Early Substance Use and the Age of Onset of Homelessness

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Motivation (1/3)

- The Australian Bureau of Statistics enumerated 105,237 homeless people on the Census night of 2011.
- In a 2006 survey, 91% of respondents identified substance abuse as the primary cause of homelessness.
- Indeed, Substance use can lead to homelessness through a number of processes characterised by the gradual depletion of an individual's economic and social resources.

  As people's substance use increases, their financial reserves diminish, which may lead to rent arrears and eviction. Substance use may also lead to family breakdown and then homelessness (Coumans & Spreen, 2003).
- And levels of homelessness are actually far higher among substance users than among the wider population (Kemp et al., 2006).

Motivation (2/3)

- But homelessness is associated with a broad range of other social problems and difficulties.

  Actually, only slightly more than 10% of people who have been homeless identify substance abuse as the reason why they became homeless after: family breakdown, domestic violence and financial difficulties.

- And Homelessness may also lead to substance use through social adaptation.

  Some homeless people may start using as a result of socialisation into the homeless subculture where substance use is an accepted social practice (Johnson et al., 2008). Or drug use may be a way of coping with uncertain and chaotic living conditions (Neale, 2001).

Motivation (3/3)

- Therefore, it is often believed that substance use and homelessness may be self-reinforcing via a number of processes.

- But whether a causal link exists between homelessness and substance use is unclear

  - Substance use *causes* homelessness (Early, 2005)
  - Homelessness *causes* substance use (Johnson and Chamberlain, 2008)

- These are crucial questions for policy makers and service providers designing and delivering interventions in this area.

  Reducing or ending homelessness (or substance use) requires knowledge of why people become homeless (or start using).

The literature (1/2)

- Lack of suitable data on the substance use of representative samples of individuals experiencing homelessness or at risk of homelessness.

- The vast majority of the evidence comes from:

- Small-scale (50 to 400 indiv.), ad hoc, cross-section surveys (Scutella and Johnson, 2012).
- Where respondents are drawn from specific provider-based populations (e.g. Kemp et al., 2006).

- Exceptions:

- Fertig and Reingold (2008) exploit data from the Fragile Families and Child Wellbeing Study. They find no evidence that mothers with a 'drug problem' are more likely to be homeless 1 year later.
- Shinn et al. (1998) use data on around 500 disadvantaged families in NY. They also find little evidence of a substance abuse impact on homelessness once observable factors are controlled.

The literature (2/2)

- BUT

- Draw on small numbers of people experiencing homelessness & have limited information on use.
- Neither considers the reverse impact of homelessness on substance use in a multivariate model.

- McVicar, Moschion & van Ours (2015)

- Use the Journeys Home survey to investigate how transitions in and out of substance use are related to transitions in and out of homelessness over the survey period.
- Find that the associations between substance use and homelessness are unlikely to be causal, in either direction. The exception is a positive effect from risky alcohol use to homelessness.
- Do not examine the impact of take-up of substance use on the onset of homelessness.

Our contribution (1/2)

- The existing studies mostly give us a partial picture of the (acute) substance use of a narrow group of the homeless.

  We know less about: (i) the effects of different degrees of substance use; (ii) among people experiencing other forms of homelessness than sleeping rough.

➔ We examine the effect of substance use in "Journeys Home", a large-scale and unique longitudinal study drawn from a broad sample of Australians who are homeless or at risk of homelessness.

- Large sample of 1,347 individuals.
- Differentiate between the use of cannabis and other illegal street drugs (and smoking).
- Distinguish between 'ever use' and 'regular use'.
- Use a broad definition of homelessness which includes: those staying temporarily with friends or family, and those in emergency accommodation or in boarding houses.

Our contribution (2/2)

- It is not clear whether substance use leads to or follows homelessness.

  The literature focused on transitions between substance use and homelessness during a certain period, usually survey periods.

  We know little about causality.

➔ We focus on first episodes: take-up of substance use and onsets of homelessness.

➔ We explore the degree to which the associations between substance use and homelessness may be plausibly causal using a duration model allowing us to:

- Exploit the timing of events to deduce the possible direction of causality.

- Address omitted variable bias by allowing the unobserved heterogeneity terms determining each transition rate to be correlated.

- Investigate reverse causality.

Preview of results

- We find large associations between substance use and homelessness for men and women.
- Those associations are partly due to unobserved heterogeneity but not so much to reverse causality.
- After taking those into account, we find that:
  - The use of cannabis daily increases homelessness for men.
  - The use of cannabis (daily) decreases homelessness for women.
  - Street drugs have no effect.

Data (1/2)

- Sample

  - Recipients of any income support payment who are homeless or at-risk of homelessness.
  - We use the balanced panel of the first 3 waves (Sept. 2011 – Nov. 2012)
  - With complete information on the onset of homelessness and substance use.

  ➔ 1,347 individuals (80% of the wave 1 sample).

- Homelessness

  - Primary homelessness: sleeping rough or squatting in abandoned buildings.
  - Secondary homelessness: staying with relatives or friends temporarily with no alternative.
  - Tertiary homelessness: staying in a caravan, boarding house, hotel or crisis accommodation.

- Age of onset of homelessness

  - Retrospective information (wave 1): "How old [she was] the first time that [she was] without a place to live".
  - The types of accommodation where the respondent lived between each wave.

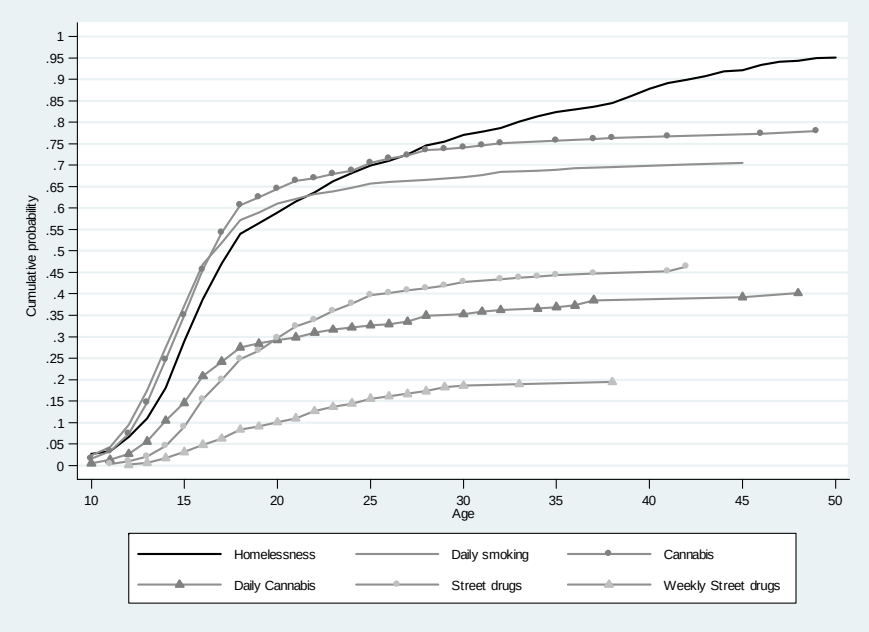
Data (2/2)

- Age of onset of substance use
  - Retrospective information collected at wave 3 about onsets and frequencies of use
  - Cannabis: ever
  - Cannabis: daily use
  - Illegal street drugs: ever
  - Illegal street drugs: weekly use
  - Tobacco: daily use

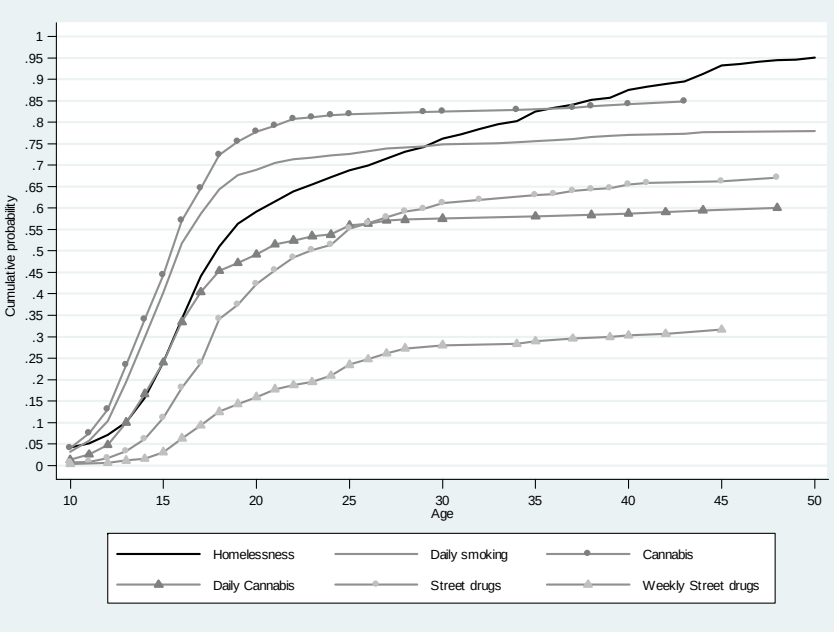
  ~Falsification test to see if our model convincingly deals with unobserved heterogeneity, i.e. unobserved characteristics or events which may simultaneously explain homelessness and substance use.

Cumulative starting probabilities

WOMEN



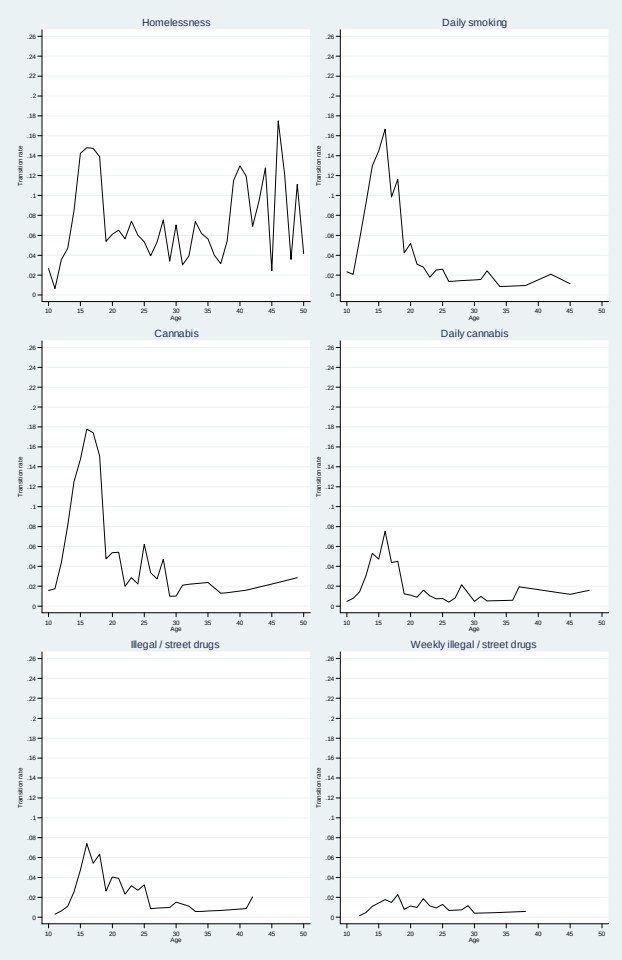
MEN



- The uptake of substance use is unlikely to occur after the age of 30.
- The onset of homelessness also increases sharply until ~18 years old for both genders. It then continues to increase (at a slower pace) until reaching more than 95 percent at age 50.

Hazard rates

WOMEN



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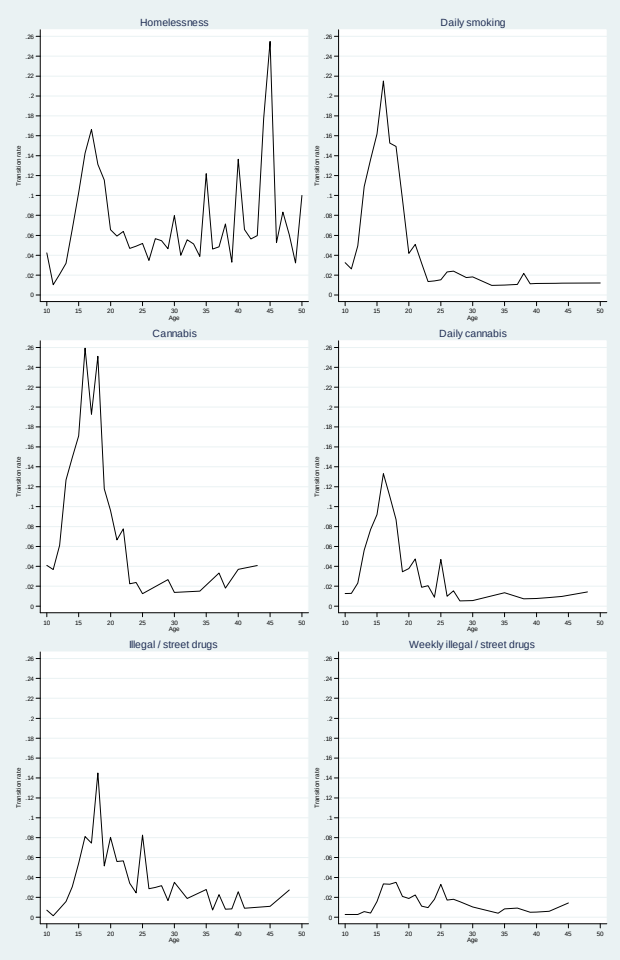


Prevalence rates and age of onset

	Ever (%)		Age onset	
	Women	Men	Women	Men
Homelessness	97.2	98.0	22.2	22.8
Cannabis	74.5	85.0	16.4	15.5
Cannabis daily	34.9	57.3	17.3	16.7
Street drugs	39.3	59.3	18.8	19.5
Street drugs weekly	15.0	25.4	19.5	20.6
Tobacco daily	78.4	85.5	16.0	15.9
N	639	708	639	708

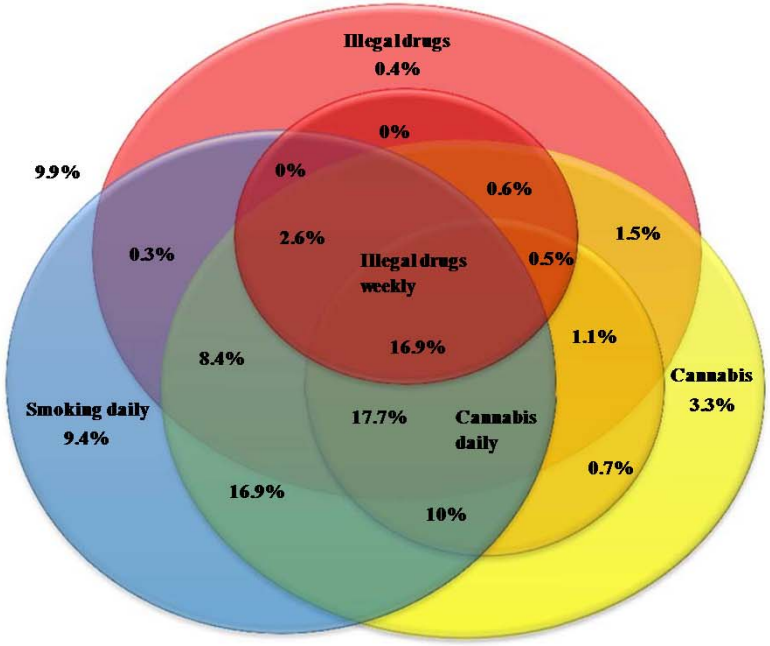
- Almost all the JH sample experienced homelessness at one stage in their life (97% of women and 98% of men) and did so at an average of about 22 yo.
- Substance use is also highly prevalent in our sample.
- The transition to cannabis ever precedes the transition into daily use (around 16 versus 17), which precedes the transition into illegal street drugs (19 yo on average), which in turn precedes the transition into its weekly use (20 yo on average).

Association between the timing of homelessness and substance use

	Cannabis	Cannabis daily	Street drugs	Street drugs weekly	Smoking daily
Women					
Drugs before	**43.4**	**14.9**	**13.5**	**3.9**	**45.7**
Same age	10.3	6.3	5.6	2.0	9.6
Homelessness before	**19.4**	**13.6**	**19.7**	**9.1**	**12.7**
Not homeless, drugs	1.4	0.2	0.5	0.0	0.9
No drugs, homeless	24.1	62.4	58.4	82.2	20.2
Not homeless, no drugs	1.4	2.7	2.4	2.8	1.4
N	639	639	639	639	639
Men					
Drugs before	**61.3**	**37.6**	**27.8**	**10.6**	**56.4**
Same age	8.8	6.2	6.2	1.7	7.3
Homelessness before	**14.0**	**13.3**	**24.7**	**13.1**	**12.4**
Not homeless, drugs	1.0	0.3	0.6	0.0	1.1
No drugs, homeless	14.0	41.0	39.3	72.6	13.8
Not homeless, no drugs	1.0	1.7	1.4	2.0	0.7
N	708	708	708	708	708

- For cannabis, most started using before becoming homeless (43% of women and 61% of men).
- The likelihood that substance uptake occurs prior to the onset of homelessness is smaller for the daily use of cannabis and for illegal/street drugs (whether used ever or weekly).
- For all drugs, homelessness can happen before or after the uptake of substance use.

Substance use – inter-correlations



- Only very few respondents are mono-users: 9.4% smoked daily only, 3.3% used only cannabis and 0.4% used only illegal/street drugs.
- In contrast, 16.9% smoked daily and used cannabis; 17.7% smoked daily, used cannabis daily and illegal/street drugs; and another 16.9% used all 5 substances.
- These interrelationships suggest that modelling each substance 1 by 1 may lead to obscuring the picture by capturing overall effects of substance use rather than the effect of 1 substance.

The empirical strategy (1/8): Bivariate mixed proportional hazard model (BMPH)

- Primary objective: to determine whether substance use leads to homelessness.

- Need to address two potential issues to identify causal effects:
  - Reverse causality
  - Common unobservable factors

- BMPH model accounts for both issues by jointly modelling the transitions into substance use and homelessness as a system in which:
  - Substance use affects homelessness accounting for the timing of events
  - Substance use and homelessness are simultaneously determined
  - Unobserved heterogeneity terms in the two processes are correlated

The empirical strategy (2/8): Identification

- Proof of the identification of the treatment effect in the BMPH model is provided by Abbring and Van den Berg (2003).

- The duration modelling:

  - Exploits the timing of events, i.e. the order in which the uptake of substance use and the onset of homelessness happen.

  - Uses the interaction between the explanatory variables and the duration dependence to identify the UH.

- The joint modelling:
  - Allows to introduce treatment effects in both directions.
  - Allowing the UH to be correlated.

The empirical strategy (3/8): Homelessness

- The hazard rate for homelessness at time t:

$$\theta_h(t|x, t_s, v) = \lambda_h(t) \exp(x'\beta_h + \delta_s I(t_s < t) + v) \quad (1)$$

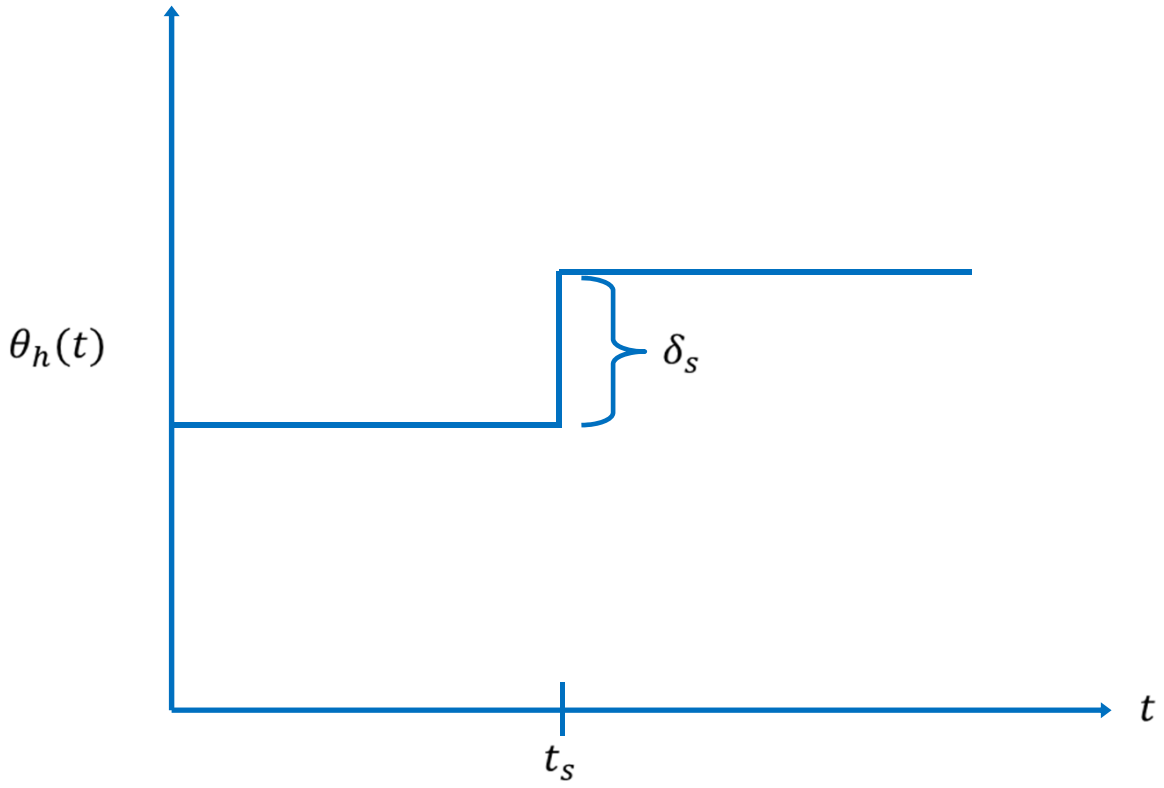
x: observable characteristics
v: unobservable characteristics
t_s: the time at which an individual first engages in substance use
$I(t_s < t)$=1 if the individual took up substance use before time t
δ_s: effect of prior substance use on homelessness
$\lambda_h(t)$: individual duration dependence

- The conditional density function for the completed durations until the onset of homelessness:

$$f_h(t|x, t_s, v) = \theta_h(t|x, t_s, v) \exp(-\int_0^t \theta_h(h|x, t_s, v)dh) \quad (2)$$

Individuals who have not experienced homelessness by the time they are last observed in the data are assumed to have a right-censored duration until the onset of homelessness.

The empirical strategy (4/8): Hazard rate of homelessness



The empirical strategy (5/8): Duration dependence

- Duration dependence ($\lambda_h(t)$) is modelled flexibly using a step function:

  $\lambda_h(t) = exp(\Sigma_k \lambda_{h,k} I_k(t))$ (3)

  - k: duration categories ($k = 1,\ldots, 10$):
    - k=1 represents ages before 12;
    - k=2,…,8 represent individual ages (12, ..., 18);
    - k=9 represents ages (19, ..., 21);
    - k=10 represents ages from 22 onwards.
  - $I_k(t)$: are k dummy variables equal to 1 if the individual becomes homeless in duration k.

- Duration dependence is modelled similarly for substance use.

- Our explanatory variables are:

  - Dummies for not living with parents at age 14 because they were: separated; dead; conflict - Dummies for experiencing as a child: emotional abuse/neglect; physical violence; sexual violence
  - Dummies for the male's and female's caregiver: substance abuse; incarceration; mental health problems; long-term unemployment; gambling problems
  - Dummies for missing information on reason for not living with parents at 14; violence and abuse during childhood; male's and female's caregiver.

The empirical strategy (6/8): Substance use

- The hazard rate for substance use at time t:

$$\theta_s(t|x, u) = \lambda_s(t) \exp(x'\beta_s + u) \qquad (4)$$

x: observable characteristics
u: unobservable characteristics
$\lambda_h(t)$: individual duration dependence

- The conditional density function for the completed durations until the individual takes up substance use:

$$f_s(t|x, u) = \theta_s(t|x, u) \exp(-\int_0^t \theta_s(s|x, u)ds) \qquad (5)$$

- Note that at this stage we have NOT yet included a treatment effect of homelessness on substance use.

The empirical strategy (7/8): The joint model

- Potential correlation exists between the unobserved components in the hazard rates for homelessness (v) and substance use (u).
- This is accounted for by specifying the joint density function for the duration of time until homelessness t_h and the duration of time until substance uptake t_s conditional on x as:

$$f(t_s, t_h|x) = \int u \int v f_s(t|x, u) f_h(t|x, t_s, v) dG(u,v) \qquad (6)$$

- The joint distribution function $G(u,v)$ is assumed to be discrete.

The empirical strategy (8/8): The joint model

- Suppose there exists 2 types of individuals (high susceptibility and low susceptibility) in the hazard rates for substance use and homelessness.

- This implies four types of individuals represented by four points of support with the following probabilities:
  $Pr(u = u_1; v = v_1) = p_1$
  $Pr(u = u_1; v = v_2) = p_2$
  $Pr(u = u_2; v = v_1) = p_3$
  $Pr(u = u_2; v = v_2) = p_4$
  where $0 \leq p_j \leq 1$ for $j=1,...,4$

- We model these probabilities using a multinomial logit specification:
  $p_j = exp(\alpha_j) / \Sigma_j exp(\alpha_j)$ for $j=1,...,4$

Parameter estimates cannabis use and homelessness (1/2)

	Women				**Men**			
	Cannabis		Homeless		Cannabis		Homeless	
Effect cannabis			**-0.12**	**(0.9)**			**0.31**	**(2.3)****
Age								
12	1.14	(3.6)**	0.82	(2.5)**	0.59	(2.6)**	-0.26	(0.8)
13	1.99	(6.9)**	1.18	(3.8)**	1.51	(7.7)**	0.16	(0.6)
14	2.75	(9.5)**	1.88	(6.7)**	1.87	(8.9)**	0.89	(3.7)**
15	3.28	(11.1)**	2.55	(9.4)**	2.24	(9.2)**	1.37	(5.9)**
16	3.92	(12.2)**	2.71	(9.7)**	2.99	(10.6)**	1.73	(7.6)**
17	4.33	(12.2)**	2.79	(9.7)**	2.90	(8.4)**	1.90	(8.1)**
18	4.50	(11.9)**	2.78	(9.1)**	3.39	(9.2)**	1.65	(6.4)**
19-21	3.62	(8.6)**	1.95	(6.3)**	2.54	(6.4)**	1.19	(4.8)**
21+	2.99	(7.2)**	2.25	(7.6)**	0.57	(1.3)	1.12	(4.4)**
Second masspoint	-2.87	(11.4)**	-0.83	(5.1)**	-1.74	(5.5)**	-0.44	(2.1)**
α	0.09	(0.7)			-0.15	(0.5)		
Probas	52%				46%			

Note: absolute *t* statistics in parentheses; a ** (*) indicates significance at a 5 (10) percent level.

- For women we find no effect of cannabis use on transition into homelessness.
- For men, cannabis uptake increases the transition into homelessness by 36% (100(exp(0.31)-1)).
- The covariates matter: especially childhood experiences and missing information (for women).
- There are clear age effects for cannabis and homelessness, for men and women.

Parameter estimates cannabis use and homelessness (2/2)

- Unobserved heterogeneity:

  - We have 2 types for cannabis (high/low) and 2 types for homelessness (high/low).

    * For women, the low type has a transition rate that is lower than the high type by: 94% for cannabis and 56% for homelessness.

    * For men, the low type has a transition rate that is lower than the high type by: 82% for cannabis and 36% for homelessness.

  - And there is perfect correlation:

    * 52% of women are high/high & 48% are low/low.

    * 46% of men are high/high & 54% are low/low

Effect of substance use on the onset of homelessness

- Our preferred model (col 2) shows:
  - For men, cannabis increases transitions into homelessness by 36% (ever) and 51% (daily).
  - For women, cannabis daily decreases transitions into homelessness by 24%.
  - Street drugs have no effect on homelessness.
  - Daily smoking increases homelessness for men.
- The correlation in the unobservables matter.

	Separate estimate	Joint estimates	LR-test correlation	LR-test effect drug
a. Cannabis ever				
Women	0.35(3.5)**	**-0.12(0.9)**	34.8**	1.0
Men	0.52(5.2)**	**0.31(2.3)****	6.4**	6.8**
b. Cannabis daily				
Women	0.29(2.6)**	**-0.27(1.8)***	40.4**	3.2*
Men	0.52(5.3)**	**0.41(3.2)****	1.8	12.6**
c. Street drugs ever				
Women	0.27(1.7)*	**-0.32(1.6)**	47.4**	4.0**
Men	0.36(3.1)**	**0.14(1.0)**	13.6**	1.4
d. Street drugs weekly				
Women	0.03(0.1)	**-0.48(1.2)**	28.8**	2.8*
Men	0.36(2.4)**	**0.18(1.1)**	5.2**	1.2
e. Smoking daily				
Women	0.42(4.2)**	**-0.01(0.0)**	21.0**	0.0
Men	0.48(4.5)**	**0.48(3.4)****	0.0	6.8**

The LR-test on effect drug refers to the joint model. Note critical - values with 1 degree of freedom are 3.8 (5%) and 2.7 (10%).
Panels a to d based on 639 women and 708 men; panel e based on 578 women and 650 men

Sensitivity analysis: reverse causality

- Reverse causality is generally not an issue.
- We find that homelessness decreases:
  - Transitions into cannabis daily for men
  - Daily smoking for both genders
- Main results are confirmed.
- Models including reverse causality only differ from models without in 2 / 10 cases.

	Drugs to Homeless	Homeless to drugs	LR-test Reverse causality
a. Cannabis ever			
Women	**-0.11(0.8)**	0.16(1.0)	1.0
Men	**0.29(2.0)****	-0.11(0.6)	0.4
b. Cannabis daily			
Women	**-0.28(1.8)***	-0.08(0.4)	0.0
Men	**0.34(2.4)****	-0.34(1.8)*	5.6**
c. Street drugs ever			
Women	**-0.32(1.6)**	0.05(0.2)	0.0
Men	**0.10(1.7)**	-0.18(1.2)	1.4
d. Street drugs weekly			
Women	**-0.45(1.2)**	0.22(0.7)	0.6
Men	**0.17(1.0)**	-0.10(0.4)	0.2
e. Smoking daily			
Women	**-0.06(0.4)**	-0.34(1.8)*	2.6
Men	**0.29(2.1)****	-0.43(2.6)**	10.2**

Panels a to d based on 639 women and 708 men; panel e based on 578 women and 650 men

Sensitivity analysis

- The effect of early cannabis use on early homelessness:

  - For men, the effect of cannabis is larger on <u>early</u> homelessness: 68%, 60%, 36%

  - For women, the negative effect of cannabis is larger between 30 and 40.

- Smoking alone does not increase transitions into homelessness.
- Cannabis use less than daily does not affect the onset of homelessness.
- Cannabis daily increases transitions into homelessness by 42% for men.

	Separate estimate	Joint estimates	LR-test correlation	LR-test effect drug
a. Beyond age 40 censored				
Women	0.29(2.6)**	-0.30(2.0)**	48.6**	3.8*
Men	0.57(6.0)**	0.47(3.7)**	1.6	12.4**
b. Beyond age 30 censored				
Women	0.41(3.5)**	-0.21(1.4)	44.4**	1.8
Men	0.59(6.0)**	0.52(4.0)**	0.6	0.8
c. Effect daily smoking for men				
Smoking no cannabis	0.05(0.2)	0.08(0.3)	0.0	12.8**
Smoking no daily cannabis	0.42(3.0)**	0.44(2.6)**		
Smoking daily cannabis	0.55(4.8)**	0.58(3.8)**		
d. Effect cannabis use for men				
Cannabis not daily	0.41(2.8)**	0.23(1.4)	5.6**	2.4
Cannabis daily	0.56(5.3)**	0.35(2.4)**		

The LR-test on effect drug refers to the joint model. In panel c, the LR-test for the effect of drug use refers to non-daily use only. Note: critical values with 1 degree of freedom are 3.8 (5%) and 2.7 (10%).

Conclusions

- Cannabis daily increases transitions into homelessness by 42% for men.
- For women, cannabis (daily) appears to decrease transitions into homelessness, possibly through a protective effect of children.
- Street drugs have no effect on transitions into homelessness.
- And reassuringly, smoking daily neither!

- Unobserved heterogeneity matters but reverse causality mostly does not.

- To do:
  - Try to test for the protective effect of children.
  - Refine the way we interact the use of different substances.
  - Maybe vary the treatment effects by age (here we assume that the effect of substance use at 15 = the effect of substance use at 30).

Mean of variables

	Women	Men
Parents separated	36.5	31.6
Parents dead	6.7	6.4
Conflict with parents	8.3	6.1
Emotional abuse	57.6	58.8
Physical violence	57.3	63.0
Sexual violence	38.7	16.0
Male caregiver substance abuse	28.5	30.4
Male caregiver jail	10.3	10.6
Male caregiver hospital	5.5	4.8
Male caregiver unemployed	16.4	16.0
Male caregiver gambling	8.8	8.5
Female caregiver substance abuse	18.5	15.8
Female caregiver jail	2.7	2.0
Female caregiver hospital	13.2	10.0
Female caregiver unemployed	41.3	36.2
Female caregiver gambling	9.4	5.1
Missing info reason	1.6	1.7
Missing info violence	12.8	10.3
Missing info male caregiver	11.0	10.3
Missing info female caregiver	11.9	11.9
Total	639	708

Cannabis use and homelessness - covariates

	Women				Men			
	Cannabis		Homeless		Cannabis		Homeless	
Effect cannabis			-0.12	(0.9)			0.31	(2.3)**
Childhood								
Parents separated	0.65	(4.2)**	0.36	(3.6)**	0.53	(3.6)**	0.43	(4.1)**
Parents dead	0.46	(1.7)**	0.58	(2.5)**	0.36	(1.7)*	0.20	(1.1)
Conflict with parents	1.43	(6.0)**	1.22	(8.0)**	0.70	(3.3)**	0.71	(5.1)**
Emotional abuse	0.49	(2.0)**	0.48	(2.8)**	0.22	(1.2)	0.40	(3.0)**
Physical violence	0.51	(2.1)**	0.18	(1.0)	0.79	(4.2)**	0.00	(0.0)
Sexual violence	0.60	(3.4)**	0.08	(0.7)	-0.03	(0.1)	-0.10	(0.8)
Male caregiver								
Substance abuse	0.62	(3.4)**	-0.07	(0.5)	0.20	(1.3)	-0.14	(1.2)
Jail	0.05	(0.2)	0.17	(1.0)	0.45	(1.9)*	0.06	(0.4)
Hospital	0.43	(1.5)	0.10	(0.5)	-0.45	(1.6)	-0.31	(1.4)
Unemployed	-0.51	(2.5)**	0.29	(1.8)*	0.03	(0.2)	0.31	(2.4)**
Gambling	-0.03	(0.1)	-0.19	(1.1)	-0.02	(0.1)	-0.03	(0.2)
Female caregiver								
Substance abuse	0.39	(1.9)**	0.17	(1.2)	0.50	(2.8)**	0.31	(2.4)**
Jail	0.25	(0.6)	0.38	(1.3)	0.80	(1.7)	-0.12	(0.3)
Hospital	0.30	(1.4)	0.39	(2.7)**	0.02	(0.1)	0.39	(2.4)**
Unemployed	0.00	(0.0)	0.15	(1.4)	0.09	(0.6)	0.14	(1.4)
Gambling	-0.49	(2.0)**	-0.21	(1.1)	-0.49	(1.6)	-0.12	(0.6)
Missing info								
Reason	1.49	(2.1)**	1.21	(2.3)**	-0.31	(0.4)	-0.05	(0.1)
Violence	0.73	(3.2)**	0.20	(1.3)	0.05	(0.3)	0.09	(0.6)
Father	0.64	(2.5)**	0.57	(3.3)**	0.40	(1.8)	0.13	(0.8)
Mother	-0.23	(0.9)	0.16	(1.0)	-0.49	(2.4)**	0.20	(1.2)
Constant	-5.53	(16.4)**	-4.98	(18.7)**	-3.92	(15.9)**	-4.08	(18.5)**

Note: absolute *t* statistics in parentheses; a ** (*) indicates significance at a 5 (10) percent level.