Recent Experiences of Violence and Poor Mental Health among Older Homeless Adults: Results from the HOPE HOME Study

Emma Gierman, Namrata Mohanty, Katelynd Todd, Michelle Tong, Joanna Vinden, Jiying Zou

Public Health 241: Statistical Analysis of Categorical Outcome Data

Background

Homeless individuals are at an increased risk for violence and victimization on the streets and in shelters.[1] Among homeless populations, older age may increase the risk of experiencing a violent attack.[2] Vulnerable to poor health, older homeless adults suffer from functional and cognitive impairments[3] that may put them at increased risk of victimization due to limited capacity to defend themselves. Work has linked exposure to violence and victimization to poor mental health[4],[5,6] and poor social adjustment.[6,7] Poor mental health may compromise an individual's ability to escape abusive relationships, and history of abuse may be a risk factor for subsequent violence and abuse.[6]

HOPE HOME Data Sampling and Study

The HOPE HOME (Health Outcomes of People Experiencing Homelessness in Older Middle Age) Study is a longitudinal study of older homeless adults; this analysis focuses on baseline data. From July 2013 to June 2014, we enrolled a **population-based** sample of 350 homeless adults aged 50 years and older from homeless encampments, recycling centers, overnight homeless shelters, and free and low-cost meal programs serving at least three meals a week in Oakland, California.

We examine the association between recent experiences of violence (sexual and physical assault) within the last 6 months and poor mental health (measured as depressive symptomatology score 16+ on the Center for Epidemiological Studies Depression scale). Additionally, we consider age, gender, duration of current episode of homelessness, having a drug use disorder and social support.

Hypothesized Relationships

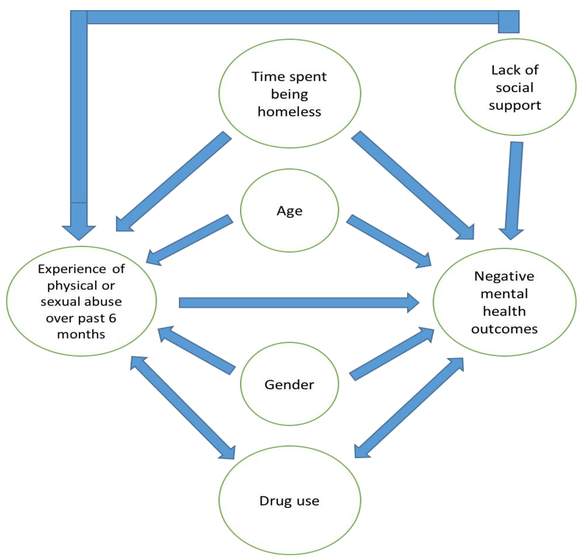


Table 1: Variable Coding Scheme

$$x = \begin{cases} 1, & \text{Physical or Sexual Abuse } (\geq 1 \text{ events in past 6 months}) \\ 0, & \text{No Physical or Sexual Abuse } (0 \text{ events in past 6 months}) \end{cases}$$

$$h = \begin{cases} 1, & \text{Time Spent Homeless for Current Episode } (\geq 1 \text{ years being homeless}) \\ 0, & \text{Time Spent Homeless for Current Episode } (< 1 \text{ year being homeless}) \end{cases}$$

$$v = \begin{cases} 1, & \text{Moderate to High Drug Use Problem (ASSIST score range } \geq 4) \\ 0, & \text{Low Risk Drug Use Problem (ASSIST score range from } 0-3) \end{cases}$$

$$s = \begin{cases} 1, & \text{Had Social Support } (\geq 1 \text{ person to lend them money}) \\ 0, & \text{Did Not Have Social Support } (0 \text{ persons to lend them money}) \end{cases}$$

$$y = \begin{cases} 1, & \text{Moderate to High Risk of Depression } (\geq 16 \text{ CESD score}) \\ 0, & \text{Low Risk of Depression } (< 16 \text{ CESD score}) \end{cases}$$

$$g = \begin{cases} 1, & \text{Male} \\ 0, & \text{Female} \end{cases}$$

$$w = \begin{cases} 2, & \text{if } 60 \leq age \leq 80 \\ 1, & \text{if } 60 \leq age < 70 \\ 0, & \text{if } 50 \leq age < 60 \end{cases}$$

$$W = \begin{cases} 1, & \text{if } age < 60 \\ 0, & \text{Otherwise} \end{cases}$$

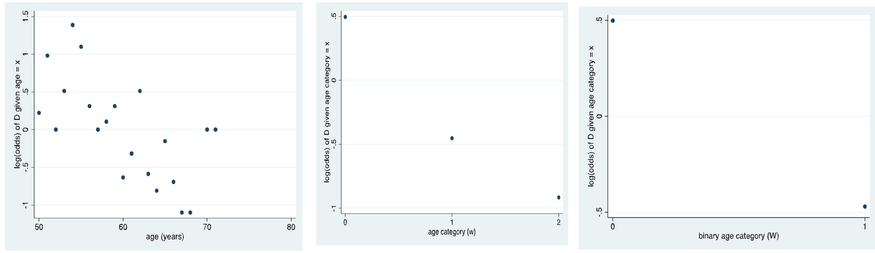
$$w_1 = \begin{cases} 1, & \text{if } 60 \leq age < 70 \\ 0, & \text{Otherwise} \end{cases}$$

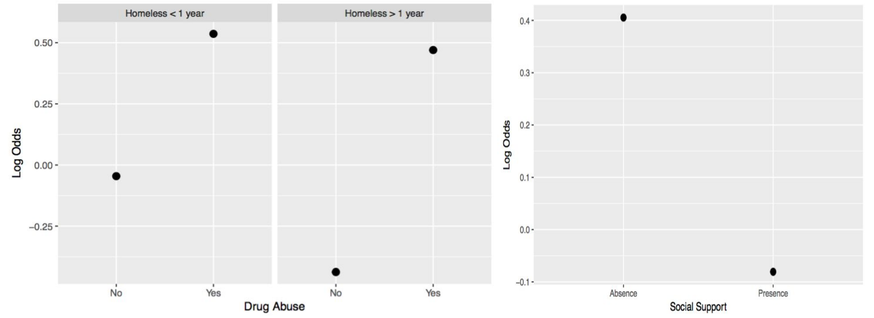
$$w_2 = \begin{cases} 1, & \text{if } 70 \leq age \leq 80 \\ 0, & \text{Otherwise} \end{cases}$$

Model Selection Process

Models	Parameter	Estimate	SE	OR	P-value	95% CI	Log Likelihood
1. $log\left(\frac{p}{1-p}\right) = a$	a	0.133	0.108		0.217	(0.925, 1.410)	-239.759
2. $log\left(\frac{p}{1-p}\right) = a + bx$ where x = violence	a	0.059	0.114	1.060	0.608	(0.848, 1.326)	-234.255
	b	0.935	0.387	2.546	0.016	(1.192, 5.441)	
3. $log\left(\frac{p}{1-p}\right) = a + bx + c(age)$ where $age = \frac{age-50}{10}$	a	0.816	0.17		0.000	(1.476, 3.465)	-225.179
	b	0.866	0.395	2.378	0.028	(1.096, 5.160)	
	c	-0.921	0.225	0.398	0.000	(0.256, 0.618)	
4. Age as Confounder (Indicator Variables): $log\left(\frac{p}{1-p}\right) = a + bx + c_1w_1 + c_2w_2$	a	0.440	0.148		0.003	(1.162, 2.075)	-225.111
	b	0.830	0.397	2.29	0.036	(1.053, 4.987)	
	c_1	-0.951	0.236	0.39	0.000	(0.243, 0.613)	
	c_2	-1.234	0.728	0.29	0.090	(0.070, 1.211)	
5. Dichotomous Age (Threshold Model): $log\left(\frac{p}{1-p}\right) = a + bx + cW$	a	0.440	0.148		0.003	(1.163, 2.078)	-225.186
	b	0.825	0.396	2.28	0.037	(1.050, 4.959)	
	c	-0.970	0.231	0.38	0.000	(0.241, 0.596)	
6. Various Age Levels in One Variable (Dose-Response): $log\left(\frac{p}{1-p}\right) = a + bx + cw$	a	0.424	0.145		0.003	(1.151, 2.032)	-225.046
	b	0.852	0.397	2.347	0.032	(1.077, 5.115)	
	c	-0.907	0.217	0.404	0.000	(0.264, 0.617)	
7. $log\left(\frac{p}{1-p}\right) = a + bx + dg$ where g = gender	a	0.0962	0.233		0.680	(0.697, 1.740)	-234.238
	b	0.932	0.388	2.540	0.016	(1.188, 5.430)	
	d	-0.048	0.261	0.953	0.854	(0.571, 1.591)	
8. Interaction Between Age and Gender: $log\left(\frac{p}{1-p}\right) = a + bx + cW + dg + j(W * g)$	a	0.336	0.270		0.214	(0.824, 2.374)	-224.916
	b	0.849	0.398	2.338	0.033	(1.073, 5.097)	
	c	-0.606	0.334	0.545	0.070	(0.283, 1.049)	
	d	2.990	2.073	19.895	0.149	(0.342, 1155.879)	
	j	-0.0523	0.035	0.949	0.129	(0.885, 1.017)	
9. $log\left(\frac{p}{1-p}\right) = a + bx + ev$ where v = drug abuse	a	-0.267	0.158		0.092	(0.562, 1.044)	-229.690
	b	0.855	0.392	2.342	0.030	(1.086, 5.052)	
	e	0.665	0.222	1.945	0.003	(1.260, 3.003)	
10. $log\left(\frac{p}{1-p}\right) = a + bx + fh$ where h = time homeless	a	0.148	0.158		0.348	(0.851, 1.579)	-232.473
	b	0.960	0.388	2.611	0.013	(1.220, 5.588)	
	f	-0.207	0.219	0.813	0.345	(0.529, 1.249)	
11. Interaction Between Drug Abuse and Length of Time Homeless: $log\left(\frac{p}{1-p}\right) = a + bx + dv + fh + j(v * h)$	a	-0.103	0.216		0.633	(0.591, 1.377)	-227.105
	b	0.882	0.394	2.415	0.025	(1.115, 5.230)	
	d	0.539	0.539	1.714	0.086	(0.927, 3.167)	
	f	-0.415	0.316	0.660	0.189	(0.355, 1.227)	
	j	0.338	0.446	1.403	0.448	(0.585, 3.364)	
12. $log\left(\frac{p}{1-p}\right) = a + bx + is$ where s = social support	a	-0.641	0.177		0.074	(0.970, 1.942)	-228.643
	b	0.872	0.394	2.391	0.027	(1.105, 5.173)	
	i	-0.478	0.394	0.620	0.034	(0.398, 0.964)	
13. Final Model Without Time Homeless: $log\left(\frac{p}{1-p}\right) = a + bx + cW + ev + is$	a	-0.799	0.391		0.041	(0.209, 0.968)	-214.550
	b	0.698	0.411	2.011	0.089	(0.899, 4.50)	
	c	-1.022	0.239	0.360	0.000	(0.225, 0.575)	
	e	0.679	0.234	1.972	0.004	(1.247, 3.119)	
	i	0.641	0.239	1.899	0.007	(1.188, 3.035)	
14. Final Model: $log\left(\frac{p}{1-p}\right) = a + bx + cW + ev + fh + is$	a	-0.686	0.408		0.093	(0.0.226, 1.121)	-212.348
	b	0.720	0.413	2.054	0.081	(0.915, 4.617)	
	c	-1.019	0.241	0.361	0.000	(0.225, 0.579)	
	e	0.719	0.236	2.052	0.002	(1.293, 3.256)	
	f	-0.318	0.233	0.728	0.173	(0.461, 1.150)	
	i	0.648	0.241	1.911	0.007	(1.193, 3.062)	

Logodds plots of outcome vs. exposure/confounders





Goodness of Fit Testing

Hosmer-Lemeshow Test

Model	Chi2	df	p-value
13. $log\left(\frac{p}{1-p}\right) = a + bx + cW + ev + is$	6.12	3	0.106
14. $log\left(\frac{p}{1-p}\right) = a + bx + cW + ev + fh + is$	5.78	3	0.123

Pearson X^2 Goodness of Fit Test

Model	Chi2	df	p-value
13. $log\left(\frac{p}{1-p}\right) = a + bx + cW + ev + is$	15.49	11	0.161
14. $log\left(\frac{p}{1-p}\right) = a + bx + cW + ev + fh + is$	33.59	24	0.092

We ran Hosmer-Lemeshow and Pearson Chi-Squared GOF tests on models 13 and 14. Both models suitably fit our data (p-values > $\alpha = 0.05$). By Pearson, model 13 was a better fit, but by HL, model 14 was.

Conclusions

We sought to investigate the association between recent exposure to physical and sexual violence and poor mental health among a local older homeless adult. Based off prior knowledge and extant literature, we postulated that older age, gender, length of time homeless, having a drug use problem, and having social support may confound this association. Across all models, excluding an interaction term, we found significant Wald p-values for exposure to violence over the past 6 months. Significant ($p<0.05$) confounding due to age, drug use, and social support were found. We found slight, non-significant ($p<0.2$) confounding by time spent homeless but retained the variable in our final model due to final model testing results and in consideration of public health interventions.

References

[1] North CS, Smith EM, Spitznagel EL. Violence and the homeless: an epidemiologic study of victimization and aggression. J Trauma Stress. 1994;7(1):95-110.
[2] Meinbresse M, Brinkley-Rubinstein L, Grassette A, et al. Exploring the experiences of violence among individuals who are homeless using a consumer-led approach. Violence Vict. 2014;29(1):122-136.
[3] Gundersen C, Ziliak JP. Food Insecurity And Health Outcomes. Health Aff (Millwood). 2015;34(11):1830-1839.
[4] Fitzpatrick KM, LaGory ME, Ritchey FJ. Dangerous places: exposure to violence and its mental health consequences for the homeless. Am J Orthopsychiatry. 1999;69(4):438-447.
[5] Boris NW, Heller SS, Sheperd T, Zeanah CH. Partner violence among homeless young adults: measurement issues and associations. J Adolesc Health. 2002;30(5):355-363.
[6] Tsai AC, Weiser SD, Dilworth SE, Shumway M, Riley ED. Violent Victimization, Mental Health, and Service Utilization Outcomes in a Cohort of Homeless and Unstably Housed Women Living With or at Risk of Becoming Infected With HIV. American journal of epidemiology. 2015;181(10):817-826.
[7] Nyamathi A, Marlow E, Zhang S, et al. Correlates of serious violent crime for recently released parolees with a history of homelessness. Violence Vict. 2012;27(5):793-810.