The Provision of Dental Care to Emergency Shelter Users Corresponds to Lower Shelter Use over Time

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Research Question

Is receiving dental care predictive of fewer shelter stays, or a greater likelihood of not using shelters over four years of follow-up?

Introduction

- Homeless health care needs are widely known to be more extreme than the general population, often with more complex health issues.
- This also applies to dental health, which is generally bad, with care being underutilized and problems untreated.
- Few programs deliver dental care to individuals experiencing homelessness in a format conducive to measuring resultant emergency shelter utilization.
- Caton *et al.* (2016) suggests that success requires an element of outreach (going into the community centres to reach individuals using the services).

Litterature Review

- Evidence from large-scale dental interventions on people experiencing homelessness is lacking; e.g. Figueiredo *et al.* (2013,2016), Gibson *et al.* (2008).
- It is unknown whether dental care can shorten the period of homelessness for those not in a targeted program; e.g. Greenhalgh and Goodacre (2016).
- It is unknown whether dental care will result in a decrease in system use, particularly, emergency shelters; e.g. Nunez *et al.* (2013).

Contribution

We employ large-scale dental intervention on emergency shelter users in Calgary, Alberta, Canada

- A unique preventive care program exists that administers a general wellness program to emergency shelter users and part of that program is dental care.
- As part of the mercury amalgam replacement initiative participants would receive dental care they needed which could include treatment of infection, cleaning, and tooth repair.
- Using the linked data, we can observe emergency shelter use patterns before and after receiving dental care.

Data

The data is provided by two sources:

1. The wellness program
   - Dental care: Substantial and basic
   - from January 1, 2011 to March 31, 2016
   - Unique IDs=8,240
   - contains information regarding participation in the program, such as appointment dates and dentist-reported information.
2. The Calgary Homeless Foundation
   - single adult shelters: Length of stay and episode
   - from July 1, 2007 to April 30, 2016
   - Unique IDs=33,754
   - contains only basic demographic information on date of birth, sex, and ethnicity along with check-in and -out dates for the relevant shelters

Model Specification

The following model estimates stays in the emergency shelter over time for the wellness program participants and the controls:

$$Stays_{i,t} = \sum_{t=1}^{4} \left(\beta_t^C year_t + \beta_t^P year_t P_i \right) + \sum_{t=-4}^{-1} \left(\beta_t^C year_t + \beta_t^P year_t P_i \right) + u_{i,t}$$

- $Stays_{i,t}$ is a count variable indicating number of times an individual, i, stayed at an emergency shelter during the year t.
- $t = 1, 2, 3, 4$: years *after* joining the wellness program dental care date.
- $t = -1, -2, -3, -4$: years *before* joining the wellness program dental care date.
- P_i is a dummy for wellness program participation

Identification Strategy

We employ the difference-in-differences between the participants and the controls over time to determine whether the dental care has a role in shelter utilization changes over time.

$\beta_t^c - \beta_{-1}^c$: The difference in shelter utilization b/w controls

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$(\beta_t^c + \beta_t^P) - (\beta_{-1}^c + \beta_{-1}^P)$: The difference b/w participants

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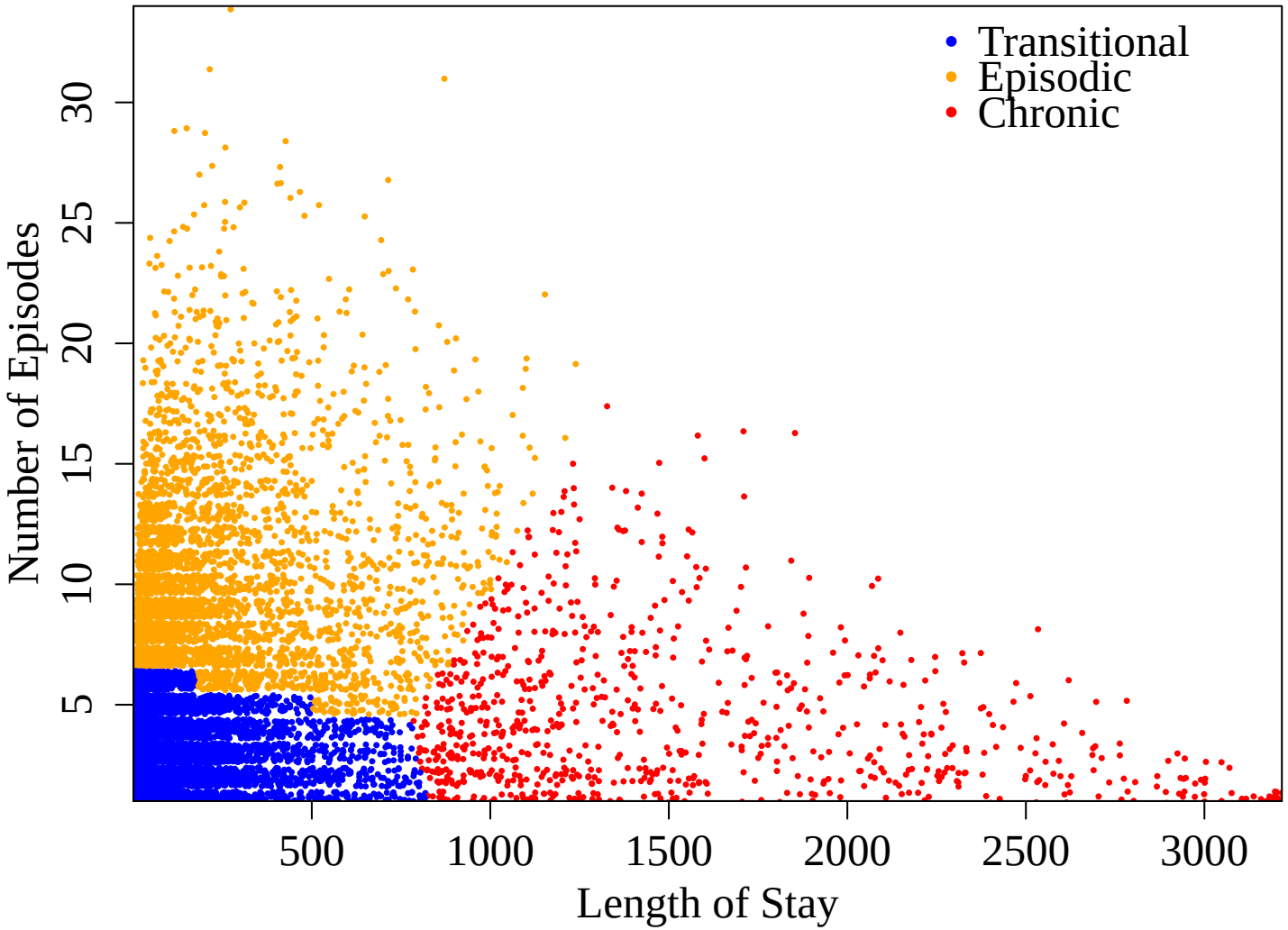
$\beta_{-1}^P - \beta_1^P$

- A positive value indicates that the participants have a larger decrease in stay, or a smaller increase in stays, than the controls versus their respective baselines (one year prior to joining).

The number of days of emergency shelter use can vary widely.



M-estimation (Huber *et al.* 1964)

We minimize the objective function

$$\sum_{n=1}^{n} \rho(e_i) = \sum_{n=1}^{n} \rho(y_i - \boldsymbol{x_i'}\boldsymbol{\beta})$$

f.o.c.

$$\frac{\partial}{\partial \beta} \sum_{n=1}^{n} \rho(y_i - \boldsymbol{x_i'}\boldsymbol{\beta}) = \sum_{n=1}^{n} \psi(y_i - \boldsymbol{x_i'}\boldsymbol{\beta})\boldsymbol{x_i'} = 0$$

Where ψ is the influence function, the derivative of ρ, which we can use

$$w_i = w(e_i) = \psi(e_i)/e_i$$

$$\sum_{n=1}^{n} w_i(y_i - \boldsymbol{x_i'}\boldsymbol{\beta})\boldsymbol{x_i'} = 0$$

$$w(e) = \begin{cases} 1 & \text{if } |e| \leq k \\ k/|e| & \text{if } |e| > k \end{cases}$$

Demographics

Mean values of demographic and shelter utilization measures for participants and matched controls, for both types of dental care intervention

	Substantial Dental Care		Basic Dental Care	
	Participants	Controls	Participants	Controls
Average age	43.42 (9.77)	44.72 (13.09)	41.01 (11.15)	41.44 (13.00)
Sex				
Male	84.43%	83.95%	83.51%	82.25%
Female	15.57%	16.05%	16.49%	17.75%
Ethnicity				
Caucasian	72.68%	72.09%	70.52%	69.59%
Aboriginal	15.57%	13.20%	15.94%	15.96%
Other	11.75%	14.71%	13.55%	14.45%
Average length of stay	335.43 (400.30)	230.90 (420.39)	319.03 (403.76)	228.03 (434.81)
Average episode	5.29 (4.21)	5.10 (4.82)	5.27 (4.27)	4.93 (4.74)
N	366	1,788	1,255	6,192

Note: Numbers in parentheses are standard deviations.

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Resutls: Regression

M-estimation regression results for both substantial and basic dental care

	Substantial Dental Care			Basic Dental Care		
	Estimate	St. error	p-value	Estimate	St. error	p-value
Post1	18.162	0.803	0.000	15.721	0.375	0.000
Post2	15.484	0.731	0.000	12.630	0.342	0.000
Post3	11.309	0.682	0.000	8.834	0.321	0.000
Post4	5.647	0.658	0.000	4.312	0.311	0.000
Pre1	20.285	0.908	0.000	18.157	0.426	0.000
Pre2	22.544	1.014	0.000	20.805	0.482	0.000
Pre3	26.007	1.113	0.000	27.113	0.541	0.000
Pre4	40.025	1.241	0.000	40.964	0.612	0.000
Post1$\times P$	51.688	1.687	0.000	43.997	0.798	0.000
Post2$\times P$	5.857	1.643	0.000	5.498	0.777	0.000
Post3$\times P$	2.487	1.610	0.123	1.488	0.763	0.051
Post4$\times P$	1.130	1.597	0.479	0.013	0.758	0.986
Pre1$\times P$	16.780	1.825	0.000	12.387	0.857	0.000
Pre2$\times P$	-5.030	2.475	0.042	1.260	1.177	0.285
Pre3$\times P$	-4.337	2.867	0.130	-3.233	1.355	0.017
Pre4$\times P$	-12.417	3.201	0.000	-7.178	1.582	0.000

Resutls: Diff-in-Diff

Difference-in-differences estimates for each year since intervention versus baseline

	Substantial Dental Care			Basic Dental Care		
	Estimate	St. error	*p*-value	Estimate	St. error	*p*-value
Post 1	-34.908	2.485	0.000	-31.610	1.171	0.000
Post 2	10.923	2.456	0.000	6.889	1.157	0.000
Post 3	14.293	2.434	0.000	10.899	1.147	0.000
Post 4	15.650	2.425	0.000	12.373	1.144	0.000

Note: Positive coefficients indicate a larger decrease in stays compared to the control group.

Proportion of participants and controls who use no emergency shelters.

	Substantial Dental Care		Basic Dental Care	
	Participants	Controls	Participants	Controls
Post 1	6%	27%	5%	27%
Post 2	37%	35%	39%	39%
Post 3	50%	45%	56%	51%
Post 4	72%	67%	77%	73%

Results: Summary

- There is increased utilization of emergency shelters following dental care, then that utilization decreases below baseline faster than in the controls, whether the emergency shelter user receives substantial or basic dental care.
- That pattern is consistent with the idea that care stabilizes emergency shelter users, in other words, they utilize shelters more to benefit from the additional services the shelters provide.
- Those receiving either form of dental care had a higher rate of exiting emergency shelters than their controls.

Discussion

- Dental care in Canada is not covered by public insurance like primary or emergency care and the dental needs of the homeless can be more extreme that the rest of the population due to historical neglect, trauma, or substance abuse.
- The substantial dental care was motivated by a specific interest in replacing mercury amalgam with resin, but the incidental care the participants received would be far beyond what they could normally access.
- Limitations to our study include the inability to determine exactly what dental care was received.