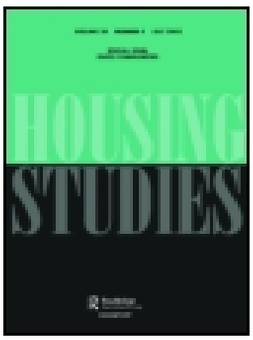

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What drives the high health care costs of the homeless?

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ABSTRACT

Existing research demonstrates that mean health care costs incurred by those experiencing homelessness are high. However, high mean health care costs mask the fact that a sizeable number of people experiencing homelessness incur low costs and that very high costs are driven by a minority of the homeless population. This paper examines health care costs estimated from two Australian surveys of those experiencing homelessness undertaken by the authors. It demonstrates three important findings. First, higher health care costs are most strongly associated with diagnosed mental health disorders, followed by long-term physical health conditions. Second, having a current drug or alcohol dependency, but no diagnosed mental health disorder or long-term physical health issue, is not associated with higher level health care costs. Finally, higher health care costs are incurred by those with long periods of rough sleeping. The findings of this research provide a significant economic argument for government intervention to break the cycle of homelessness as they reveal significant potential savings to effective interventions for homeless people with diagnosed mental health disorders and long-term rough sleeping.

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Homelessness; housing economics; housing need; health care costs; mental health; alcohol and drug dependence

1. Introduction

People experiencing homelessness are more likely to experience mental health disorders, long-term physical health conditions and conditions requiring hospital treatment than the general population. As a result, they are over-represented in costly, but low- or zero-price health care service provision such as emergency department, hospital care and psychiatric care provided by universal-access health care providers (e.g. the Australian public health system). Mean health care costs of the homeless are, therefore, significantly higher than for the general population.

There is an emerging literature, however, that suggests that health care costs are not evenly distributed across the homeless population; some have very high health care costs and others, low health care costs (Eberly *et al.*, 2001; Poulin *et al.*, 2010; Zaretzky & Flatau, 2013).

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The evidence that health care costs are not evenly distributed among people experiencing homelessness raises the question we address in the present paper: what factors influence the extent to which a homeless person incurs high health care costs?

The issue of the drivers of health care costs among homeless people is addressed in the present paper with reference to health care cost data collected as part of two major surveys we conducted in Australia of those experiencing homelessness. The first examined the circumstances of clients of an integrated support programme for single homeless men in Sydney, referred to as the 'Michael Project' (Flatau *et al.*, 2010, 2012). The second study examined the circumstances of a broader set of clients of supported accommodation services for single men and a small number of women who may otherwise have been without shelter, referred to as the 'Cost of Homelessness study' (Zaretzky & Flatau, 2013; Zaretzky *et al.*, 2013). In both studies, we surveyed clients of homelessness services and asked them questions on a broad range of topics including their use of health care services, diagnosed mental health disorders, long-term physical health conditions, use of, and dependence on, alcohol and drugs, and lifetime history of homelessness. Our studies adopted a self-report approach to the determination of the utilisation of health care services; respondents detailing their history of health care use over the previous 12 months. Utilisation over a 12-month period was then multiplied by prices per unit of utilisation to arrive at a year's cost of health care support.

The present paper examines the characteristics of participants with different levels of health care costs and uses cluster analysis to group study participants into health care cost groupings. Consistent with preliminary evidence from the USA (Poulin *et al.*, 2010), the present study provides evidence that the existence of diagnosed mental health disorders is a driver of high health care costs in the 12 months prior to survey completion. However, in one of the samples examined, the cohort which incurred the highest health care costs is characterised by those who had spent a significant number of years sleeping rough suggesting that there is an important duration dimension to the costs of homelessness.

The structure of the paper is as follows. First, we provide a discussion of the relevant literature concerning the relationship between health and homelessness and the health care costs associated with homelessness. This discussion is followed by a description of the method used to examine health care costs for the homeless in the two studies in question and a presentation and discussion of our findings. The conclusion summarises the findings and considers their policy implications.

2. Background

The extant research suggests a number of important relationships between health status and homelessness. In terms of mental health relationships, the literature suggests that the prevalence of mental health disorders and multi-morbidity across substance use disorders and other mental health disorders is higher among those experiencing homelessness than the general population (Baggett *et al.*, 2013, 2014; Bassuk *et al.*, 1998; Drake *et al.*, 1991; Fazel *et al.*, 2008, 2014; Fichter & Quadflieg, 2001; Glasser & Zywiak, 2003; Goering *et al.*, 2002; Madianos *et al.*, 2013; Palepu *et al.*, 2013; Spicer *et al.*, 2015; Teesson *et al.*, 2000, 2003; Vila-Rodriguez *et al.*, 2013). The literature also points to the fact that homeless people experience higher rates of long-term physical health conditions, particularly infectious diseases, than the general population (Fazel *et al.*, 2014). As a consequence, people experiencing

homelessness are over-represented in a range of health services such as emergency department presentations, and hospital and psychiatric care leading to higher mean health care costs than for the general population (Chartier *et al.*, 2012; Cheung *et al.*, 2015; Conroy *et al.*, 2014; Corporation for Supportive Housing, 2004; Culhane *et al.*, 2002; Fazel *et al.*, 2014; Flatau *et al.*, 2008, 2012; Fuehrlein *et al.*, 2015; Hwang *et al.*, 2011; Kim *et al.*, 2006; Kushel *et al.*, 2002; Parsell *et al.*, 2016; Perlman & Parvensky, 2006; Salit *et al.*, 1998; Social Policy Research Centre, 2007; Wood *et al.*, 2016; Zaretzky & Flatau 2013; Zaretzky *et al.*, 2008, 2013).

In terms of the distribution of health care costs among those experiencing homelessness, the literature is less developed. A very small study (ten homeless and five housed but previously homeless people) in British Columbia (Eberly *et al.*, 2001) provided initial evidence that high average health care costs for those experiencing homelessness may not be representative of costs incurred by the broader homeless population. Instead, the study indicated that some homeless people made very little use of the health system, and, in fact, actively avoided it. In Australia, Joffe *et al.* (2012), adopting the costing method used in Flatau *et al.* (2008), examined health care costs incurred by 35 rough sleepers in Sydney, and similarly concluded that a small number of participants incurred much higher costs than the majority of the group. The effect of chronic disease on the frequency and length of time in hospital was hypothesised as being a major driver of increased health care costs.

Recently in the US, Poulin *et al.* (2010) found that, for a sample of chronically homeless persons, predominantly men, high observed health expenditures were largely driven by those with serious mental health disorders. They examined psychiatric care, substance abuse treatment and incarceration (but not general hospital admissions, emergency department presentations, outpatient services or ambulance use), and found that 20% of the sample accounted for 60% of all costs. Eighty-one per cent of those in the high-cost quintile had a serious mental health disorder. In contrast, 83% of the people in the lowest cost quintile had substance use issues and no recent history of mental health issues.

The two Australian studies undertaken by the authors and the subject of further inquiry in the present paper; namely, the Michael Project and the Cost of Homelessness study, found that mean health care costs for homeless people were a significant multiple of mean general population health care costs, but not all individuals were heavy users of health services. Indeed, Zaretzky & Flatau (2013) found that approximately 33.0% of participants incurred a total health care cost below the general Australian population mean for the same services in the 12 months prior to the baseline survey.

Internationally, there is strong evidence that the recurrent cost of homelessness assistance and support is largely, if not totally, offset by cost offsets relating to reduced use of high-cost institutional health facilities, contacts with justice services and other welfare services providing an economic as well as a social reason for government to provide homelessness support (see, e.g. Conroy *et al.*, 2014; Corporation of Supportive Housing, 2004; Culhane *et al.*, 2002; Flatau & Zaretzky, 2008; Flatau *et al.*, 2012; Johnson *et al.*, 2014; Parsell *et al.*, 2016; Pleace, 2015; Pleace *et al.*, 2013; Van Leerdam, 2013; Wood *et al.*, 2016; Zaretzky & Flatau, 2013). There is also a growing body of evidence, primarily from Northern America, that a model where housing is provided quickly combined with ongoing wrap around support (for example, a Housing First (HF) or a Common Ground model) is an effective and cost-efficient manner in which to reduce homelessness and can provide better outcomes than other approaches, particularly for people with mental and physical health

issues (Busch-Geertsema, 2013; Groton, 2013; Gulcur *et al.,* 2003; Ly & Latimer, 2015; Sillanpaa, 2013; Van Leerdam, 2013; Pleace, 2015). A large-scale evaluation of the Canadian HF programme, the Cross-site at home/Chez Soi project, found that over the two-year period following study entry, every $10 invested resulted in an average savings of $21.72 in health care, justice and welfare costs. Savings were greatest for those with highest needs, and highest costs on entry to the programme. All programme participants had experienced a long period sleeping rough over their lifetime, had one or more serious mental illnesses and 90% had at least one chronic health condition.

In Australia, evaluation of the (Mental Health) Housing and Accommodation Support Initiative (HASI) (Social Policy Research Centre, 2007) provided early evidence that providing housing with support to people with a serious mental health condition is cost effective. HF and Common Ground programmes introduced since the Australian Government's increased commitment in 2009 to reduce homelessness (Commonwealth of Australia, 2008) have since been shown to be cost effective for a broader range of homelessness populations. For example, the Misha Project (Sydney) was a HF programme for single men (Conroy *et al*., 2014), the Micah programme (Brisbane) used both a HF and a Common Ground approach to house and support both men and women (Mason & Grimbeek, 2013), the Journey to Social Inclusion pilot programme focused on rapid housing with wrap around intensive support over three years, focusing on people who had experienced trauma (Johnson *et al*., 2014) and although many clients in these programmes had a mental illness, this was not a requirement to enter the programme. Although not HF per se, programmes to assist the homeless access and maintain a tenancy are also found to be cost effective, particularly where people are leaving mental health facilities (Parsell *et al*., 2016; Wood *et al*., 2016; Zaretzky & Flatau 2015).

3. Method

This paper extends the findings of the two Australian studies undertaken by the authors by attempting to classify respondents into low, medium, high and very high health care cost groups and understand the drivers of the various cost groups.[1] Both studies involved face-to-face interviews with clients of homelessness services and the collection of self-report information on histories of homelessness, diagnosed mental health disorders, and drug and alcohol use and dependence. Linkage with administrative data on health care service use would provide independent reporting of service use, but this was not possible in relation to these studies. Nevertheless, existing research using linked administrative data on the costs of homelessness shows self-report information from the homeless to be sufficiently accurate for research studies (Calsyn *et al*., 1993; Clifasefi *et al*., 2011; Metraux *et al*., 2014; Parsell *et al*., 2016; Wood *et al*., 2016).

Whether a respondent had been diagnosed with a mental health disorder in the study was determined on the basis of respondents reading through a list of mental health disorders, including mood disorders, anxiety disorders, personality disorders, psychotic disorders, dissociative disorders, substance use disorders, eating disorders and impulse-control disorders, and answering the question of whether they had ever been diagnosed with a specified mental health disorder by a medical practitioner (e.g. a psychiatrist or GP) or psychologist. Current drug and alcohol dependence was assessed using the Severity of Dependence Scale (Gossop *et al*., 1995).[2]

Total health care cost incurred by participants in the 12 months prior to completing the baseline survey of the studies is examined for all respondents in the two studies who completed the baseline survey (including those who did not participate in follow-up interviews), but excluding those in the Cost of Homelessness study who received assistance from a tenancy support service while housed. The Michael Project sample consisted of men who were rough sleeping, those in overnight crisis and emergency accommodation, and those in medium-term-supported accommodation for those otherwise homeless (the largest group). The Cost of Homelessness sample was drawn from clients of supported accommodation services (both emergency and medium term accommodation) for single men and single women. Health care costs examined in each study were: visits to a general practitioner, medical specialist consultation, psychologist, nurse or allied health professional consultation, visits to casualty or emergency, outpatient visits, use of ambulance, nights spent in hospital, nights spent in a mental health facility, and nights spent in a drug and alcohol detox or rehabilitation facility. In total, 243 participants of the Michael Project and 144 participants of the Cost of Homelessness study provided all necessary information to calculate total health care cost incurred in the 12 months prior to completing the baseline survey. Health care costs were assessed on the basis of self-reported health care utilisation times unit costs summed up over the prior 12 months.

The extent to which total health care costs incurred varied across individuals was assessed on the basis of mean and median costs as well as the full distribution of costs. Examination of the characteristics of individuals with different levels of costs and cluster analysis was then used to examine the association between client characteristics and total health care costs incurred. A two-step cluster analysis procedure was applied to accommodate the mixture of continuous and categorical variables examined. The log-likelihood criterion was used to determine cluster groupings. Continuous variables were standardised to mitigate the effect of outliers. Client characteristics examined were those suggested by the literature as potentially impacting on the propensity to incur high health care costs: gender, Indigenous status, age, reporting a long-term physical health condition or disability, reporting a diagnosed mental health disorder (by a medical practitioner or psychologist), screening dependent on drugs or alcohol (using the Severity of Dependence Scale), time spent in any form of homelessness over the previous 12 months, time spent sleeping rough over the lifetime and time spent in any form of homelessness over the lifetime. Time spent in any form of homelessness was defined as including sleeping rough, living in crisis or emergency accommodation, living with relatives or friends because there was nowhere else to go ('couch surfing'), and living in a caravan or in a boarding house or rooming house without private facilities or formal tenancy arrangements. Results were examined to determine which characteristics were associated with the variation in total health care costs. Finally, the mean, median and distribution of health care costs were estimated for each cluster to examine the relationship between health care costs incurred and each cluster category.

Participants were asked about the first time they experienced homelessness, as well as total time spent living in each identified form of homelessness (e.g. rough sleeping, emergency and medium term supported accommodation) over their lifetime. In a small number of cases, inconsistencies were evident in the reported results on time spent in homelessness such that total time reported in various homeless states was greater than possible given the participant's age and when they stated they first experienced homelessness. In such cases, the period spent sleeping rough or living in other homelessness states was set at the maximum

Table 1. Mean and median total health care cost/participant.

	Total health care cost/participant ($)	
Study	Mean	Median
Michael Project study ($n = 243$)	20,023	4604
Cost of homelessness study ($n = 144$)	19,294	3857

possible time taking into account current age and age when the respondent first experienced homelessness. This adjustment to total time spent sleeping rough affected one Michael Project participant and two Cost of Homelessness study participants. The adjustment for total time spent living in any form of homelessness affected 20 (8.2%) Michael Project and 10 (6.9%) Cost of Homelessness study participants. Conclusions regarding the drivers of high health care costs were not sensitive to this adjustment.

4. Results

4.1. Average health care cost

Table 1 presents average health care costs for the baseline sample for each of the studies. The results show a very high mean cost, consistent with that reported elsewhere in the literature cited previously. The mean total health care cost incurred by Michael Project baseline survey participants over the previous 12 months was $20,023/participant and for the Cost of Homelessness study, $19,294/participant.[3] These figures are considerably higher than our estimate of the Australian general population mean cost for the same health care services included in these studies of approximately $2000 per year per person (population incidence and unit cost of service sourced from publicly available sources; see Flatau *et al.*, 2012; Zaretzky *et al.*, 2013 for further details).

In both studies, the median cost was much lower than mean costs at less than one-quarter of the mean: $4604/participant for the Michael Project and $3857/participant for the Cost of Homelessness study. The markedly lower median cost suggests that, for both samples, the very high mean figure was driven by a minority of participants who incurred very high costs and confirm the importance of focusing on the full distribution of costs in any analysis of the costs of homelessness.

4.2. Variation in health care cost within the homeless population

Examination of the distribution of total health care cost/participant provides further insight into the level of variation in health care costs incurred by individuals within the homeless population (see Figures 1 and 2). In both studies, a marked positive skew is evident. For the Michael Project (Figure 1), 33.6% of participants incurred a total health care cost of $1000 or less (below our estimate of the mean Australian costs for the same health care costs), and 50.4% incurred a total health care cost of $5000 or less. The very high mean cost is largely driven by the 13.1% of participants who incurred a total health care cost of greater than $50,000, with 0.4% (one person) incurring a cost of just under $230,000.

Similarly, for the Cost of Homelessness study (Figure 2), 34.0% of participants incurred a total health care cost of $1000 or less, and 55.6% incurred a cost of $5000 or less. The

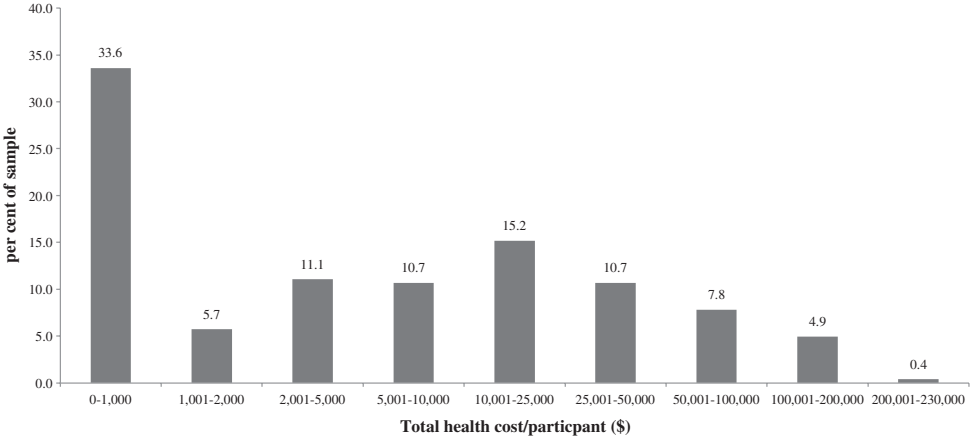

Figure 1. Michael Project study: Distribution of total health care costs incurred by participants.

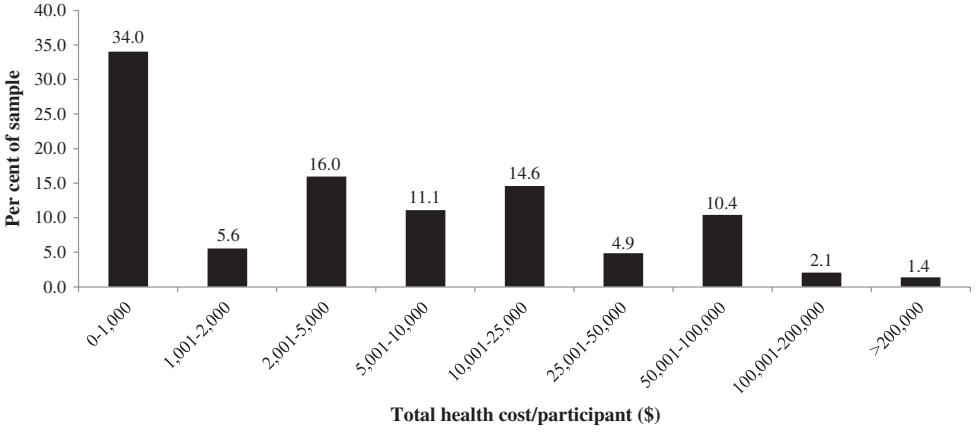

Figure 2. Cost of Homelessness study: Distribution of total health care costs incurred by participants.

high mean cost is driven largely by the 13.9% of participants who incurred a total health care cost greater than $50,000, with 1.4% (two people incurring a cost of over $200,000.

4.3. Client characteristics associated with high health care costs

The large variation in health care costs incurred by clients of specialist homelessness services raises the question: are there characteristics that make it more likely for a client to have high health care costs? This question was addressed first by examining the characteristics of clients with different levels of health cost; low (≤$2000), medium ($2001–$10,000), high ($10,001–$50,000) and very high (>$50,000), and by applying cluster analysis to each study population. Characteristics considered were whether the participant reported that they had ever been diagnosed with a mental health disorder (excluding a diagnosed substance use disorder), whether they had a long-standing physical health condition, whether they screened positive for current alcohol and other drug (AOD) dependence, total time spent

Table 2. Characteristics of study respondents, by health care cost level.

		Proportion of respondents with condition				Homelessness experience over lifetime	
Health cost level	Per cent of sample	Mental health condition (per cent)	Long-term physical health condition (per cent)	Mental health and long-term physical health condition (per cent)	AOD dependent (per cent)	Slept rough (months, mean)	Homeless (months, mean)
Michael Project study							
Low	39.3	36.8	47.0	22.1	34.7	20.8	70.5
Moderate	22.8	58.5	74.0	49.1	52.8	36.2	88.6
High	25.9	66.7	60.0	41.3	50.8	33.5	100.5
Very high	13.1	75.0	66.0	50.0	56.3	36.6	97.0
Cost of Homelessness study							
Low	40.0	38.6	39.6	18.9	22.8	18.3	62.1
Moderate	27.1	76.9	66.7	56.4	41.0	32.5	73.1
High	19.4	71.4	67.9	46.4	46.4	24.7	68.9
Very high	13.9	90.0	89.5	78.9	50.0	45.8	106.8

sleeping rough over their lifetime. Clusters were then formed using these characteristics, both with total health care cost included as a factor in the cluster formation and with it used as an evaluation field.

Having a diagnosed mental health disorder was found to be a driver of high costs, but very high costs were found to be more closely associated with having spent a very long time sleeping rough. Conversely, screening positive for current AOD dependence (independent of a diagnosed mental health disorder including diagnosed substance use disorder) was not found to drive higher health care costs. The quality of the model was not improved by adding other characteristics considered: age, gender, indigenous status and time spent homeless (any form of homelessness) in the previous 12 months.

Examining the characteristics of respondents when categorised by health cost level (Table 2), there is a clear distinction between the characteristics of respondents with low health cost and those with higher costs. For both samples, respondents with low health cost (approximately 40% of respondents from each sample) were also markedly less likely to report mental health and/or long-term physical health conditions or be classified as drug- and/or alcohol-dependent. For example, only 22.1% of Michael Project and 19.8% of Cost of Homelessness Study respondents with low health cost reported both a mental and physical health condition. This more than doubled to 49.1 and 56.4% of respondents, respectively, for those with moderate health cost. Low health costs also corresponded with markedly shorter experience of lifetime homelessness, particularly rough sleeping. Those with moderate health costs reported nearly double the time rough sleeping compared with respondents with low health cost.

The relation between health conditions, time spent homeless and health cost is not as clear for the higher cost categories. For the Michael Project, the existence of a mental health condition is the primary factor associated with differentiation between moderate, high and very high health costs, with higher health costs positively associated with a larger proportion of respondents reporting a diagnosed mental health condition (58.5, 66.7 and 75.0%

Table 3. Michael Project study: Cluster analysis results.

Cluster	Predictor variables						
	Mental or long-term physical health condition		AOD dependent		Time sleeping rough over lifetime	Total health care cost/ participant	Per cent of sample
	No (per cent)	Yes (per cent)	No (per cent)	Yes (per cent)	Average (months)	Average ($)	Per cent
Health cost included as predictor variable							
Model quality = 0.7							
1	100		63.2	36.8	19.5	10,382	23.5
2		100	100		17.1	20,049	39.5
3		100		100	186.5	26,325	43.0
Health cost excluded as predictor factor							
Model quality = 0.9							
1	100			100	17.1	9813	8.6
2	100		100		20.3	10,715	15.2
3		100	100		8.4	20,339	37.7
4		100	25.0	75.0	185.2	20,407	6.6
5		100		100	22.7	26,874	32.0

of those with moderate, high and very high health cost, respectively). No clear pattern is discernible for the other factors considered, although those with very high health costs are more likely to report drug and/or alcohol dependence (56.3%) than those with moderate (52.8%) or high (50.8%) health costs.

In the Cost of Homelessness study, a positive relation is evident between higher health cost and drug and/or alcohol dependency (41.0, 46.4 and 50.0% of those with moderate, high and very high health costs, respectively). For other characteristics, there is no clear difference between respondents with moderate and high health cost, but a markedly higher incidence of mental and/or physical health conditions and time spent homeless is observed for those with very high health costs. For example, of those with very high health cost, 78.9% report a mental and physical health condition, and, on average, they had spent 45.8 months sleeping rough, compared with 46.4% and 24.7 months, respectively for those with high health cost. Thus, in this sample, all factors play a role in driving the very high health costs incurred by a small proportion of respondents.

The importance of these characteristics in driving health costs is also displayed in the cluster analysis results. For the Michael Project (Table 3), only three clusters are formed when health cost is included as a factor. Moving from Cluster 1 through to Cluster 3, the average health care cost/participant increased consistently. Comparison of clusters 1 and 2 (mean health cost of $10,382/person and $20,049/person, respectively) shows that health care costs were markedly higher where individuals had a mental or long-term physical health disorder. The very higher health costs incurred by individuals in cluster 3, (mean health cost of $26,325/person) reflects the additional cost impact of AOD dependence as well as a longer period spent sleeping rough over a lifetime.

Excluding health cost as a factor (Table 3) clarifies the importance of mental and long-term physical health conditions in driving the health costs incurred by individuals in this study. Individuals in clusters 1 and 2 had the lowest health costs, at $9813/person and $10,715/person, respectively. None of these individuals reported a mental or long-term

physical health condition. Individuals in cluster 1 all screened positive to AOD dependence, but no individuals in cluster 2 (where health costs were slightly higher) screened positive, suggesting that AOD dependence by itself does not add significantly to health costs. Clusters 3 to 5 have a markedly higher mean health cost, all individuals in these clusters reported a mental or physical health condition. Again, mean costs do not appear to be driven by AOD dependence, with no marked difference in health cost between cluster 3, where no individual screened AOD dependent and cluster 4, where 75.0% screened dependent. Interestingly, individuals in cluster 4 had spent a markedly longer time sleeping rough (185.2 months) than those in other clusters, but this is not associated with higher health costs.

To check whether the conclusions were sensitive to using 'rough sleeping' as a definition of homelessness, clusters were also formed using a broader definition of homelessness, being total time living across a range of homeless circumstances including rough sleeping, crisis/emergency accommodation, staying with relatives and friends, and living in caravan parks and in boarding houses without private facilities. Clusters formed using total time spent homeless as a predictor factor (results not reported) also show the importance of mental and/or long-term physical health conditions as a predictor of high health costs. Three clusters are formed, both when health cost is included as a predictor and when it is excluded, and the attributes of these clusters mirror those formed when rough sleeping and health cost are included as predictors. Individuals in the cluster with the highest health cost also reported approximately double the time spent in any form of homeless over their lifetime (112.6 months), compared with those in the other two clusters Cluster 1, 67.2 months and cluster 2, 54.1 months), supporting the potential role of cumulative time spent homeless has in attributing to higher health cost.

Examination of clusters formed for the Cost of Homelessness study participants (Table 4) also indicated that the existence of mental and physical health issues was a major driver of health care costs. However, for individuals in this study it is clear that the very high costs incurred by approximately 10% of the study population were associated with having

Table 4. Cost of Homelessness study: Cluster analysis results.

	Predictor variables						
Cluster	Mental or long-term physical health condition		AOD dependent		Time sleeping rough over lifetime	Total health care cost/ participant	Per cent of sample
	No (per cent)	Yes (per cent)	No (per cent)	Yes (per cent)	Average (months)	Average ($)	Per cent
Health cost included as predictor variable							
Model quality = 0.7							
1	100		66.7	33.3	11.6	2454	19.4
2		100	100		5.8	14,231	43.2
3		100		100	10.2	21,092	25.2
4		100	58.8	41.2	152.5	61,374	12.2
Health cost excluded as predictor factor							
Model quality = 0.8							
1	100		66.7	33.3	11.6	2454	19.4
2		100	100		7.0	19,438	44.6
3		100		100	10.2	21,092	25.2
4		100	53.3	46.7	166.9	46,137	10.8

spent a very long time sleeping rough. People allocated to Cluster 1 had the lowest average health care cost ($2454/person), and did not have a diagnosed mental health disorder or long-term physical health condition. People allocated to Clusters 2 and 3 (health costs of $14,231/person and $21,092/person, respectively) all had a diagnosed mental or long-term physical health condition, but those in Cluster 3, who also screened positive for a current AOD dependence issue, had the higher average health care cost. In comparison to the Michael Project, where the screening positive for AOD dependence was not strongly associated with higher health costs, for the Cost of Homelessness study, the average health care cost for Cluster 3 (all of whom had a mental and/or physical health condition and a current AOD dependence issue) was 50% greater than for Cluster 2 (all of whom had a diagnosed mental health disorder, but no AOD dependence issue), suggesting AOD dependence to be a driver of health cost for these individuals.

When considering Cluster 4; the average health care cost ($61,374/person) was approximately three times that observed for Cluster 3 ($21,092/person). All people allocated to Cluster 4 had a diagnosed mental and/or physical health condition and only 41.2% had a current AOD dependence issue. For these individuals, the very high average health care cost appears to be associated with a very long time spent sleeping rough over a lifetime.

For the Cost of Homelessness study, excluding health care cost as a predictor does not change the conclusion that existence of a mental and or long-term physical health condition is a major driver of high health costs, and that the very high cost incurred by a small proportion of individuals is strongly associated with having spent a long time sleeping rough. Once health cost is excluded as a predictor, consistent with the Michael Project sample, screening positive to AOD dependence is not strongly associated with higher health costs.

When clusters are formed based on total time homeless over a lifetime (results not reported) and health cost is included as a predictor, the attributes of the clusters formed are not sensitive to whether time sleeping rough or total time homelessness is used as a predictor variable, supporting the conclusion that having a mental and/or long-term physical health condition is a driver of high health costs, and experiencing a very long time homeless over a lifetime drives very high health costs. However, when total time homeless is included as a predictor and health cost is excluded only three clusters are formed. Examination of health costs for each cluster identifies only having a mental and/or long-term physical health condition as a driver of higher health cost.

Figures 3 and 4 show that the pattern in average 'total health care cost' across these clusters was not driven by a small number of people allocated to each cluster, rather it reflects a broad pattern in differences in health care costs across the clusters. Examining the Michael Project clusters (Figure 3), the vast majority of people allocated to Clusters 1 and 2 (no diagnosed mental and/or physical health condition) incurred comparatively low health care costs; 52.4% of cluster 1 and 61.1% of cluster 2 incurred a total health care cost of $1000 or less. Participants allocated to Clusters 3 and 4 all had a self-reported diagnosed mental health disorder. They also recorded smaller proportions incurring very low health care costs of $1000 or less than observed for Clusters 1 and 2 (Cluster 3, 32.6% and Cluster 25.0%). Forty per cent of Cluster 3 and half of Cluster 4 incurred comparatively high health care costs of between $5000 and $100,000. Cluster 5 shows an even smaller 17.9% of people who incurred low health care costs of $1000 or less and a larger 59.0% who incurred high costs of $5000 to $100,000. Each of these clusters showed approximately 6% of people had health care costs greater than $100,000.

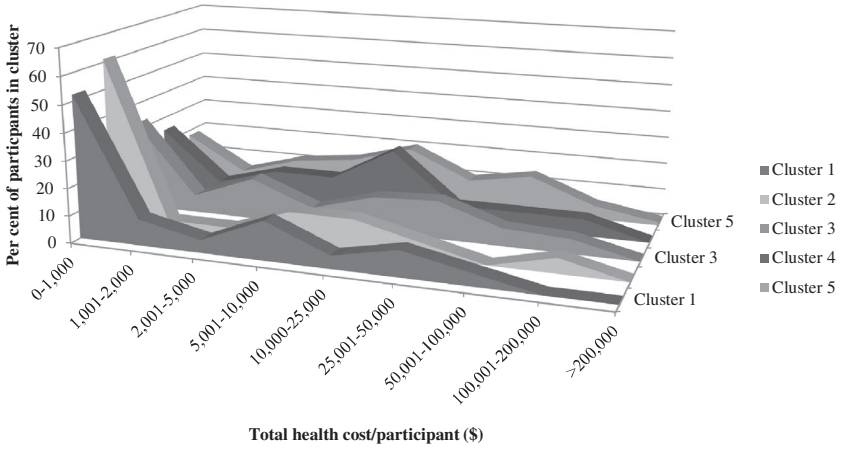

Figure 3. Michael Project study: Distribution of total health cost, by cluster (time spent rough sleeping, health cost excluded as predictor).

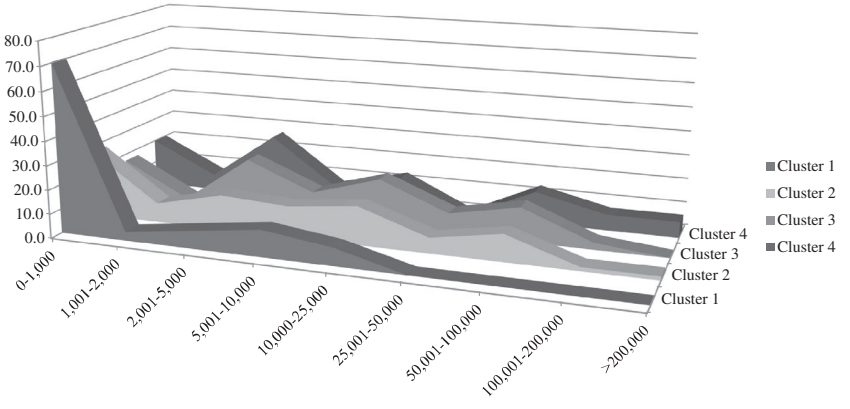

Figure 4. Cost of Homelessness study: Distribution of total health cost, by cluster (time spent rough sleeping, health cost excluded as predictor).

This pattern of health care costs is more evident when considering participants of the Cost of Homelessness study (Figure 4). Seventy per cent of people allocated to Cluster 1 had a total health care cost of $1000 or less. None of these people had a diagnosed mental health disorder and/or long-term physical health condition. When considering Clusters 2 and 3, all of whom have a diagnosed mental health disorder and/or long-term physical health issue, a much smaller proportion had health care costs of $1000 or less (27.4% in Cluster 2 and 17.1% in Cluster 3), and a much larger proportion had high health care costs, with 46.8% of Cluster 2 and 54.3% of Cluster 3 having a total health care cost of between $5000 and $100,000.

The total health care cost of people allocated to Cluster 4 (average time spent sleeping rough of 14 years) shows an even stronger trend towards higher health care costs. Only one-fifth (20.0%) had a health care cost of $1000 of less, while 26.7% had a health care cost of over $50,000 and 13.3% reported health care costs of greater than $100,000. This supports

the contention that for this population a long time spent sleeping rough represents a driver of very high health costs.

5. Conclusion

Examination of health care costs incurred by two separate samples accessing homeless support services in Australia showed that the high average health care costs found for these groups was driven by a comparatively small proportion of the group. A large proportion of those who were homeless actually incurred low costs (consistent with Australian population norms), with the median health care cost in each group being approximately one-quarter of the mean. For both samples, higher health care costs were strongly associated with having a diagnosed mental health disorder and/or a long-term physical health condition, with health care costs for those participants with a mental health disorder (excluding substance use disorders) and/or physical health condition being at least double that of those without. Current AOD dependence itself was not consistently associated with markedly higher health care costs. Very high health care costs were also incurred by participants who, on average, had spent a significant amount of time sleeping rough. This effect was more evident for the Cost of Homelessness study population, where those who had spent a significant time sleeping rough incurred health care costs at least double those incurred by others with otherwise similar attributes.

This finding, and its consistency across two separate and different samples of people experiencing homelessness, provides a significant economic argument for intervention through sustained government programmes targeted to both assist people to manage mental health disorders and long term physical health conditions in a cost-effective and sustainable manner, and to break the cycle of homelessness and maintain stable accommodation. Effective intervention, such has been shown in Housing First programmes (Conroy *et al.*, 2014; Larimer *et al.*, 2009; Palepu *et al.*, 2013), would result in these very high health care costs being reduced in the future. The study also suggests that savings may be relatively small for some people experiencing homelessness as their costs were relatively low in the first instance. Such interventions, however, may assist in lowering the probability of a transition into long-term rough sleeping, and result in a range of positive benefits for those experiencing homelessness such as significantly improved housing outcomes, improved social relationships and greater social connectedness, improved overall quality of life and improved labour market outcomes (Conroy *et al.*, 2014; Flatau *et al.*, 2012; Kirst *et al.*, 2015; Patterson *et al.*, 2013; Zaretzky & Flatau, 2013).

An individual's health costs may change from year to year; a person with high cost in the year examined may not have high cost in the next year. Further examination of different homeless populations, preferably over a longer window, is desirable to provide stronger evidence of the drivers of high health care costs and where programmes should be focused to produce cost effective homelessness interventions. Linking of administrative data will allow this to occur (see Parsell *et al.*, 2016; Wood *et al.*, 2016), pointing to the importance of supporting further development of Australian administrative data linkage initiatives and infrastructure.

Notes

1. The Michael Project received Murdoch University Human Research Ethics Committee outright approval on 22 August 2008 (No. 2008/165), while the Cost of Homelessness study received Murdoch University Human Research Ethics Committee outright approval on 6 August 2010 (No. 2010/138). The lead chief investigators of the two studies, Paul Flatau and Kaylene Zaretzky, were at Murdoch University when the studies commenced, but subsequently moved to the University of Western Australia and received follow-up ratification of ethics approval at the University of Western Australia.
2. For further discussion of how the Severity of Dependence Scale was applied in the studies see Spicer *et al.* (2015).
3. All dollar figures quoted for the studies are 2008–2009 Australian dollars.

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Disclosure statement

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