitudinal cohort from 1994 to 2012 (author). The FAS enrolled 850 adolescents from four public high schools in a city in the Midwest (53% of the population Black or African American based on 2000 Census). Baseline data collection was done at the 9th grade, and participants were followed to their adulthood (18 years of follow-up).

All participants were at high risk for school dropout. Eligibility criteria included having a grade point of 3.0 or lower at the end of the 8th grade, not having been diagnosed by the school as having emotional or developmental impairments, and being either of African American, White, or Bi-racial ethnic group (composed of African American and White).

Measures

Perceived neighborhood safety was measured using the following three items. (1) My neighborhood is a safe place to be. (2) I am afraid of the violence in my neighborhood, and (3) I am afraid I will get hurt by someone in my neighborhood. Items 2 and 3 were reverse coded. Response options included strongly disagree (1), disagree (2), agree (3), and strongly agree (4). Thus, the potential total score varied from 3 to 12, with a higher score indicative of unsafe neighborhood (Cronbach alpha = 0.60).

Perceived health was measured as being as healthy as other people of the same age. The item was "Do you think you are healthier than most people your age, not as healthy as most of them, or do you think that your health is just about the same as most people your age?" Responses included: (1) Healthier than others, (2) about the same, and (3) not as healthy as others. Perceived health was dichotomized into: (1) Poor health (not as healthy as others) and (2) good health (healthier than others or about the same).

Age, gender, family structure, and parental socioeconomic status (SES) (employment and education) at baseline were also measured [Appendix 1].

Ethics

The University of Michigan Institutional Review Board approved the study protocol for all years of data collection and all participants provided assent and consent for participation in the study.

Data analysis

We used SPSS 20 (IBM Corporation NY, USA) for our data analysis. We dichotomized perceived unsafe neighborhood, and perceived health. In our analysis, perceived unsafe environment at ninth grade and perceived health 18 years later were considered as exposure and outcome, respectively. Age, gender, family structure, parental employment, and perceived health at baseline were control variables. Age, parental employment, and family structure at baseline were all dichotomous variables. The current analysis only included 378 individuals who had data on baseline and follow-up measure. We compared those who entered to our analysis and those who did not for all baseline variables. We fitted three logistic regressions to the data. First, we fitted a logistic regression model to the pooled sample. Then, we ran our models specific to gender. Odds ratio and 95% confidence interval were reported. $P < 0.05$ was considered as statistically significant.

RESULTS

At baseline, adolescents varied in age from 14 to 17 years, with a mean age of 15 years (63.8% of the participants were either 13 or 14 years old). Half of the sample were males, and 83.2% were either Black or Bi-racial. Only in 28.4%, the adolescent was living in an intact family with biological mother and father, and only in 48.3%, both parents were employed.

At baseline, 10.2% reported poor subjective health (worse health than others of same age). Based on responses to neighborhood safety, 34.6% of participants were categorized as those who feel their neighborhood is unsafe. From those who stayed in the study, 21.2% reported poor subjective health at the end of follow-up. Table 1 describes study variables including socio-demographic factors, perceived health, and perceived safety at baseline and perceived health at follow-up.

From 851 total participants, 378 (44.4%) stayed in the study for 18 years. Our analysis showed that those who remained and those who dropped out were not significantly different in age, family structure, parental employment, perceived health and perceived safety at baseline. However, drop out was more frequent among males than females [Table 2].

Based on bivariate analysis, female gender, perceived unsafe neighborhood, and perceived poor health at baseline were positively associated with odds of poor subjective health at follow-up [Table 3].

The association between baseline perceived neighborhood safety and perceived health at follow-up was significant in a logistic regression that controlled for all study covariates. Based on our model, perceived unsafe neighborhood, perceived health and parental employment at baseline were associated with perceived health at follow-up [Table 4].

Table 1: Socio-demographic factors, perceived neighborhood and subjective health among 851 adolescents

Characteristics	All	
	<i>n</i>	Valid (%)
Gender		
Male	425	50.0
Female	425	50.0
Minority		
No	143	16.8
Yes	707	83.2
Age		
13 or 14	542	63.8
15 or 16	308	36.2
Parents working at baseline		
No	419	51.7
Yes	392	48.3
Living in an intact family at baseline		
No	609	71.6
Yes	242	28.4
Perceived unsafe neighborhood at baseline		
No	553	65.4
Yes	293	34.6
Perceived poor health at baseline		
No	760	89.8
Yes	86	10.2
Perceived poor health at follow-up		
No	298	78.8
Yes	80	21.2
Total	851	100.0

The association between perceived neighborhood as unsafe at age 15 and poor perceived health at age 33 was significant among female but not male participants. In the logistic regression specific for males, parental employment was the only predictor of perceived health at follow-up. In the logistic regression specific to females, perceived unsafe neighborhood, perceived health and parental employment at age 15 were predictive of perceived health at follow-up [Table 4].

DISCUSSION

The current study examined the association between perceived neighborhood as unsafe during adolescence and deterioration of perceived health from adolescence to early adulthood. This finding supports previous life course epidemiological findings that suggest health during adulthood has social antecedents during childhood and adolescence.^[1-5] Current findings help us better understand early cognitive and emotional processes that may predict subsequent health and illness.^[12] It is unlikely that perceived neighborhood as unsafe is a cause of deterioration of health in the next decades of

Table 2: Factors associated with drop out in the study

	n (%) dropped out	Pearson Chi-square value	P (two-sided)
Gender			
Male	263 (61.9)	13.390	<0.001
Female	210 (49.4)		
Minority			
No	78 (54.5)	0.085	0.771
Yes	395 (55.9)		
Parental employment at baseline			
No	231 (55.1)	0.044	0.833
Yes	219 (55.9)		
Living in an intact family at baseline			
No	336 (55.2)	0.145	0.703
Yes	137 (56.6)		
Age			
13-14	290 (53.5)	2.779	0.095
15-16	183 (59.4)		
Baseline perceived unsafely			
No	299 (54.1)	1.667	0.197
Yes	172 (58.7)		
Baseline perceived poor health			
No	426 (56.1)	0.435	0.510
Yes	45 (52.3)		

Table 3: Bivariate associates of perceived poor health at follow-up

Characteristics	OR	95% CI for OR		P
		Lower	Upper	
Perceived unsafe neighborhood at baseline	1.742	1.042	2.911	0.034
Perceived poor health at baseline	2.808	1.415	5.572	0.003
Female gender	1.838	1.086	3.110	0.023
Minority	1.368	0.678	2.760	0.381
Parents working at baseline	0.401	0.233	0.690	0.001
Living in an intact family at baseline	0.835	0.475	1.470	0.532
Age	0.917	0.539	1.560	0.748

OR=Odds ratio, CI=Confidence interval

life. Rather, unsafe neighborhood perception may be a proxy of a disadvantaged environment and life condition with multiple risk factors that collectively contribute to subsequent deterioration of health.

Our findings are in line with previous studies that have demonstrated the role of neighborhood perceptions as a determinant of health, independent of age, income, and lifestyle.^[13] Researchers have found that living in areas with high rates of crime, homelessness, drug trafficking, and prostitution has strong effects on the health of

residents.^[13] Based on our findings, interventions at the neighborhood level that reduce violent crime and enhance perceived safety may slow the process of deterioration of health of residents living in unsafe and often poor neighborhoods. Diez Roux *et al.* have emphasized the need for efforts at the neighborhood level in order to enhance well-being of individuals.^[65]

In addition to the effect of the social environment on health,^[19,34-41] individual health may also be influenced by physical aspects of the neighborhood.^[42] Most^[19,34,37,43,44] but not all studies^[45] from different countries have suggested that social environment may be linked to self-reported health. In a study in Alabama metropolitan area among 100 children aged 7–12, perceived neighborhood disorder was associated with increased energy intake and sodium intake and decreased potassium levels.^[46] Among 101 African American adolescents age 12–16 years, perceived neighborhood disorder was associated with poor physical activity and increased obesity.^[47] Negative perception of neighborhood characteristics has been linked to poor self-rated health as well.^[43,48]

High quality social environment may promote people's sense of management of stress and control over life. In such circumstances, the adverse impact of challenging life events may be at minimum.^[49] Availability of social support and social network members and vibrant formal and informal community organizations may help people make connections with each other, construct and maintain relationships of trust and reciprocity that all protect health. Social organizations at the neighborhood-which can be captured in social capital and cohesion-are important for the health of community members.^[44,50] Communities that are short in social organizations, resources, trust, and safety deteriorate health.^[51] Future research that explores what ingredients of social environment (i.e., connection, social support and participation at social organizations) mediate the effect of perceived social environment on health would be useful. Our results also suggest that testing how change in social environment influences subsequent change in health would be a logical next step for future research.^[52-58]

Multiple studies have shown that different measures of social environment (i.e. social capital and cohesion) potentially affect health of populations. Connecting with family, friends, colleagues, and associating with social network members have protective health effects.^[59] Social support buffers against the effect of stress, and reduces feeling of vulnerability and insecurity at the time of exposure to difficulties. Having strong social relations also provides the opportunity for mobilizing material and emotional resources that protect health.^[60,61]

In 2004, Wilson *et al.*, tested the association between perceptions of physical and social characteristics of

Table 4: Summary of logistic regression among all, male and female participants to predict perceived poor health at follow-up

Characteristics	B	SE	OR	95% CI for OR		P
				Lower	Upper	
All*						
Perceived unsafe neighborhood at baseline	0.653	0.280	1.921	1.110	3.325	0.02
Perceived poor health at baseline	1.041	0.369	2.832	1.375	5.835	0.005
Parents working at baseline	-0.915	0.291	0.401	0.226	0.709	0.002
Living in an intact family at baseline	0.078	0.311	1.082	0.588	1.990	0.80
Gender (female/male)	0.525	0.288	1.690	0.961	2.971	0.06
Males**						
Perceived unsafe neighborhood at baseline	0.100	0.513	1.105	0.404	3.019	0.84
Perceived poor health at baseline	1.106	0.698	3.022	0.770	11.868	0.11
Parents working at baseline	-1.432	0.549	0.239	0.081	0.701	0.009
Living in an intact family at baseline	0.308	0.514	1.361	0.497	3.728	0.54
Females**						
Perceived unsafe neighborhood at baseline	0.867	0.349	2.380	1.202	4.714	0.01
Perceived poor health at baseline	0.989	0.434	2.689	1.149	6.291	0.02
Parents working at baseline	-0.728	0.357	0.483	0.240	0.972	0.04
Living in an intact family at baseline	0.042	0.404	1.043	0.473	2.301	0.91

*Baseline age, gender, subjective health, family structure, parental employment, and perceived unsafe neighborhood were in the model, **Baseline age, subjective health, family structure, parental employment, and perceived unsafe neighborhood were in the model. OR=Odds ratio, CI=Confidence interval, SE=Standard error

neighborhood and three health outcomes including self-assessed health status, chronic conditions, and emotional distress in Canada. The study documented significant differences across neighborhoods in self-assessed health status and emotional distress, but not in prevalence of chronic conditions. Although, residents of neighborhoods with lower SES reported poorer health and more emotional distress, compared to others, they did not report higher number of chronic medical conditions.^[13]

In a study that measured neighborhood violent crime, subjective perceptions of neighborhood and depression among 5688 individuals aged 50–74 living in New Jersey, neighborhood violent crime and perceived neighborhood safety were associated with depressive symptoms. The association in that study was above and beyond age, sex, and household income.^[25]

Our findings are consistent with previous studies that report links between residing in economically deprived areas and poor subjective health.^[4,5,10] Based on the New Haven Established Populations for Epidemiologic Studies of the Elderly, after 8 years of follow-up, perceiving safety hazards was associated with increased risk of mobility disability among elders at retirement age whose income was below poverty line. This study was a longitudinal cohort of community-dwelling elders aged 65 and older and measured perceptions of neighborhood safety due to crime, mobility (ability to climb stairs and walk a half mile), annual household income, lifestyle characteristics (smoking, alcohol use, physical activity), presence of chronic co-morbid conditions at the individual level and crime rates at the census tract level.

Interestingly, actual crime rate was not associated with health outcomes in any sub-group, but perceived safety did predict health outcomes.^[26]

We found gender differences in the role of perceived neighborhood safety and change in perceived health. In 2015, Assari *et al.* also found gender differences in longitudinal associations between the increase in perceived neighborhood fear and depressive symptoms among African American youth who were in transition to adulthood. Following 513 individuals (235 males and 278 females) from age 20–23, they found that increase in perceived neighborhood fear was associated with an increase in depressive symptoms among males but not females.^[62] The Moving to Opportunity (MTO) study has also found that the benefits associated with change in neighborhood is stronger for girls than boys.^[55] Moving to low-poverty neighborhoods has lowered the risk behavior of girls but not boys. Daily routines, fitting in with neighborhood norms, neighborhood navigation strategies, interactions with peers, friendship making, and distance from father figures have been listed as potential explanatory factors that may explain why the benefits associated with moving to a better neighborhood is stronger for girls than boys.^[58] Osypuk *et al.* also explored how gender and crime victimization modify the effect of moving to a lower-poverty neighborhood on distress and problem behaviors. While female adolescents in families without crime victimization benefited from MTO treatment, for all outcomes, male adolescents did worse following a change in neighborhood in terms of distress and problem behaviors and major depressive disorder. Girls from families experiencing recent violent crime

victimization showed less benefit associated with moving to a better neighborhood.^[57]

Our study had several limitations. Although perceived neighborhood safety, and SES are dynamic and expected to change over time, we only measured them at baseline. Future research should operationalize these factors as time varying covariates. The study did not measure objective health, but subjective health. The study also did not use a representative sample, thus the results are not be representative to all adolescents and young adults who live in the US. The current study measured perceived neighborhood safety using 3-item, and perceived health using a single item. Although single item measures of health are valid,^[63,64] future research may use more detailed measures. Future research may also include subjective and objective measures of neighborhood.^[42,47,65-68]

Despite these limitations, using a longitudinal design with 18 years of follow-up was a significant strength of the study. Few researchers have examined the effects of neighborhood perceptions on such a long follow-up sample. In addition, our sample characteristics include participants that are not often the focus of research. Our study also contributes to burgeoning evidence about the effects of disorganized neighborhood context (perceived or not) on subsequent health.

CONCLUSIONS

This study provides useful information about how perceived neighborhood safety in adolescence has pernicious and persistent effects into the health and well-being of adults who grow up in urban areas. Our study suggests that further research examining the effects of neighborhood perceptions is necessary to replicate and further understand how they may effect health disparities. In addition, future research that examines those factors may help residents overcome the negative effects of fear of neighborhood violence (resilience) would be especially useful to help define factors that might be vital for health promotion in such conditions.^[69]

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Appendix 1: Items used in this study

What is your birthdate?

What is your sex?

How do you describe yourself? Are you...

- Black or African-American
- White or Caucasian
- Mixed African-American and White
- Other.

What is the highest level of schooling your mother ("OTHER") completed?

- Completed grade school or less
- Some high school
- Completed high school
- Vocational/training school
- Some college
- Completed college
- Graduate or professional
- No contact with mother
- Don't know/does not apply.

Is your mother ("OTHER") working in a job for pay...

- Full time (30–40 h)?
- Part-time (<30 h)?
- Retired?
- Not working
- Deceased
- Don't know.

What is the highest level of schooling your father completed?

- Completed grade school or less

- Some high school
- Completed high school
- Vocational/training school
- Some college
- Completed college
- Graduate or professional
- No contact with mother
- Don't know/does not apply.

Is your father working in a job for pay...

- Full time (30–40 h)?
- Part-time (<30 h)?
- Retired?
- Not working
- Deceased
- Don't know.

Perceived neighborhood safety

Using this 4-point scale, please tell me how much you agree with the following statements.

My neighborhood is a safe place to be

I am afraid of the violence in my neighborhood

I am afraid I will get hurt by someone in my neighborhood

Perceived Health

On a scale of 1–7, 1 being not at all concerned and 7 being very much concerned, during the last month, how much has your health worried or concerned you?

Do you think you are healthier than most people your age, not as healthy as most of them, or do you think that your health is just about the same as most people your age?

- Healthier than others
- About the same
- Not as healthy as others