“Amenable mortality within the New Zealand homeless population: We can do better!”

Original article

Sandrine Charvin-Fabre, Ottilie Stolte, Ross Lawrenson

Abstract

Aim: To describe the context surrounding death of homeless people in New Zealand and to determine the proportion of deaths that could be considered amenable to healthcare.

Method: We used coroners’ findings related to 171 deaths of persons with “no fixed abode” at the time of death, from 2008 to 2019. Recent lists of amenable mortality from the New Zealand Ministry of Health and the Office of National Statistics in the United Kingdom were combined to determine the rate of amenable mortality.

Results: The life expectancy of homeless persons identified in this sample was 30 years shorter than in the housed population with a mean age of death of 45.7 years. Deaths occurred mainly, alone, in public spaces (56.1%) or in private vehicles (14%). Three quarters (75.8%) of homeless persons died from conditions amenable to timely and effective healthcare interventions, mostly from natural causes (45.7%) and suicide (41.5%).

Conclusion: Homeless people experience considerable challenges when accessing the healthcare system, as uncovered by the dramatic rate of amenable mortality. Our findings highlight the urgent need to implement specific models of care that are designed to meet the social and healthcare needs of the homeless persons if we are to address the significant health inequalities they experience.

22/06/2020

Introduction

Homelessness is an increasing and complex worldwide issue. New Zealand, like other higher income countries faces a growing prevalence of homelessness. Estimates indicate that between the 2006-2013 censuses period, the absolute number of homeless persons increased from 33 ,000 to 41, 000 (an increase of 24.2%) compared to the population growth during the same period of 5.3%.[1-2] Definitions of homelessness vary across countries depending on the social, cultural, and legal context in which they operate.[3] The New Zealand Coalition to End Homelessness adopted a broad definition of homelessness based on a graduation of housing insecurity, ranging from those living rough or in their cars to those living in unhabitable dwelling, in temporary accommodation or in overcrowded households.[4] Widening the definition of homelessness means that "hidden homelessness" is accounted for and better illustrate the health inequalities that impact mainly Māori and Pasifika peoples amongst this population.[4]

Health inequalities that affect the homeless population worldwide contribute disproportionally to a dramatic premature mortality compared to the housed population. The mortality rate varies between studies, nonetheless typically homeless people die 15 to 30 years younger than their housed counterparts.[5-7] A New Zealand hospital-based study looked at risks factors for mortality of a cohort of homeless patients that included 126 deaths with a median age of death of 52.6 years.[8] Many of the patients had a record of cardiovascular disease and diabetes as well as mental health issues and substance misuse.

Premature mortality results from a complex combination of medical conditions often related to severe and chronic comorbidities, and the consequences of social exclusion shaped by homelessness; that is, marginalisation and stigma, loneliness, violence, and adverse living conditions. Consequently, homeless people experience poor and irregular access to healthcare, unmet care needs, delay in clinical presentations, and high use of Emergency Departments.[9-12] Yet, access to high quality health care improves many health outcomes and can reduce premature deaths.[13] The concept of *amenable mortality* as an indicator of performance -(weakness or strength)- of the health system has been debated for decades as a way to determine the boundaries of health interventions.[14] The New Zealand approach has been to develop a measure of amenable mortality that reflects the performance of the health care system, excluding a wider and intersectoral approach based

on the social determinants of health.[15] Amenable mortality is an important indicator of health care access and quality, which serves to identify areas of healthcare concern and support specific healthcare initiatives for diseases where effective intervention exist.[16] The classification of causes of death amenable to clinical interventions is based on expert reviews of medical knowledge and technologies and causal epidemiology of diseases. The New Zealand amenable mortality list has been updated in 2016 as part of the System Level Measures and refreshed Health Strategy to improve health outcomes within the population and reduce health inequalities. [16]

The objectives of this present study are to use coroners' reports to describe the context surrounding the death of homeless people in New Zealand and to determine the proportion of deaths that could be considered amenable to health care intervention.

Method

Data collection

A critical challenge in reporting the deaths of homeless people is the lack of a systematised source of statistics for this population. The Mortality Collection classifies all causes of death registered in New Zealand using the International Classification of Diseases Tenth Edition (ICD-10). The inclusion of the ICD-10 coding for homelessness (Z.590) has only recently begun to be used for identifying or registering death of homeless people. These data are incomplete and so the Mortality collection is not a viable source of homeless mortality data. Further, within DHBs, the use of the Z.590 code has not been generally adopted. How DHBs record "no fixed abode" is unclear and varies between different hospitals.

Instead, the utility of medico-legal databases is recognised worldwide as a valid source of data for public health endeavours especially for accessing data on populations that are difficult to reach (such as homeless people or prisoners) or to determine the nature, distribution and determinants of amenable deaths such as suicide.[17-19] Under the New Zealand Coroner Act 2006, deaths must be reported to the coroner if the death appears to be : a)without known cause, self-inflicted, unnatural, or violent, b) occurred as a potential result of a medical procedure, c) occurred while someone was in official custody or care, d)

in relation to which no death certificate was issued.[20] The Case Management System is the New Zealand database recording systematically all deaths reported to coroners since 2007. The Information Advisor of the Coronial Office of Wellington provided data on all coronial deaths with "No Fixed Abode" criterion at the time of death. One hundred seventy-six full-text (176) coroners' findings reports were identified and released to SCF (first researcher). This included all deaths of people with no fixed abode that were reviewed by the coronial service from January 2008 to June 2019.

Data analysis

Five cases did not meet the criteria for homelessness. The study sample is thus based on 171 coroners' reports. Demographic information was extracted from each report. Since ethnicity was not reported individually in the coroner's' reports, this information is not available. The circumstances surrounding death were obtained from the elements of information accompanying the coroners' findings: Extracts of police and toxicology reports, forensic examination, witnesses' statements, and elements of medical history provided by DHBs, community services or General Practitioners. The majority of deaths due to natural causes were not followed up by a coroner's inquiry. Only a few inquiries in patients who died from natural causes (n=10) were considered necessary by the coroners. Detailed medical information was therefore not available for analysis for all the deaths included due to natural causes. Conversely, deaths by suicide were assessed and ascertained after a long and detailed coroner's inquiry, enabling a detailed analysis. Underlying causes of death, based on forensic examination findings, were coded using ICD-10 classification. For the purposes of this study, drug and alcohol related deaths were coded using the proposal from Randall et al.[21] All deaths directly related to drug or alcohol use were coded as accidental poisoning (X40-X45) or related to mental and behavioural disorders (F10-F16, F19, F55). The causes of amenable mortality were revisited combining the lists published recently by the New Zealand Ministry of Health (2016),[16] and by the Office of National Statistics in the United Kingdom.[22] This latter list was the main basis used to develop the amenable mortality list common to all the OECD countries.[23] It is based on a previous definition of amenable mortality that was developed for use in the Australian and New Zealand context.[24] Given this common background and that aetiologies of diseases, risk factors and the healthcare standards are likely to be similar, the combination of the two lists was

regarded as applicable. Variations across amenable mortality lists relies on different sub-categories within group of diseases, and depend on the local epidemiology of diseases, the evidence of effectiveness of the intervention, as well as the quality of the cause of death coding procedure. For example, pneumonia not related to pneumococcal infection was removed from the New Zealand list because the quality of coding was deemed inadequate by the expert panel.[15] Health inequalities are extreme for the homeless population since they are marginalised in terms of accessibility to healthcare. Hence, the list that we have used, was enlarged accordingly to capture all relevant amenable conditions. The threshold is set at 75 years of age for amenable deaths other than by accident or suicide, due to the frequent difficulty of assigning a single cause to deaths beyond this age in the general population.

Ethics Approval

Ethics approval was obtained from the Human and Research Ethics Committee from the University of Waikato.

Results

- **Sociodemographic characteristics**

Of the 171 homeless people's deaths reported to the coronial office, the majority were males (n=145, 84.7%), with females accounting for 15.2% (n=26). The mean age of death regardless of cause or gender was 45.7 year; 46.7 years for females and 44.8 years for males. The average age of death by accident and suicide was dramatically young, 36.5 years and 38.2 years respectively (Table 1). At the time of death, a small minority (n= 25) of homeless people were employed (14.6%). The majority of persons (n=91) were unemployed (53.2%) with a small number receiving a benefit (10.5%). Eleven homeless people were retired (6.43%). The information was unavailable for nine individuals (5.2%) and not specified in 17 cases (9.94%).

- **Underlying causes of death (Table1)**

The main cause of death was from natural causes (42.6%). Among these, deaths from cardiovascular diseases were the most frequent (n=33), followed by infectious diseases (n=9) and from acute alcohol toxicity (n=7). Three cases of death by hypothermia were also reported. Suicide, ascertained by clear evidence of an intention to end one's life, accounted for nearly one third of all deaths (n=49). Thirty-three deaths (19.2%) were classified as accidental mainly attributed to a vehicle crash or a pedestrian struck by a vehicle or a train (n=12), a fall from a height (n=7), a fire (n=4) or a drug overdose (n=4). Deaths from an unascertained nature due to an advanced decomposition of the body or the impossibility to precisely determine the cause of death accounted for 5.2 % of all deaths. Seven deaths were the consequence of criminal homicides.

Table 1. Underlying causes of death and amenable mortality by age group (n=171).

Age Group	Suicide N=49 (28.6%)	Accident N=33 (19.2%)	Natural N=73 (42.6%)	Homicide N=7 (4.09%)	Unascertained N=9 (5.2%)	Total cause N=171	Amenable N=118/153 (75.8%)
Mean age (SD)	38.2 (14-61)	36.5(13-57)	54.5 (17-78)	44.2 (27-64)	44.7 (25-57)	45.7 (13-78)	45.4 (13-71)
10-14	1	1	0	0	0	2	2
15-19	1	0	1	0	0	2	2
20-24	7	5	0	0	0	12	12
25-29	4	3	1	1	1	10	5
30-34	4	5	1	1	4	15	5
35-39	9	5	3	0	2	19	13
40-44	7	5	4	3	0	19	12
45-49	6	3	12	0	0	21	15
50-54	6	2	14	0	1	23	18
55-59	3	4	15	0	1	23	16
60-64	1	0	9	2	0	12	7

65-69	0	0	6	0	0	6	6
70-74	0	0	5	0	0	5	5
75+	0	0	2	0	0	2	0

- **Circumstances of death and amenable mortality (Table 2)**

Information on the location of death was available for 168 deaths. The most common place where death occurred regardless of the causes of death, was in public spaces such as streets, doorways, parks and reserves, forests, beaches, harbours or rivers (56.1%), followed by private cars or campervans (14%), private housing but mainly garages (12.8%), hospital (8.7%) and temporary accommodation such as motels, hostels and backpacker accommodation (5.26%).

Information included in the coroners' findings reports was sufficient for assessing amenable mortality in 153 cases of death. According to the amenable mortality list, the categories of death from unascertained and criminal nature were excluded (n=16) as well as death from natural causes that occurred beyond 75 years old (n=2). The contribution of amenable death to the overall mortality of homeless people was extreme with 75.8% of death (n=118) considered as amenable to timely and effective healthcare intervention. The mean age of amenable death was 45.4 years old (Table1). In the group aged up to 24 years, the prevalence of amenable mortality was 100%, due to suicide and accidents (Table 1). Among amenable deaths, 45.7 % (n=54) resulted from a natural cause, especially due to cardiovascular disease (n=33), alcohol related death (n=7) and pneumonias (n=6). A single case was cancer related, however the forensic examination diagnosed post-mortem four cases of cancers at an advanced stage. Suicide represented 41.5% of the amenable death (n=49) and accidents related to a vehicle crash or pedestrians struck (n=12) or resulting from fire effects (n=3) accounted for 12.7% of all amenable deaths (Table 2).

Nearly half of the amenable deaths from natural causes occurred in public spaces (46.1%), followed by deaths in private dwellings (21.1%), in cars or campervans (17.3%), in hospital (15.38%) and lastly in temporary accommodation (7.6%). Most of the homeless persons who died from an amenable death were alone at the time of death and were found deceased by witnesses sometimes several months after that death occurred.

185

186 **Table 2:** Amenable mortality within the homeless population *(modified from Otalunde et al.*

187 *and New Zealand Ministry of Health, 2016).*

Group	Conditions	Age	ONS UK-2016	NZ- MOH-2016	Amenable Mortality (N=118)
Infections	Tuberculosis	0-74	A15-A19, B90	A15-A16	0
	Meningococcal disease	0-74			0
	Pneumococcal disease	0-74	A40.3, G.001, J.13	A40.3, G.001, J.13	
	HCV	0-74	B17.1, B18.2	B17.1, B18.2	0
	HIV/AIDS	all	B20-B24	B20-B24	0
	Other selected bacterial infections	0-74	A.38-A41, A46, A48.1, B50-B54, G00, G03, J02, L03		
Neoplasms	Stomach	0-74	C16	C16	0
	Colon	0-74	C18		1
	Rectal	0-74	C19-C21	C19-C21	0
	Bone and cartilage	0-74		C40-C41	0
	melanoma	0-74	C43	C43	0
	Female breast cancer	0-74	C50	C50	0
	Cervical	0-74	C53	C53	0
	Uterus	0-74	C54-C55	C54-C55	0
	Prostate	0-74		C61	0
	Testis	0-74	C62	C62	0

	Thyroid	0-74	C73	C73	0
	Hodgkin	0-44	C81	C81	0
	Acute lymphoblastic leukaemia	0-74	C91, C92.0	C 91	0
	Liver	0-74	C22		0
	Mesothelioma	0-74	C45		0
	Bladder	0-74	C67		0
	Benign neoplasms	0-74	D10-D36		0
	Lip, oral cavity, pharynx	0-74	C00-C14		0
	Oesophagus	0-74	C15		0
	Trachea, bronchus, lung	0-74	C33-C34		0
Endocrine and metabolic	Diabetes mellitus	0-74	E10-E14	E10-E14	2
	Disease of thyroid	0-74	E00-E07		0
	Addison's disease	0-74	E27.1		0
Drug use disorders	Alcohol related disease	0-74	F10, G31.2, G62.1, I42.6, K29.2, K70, K73, K74 9excl. K74.3-K74.5), K86		7
	Illicit drug disorders	0-74	F11-F16, F18-F19		0
Neurological	Epilepsy	0-74	G40-G47		0

Cardiovascular	Rheumatic and other valvular heart disease	0-74	I01-I09	I01, I05-I09, I33-I37	0
	Hypertensive disease	0-74	I10-I15	I10-I13	1
	Ischaemic heart disease	0-74	I20-I25	I20-I25	19
	DVT with pulmonary embolism	0-74	I26, I80.1-I80.3, I80.9, I82.9	I26	3
	Atrial fibrillation and flutter	0-74		I48	0
	Heart failure	0-74		I50	6
	Cerebrovascular disease	0-74	I60-I69	I60-I69	1
	Aortic aneurysm and dissection	0-74	I71		3
Respiratory	Influenza	0-74	J09-J11		0
	Pneumonia	0-74	J12-J18		6
	COPD	0-74	J40-J44	J40-J44	0
	Asthma	0-74	J45-J46	J45-J46	2
Digestive disorders	Gastric and duodenal ulcer	0-74	K25-K28	K25-K27	3
	Acute abdomen, appendicitis, intestinal obstruction, pancreatitis, hernia	0-74	K35-K38, K40-K46, K83, K85, K86.1-K86.9, K91.5		0
	Cholelithiasis	0-74	K80	K80	0

Genitourinary disorders	Renal failure	0-74	N17-N19	N17-N19	0
	Nephritis and nephrosis	0-74	N00-N07, N25-N27		0
	Obstructive uropathy and prostatic hyperplasia	0-74	N13, N20-N21, N35, N40, N99.1		0
Injuries	Transports accidents	All	V01-V99	V01-V99 (excluded trains)	12
	Accidental falls on same level	All	W00-X59	W00-W008, W18	0
	Suicide	All	X60-X84, Y10-Y34	X60-X84	49
	Fire (burns)	All		X00-X09	3
	Homicide/Assault X85-Y09, U50.9	All	X85-Y09, U50.9		0

- **Suicide (Table3)**

One of the main causes of death was suicide accounting for 28.6% of all death (Table 1). In those under 44 years over two-thirds of deaths were due to suicide (67.3%). Homeless persons who self-harmed were found mainly in public spaces (67.3%) or in their private vehicles (12.2%), while 10.2% deceased in temporary accommodations, and 8.16% in private garages. One person died in hospital from the direct consequences of suicide. Hanging was the most common method used (61.2%). The coroners' inquiries have revealed that 73.4 % of homeless persons who committed suicide were diagnosed with mental health issues, mainly from alcohol or drug misuse and depressive mood disorders. However, the proportion of homeless persons treated for psychiatric disorders was less than a half (46.9%). In addition, there was only evidence of recent contact with health professionals in

just under a quarter of cases (24.4%). In the majority of cases (40.8%), the final contact was up to one year or more prior to death and 22.4% of homeless persons had no contact at all with health professionals. References to lifetime suicide ideation and past suicide attempts were drawn from statements from relatives and health professionals. Nearly 70% of homeless persons had communicated suicide intent in their lifetime (69.3%) and 28.5% had evidence of prior self-harm. In nearly 70% of cases, homeless people have experienced significant and multiple stressful and traumatic life events.

Table 3. Circumstances of death by suicide

	N=49	%
Socio-demographic		
Age, years, median range	38.2 (14-61)	
Male gender (% male)	41	85.7
Clinical diagnosis		
Psychosis	5	10.2
Bipolar disorder	5	10.2
Depressive illness	23	46.9
Problematic alcohol use	18	36.7
Drug use (casual/regular)	19	38.7
No history of mental health issues	8	16.3
Other	2	4
Unknown	3	6.1
Current or past treatment for mental health issues	23	46.9
Past expression of suicide thoughts and behaviours		
Communicated suicide intent-lifetime	34	69.3
Communicated suicide intent-last year	10	20.4
Suicide attempt-lifetime	14	28.5

Suicide attempt-last year	6	12.2
Suicide notes	2	4
Contact with health professionals		
Contact up to 1 year	6	12.2
Contact last month	12	24.4
Contact last year	14	28.5
No contact at all	11	22.4
Unknown	5	10.2
Suicide method		
Hanging	30	61.2
Self-poisoning	10	20.4
Jump/fall	5	10.2
Other methods	4	8.1
Suicide location		
Public space	33	67.3
Vehicle	6	12.2
Temporary accommodation	5	10.2
Private dwelling	4	8.1
Hospital	1	2
Stressful life events		
Any events	34	69.3
Relationships breakdown	12	24.4
Financial problems	12	24.4
History of legal issues	7	14.2
Conflict with other persons	7	14.2
Bereavement	5	10.2

209

210

211 **Discussion**

The main findings of this study are the devastating and dehumanising consequences of homelessness that result in premature and preventable deaths. The mean age of death of homeless persons identified in the sample as having "no fixed abode" at the time of death was over 30 years less than in the New Zealand housed population with an overall mean age of death of 45 years, reduced further to 38 years in cases of suicide.[25] The vast majority of deaths occurred in public spaces or in private vehicles. Just over three quarters of homeless persons died from conditions amenable to timely and effective healthcare interventions, mainly from natural causes of death and suicide.

Our findings are consistent with previous results that premature and amenable mortality associated with homelessness is considerable, although exact comparisons cannot be made due to the variety of data sources and definitions of homelessness.[7,26-27] However, congruent to our results, prior homeless coronial samples indicate an average age of death of 46 years for all causes [26] and from nearly 36 to 39 years by suicide.[19,28] Cross sectional studies of homeless deaths identified by linking hospital admissions and mortality data in England and New Zealand found a mean age of death of 52 years that remains extremely young.[7-8] These studies included homeless patient samples who had been hospitalised and therefore may have benefited from medical follow-up.

The amenable mortality burden uncovered in our study is significantly higher than in a UK study that assessed this proportion to be approximatively one third.[7] The UK study focused on deaths of homeless patients admitted to hospitals that provided links with community healthcare services. Further, our findings were based on an extended list of amenable causes of death in a way that more clearly reflects the medical conditions associated with homeless deaths. The difference between the two amenable mortality lists was relevant in 23 cases, and was mainly related to alcohol diseases, acute and treatable pneumonias, and specific cardiovascular diseases (heart failure and aortic dissection). We reported minimal rates of diabetes and cancers that contradict previous international and New Zealand hospital-based studies.[7-8] It is likely that many such cases would not be reported to the coroner and thus illustrates the differences in sampling. The magnitude of social isolation and disconnection from the health system combined with chronic psychological distress and unstable life conditions negatively affect the health seeking behaviours of homeless people.[29-30] The difficulty for the homeless persons in accessing basic human needs compete

with the drive to access health and operate as significant additional stressors to receiving care.[29] Further, It is likely that the patients with "no fixed abode" cannot be registered with a General Practitioner because of a lack of address and that the cost for the co-payment within primary care is a further barrier to accessing a regular care. Our findings are sadly aligned with extant literature and reiterate the pressing need for improving the accessibility to health care for homeless people.[30]

Of particular concern, and in line with other findings, suicide was prevalent amongst homeless youth and young adults.[28] In addition, the prevalence of lifetime suicide ideation (69.3%) was significantly higher than those of depressive disorders (46.9%). Yet, in the context of homelessness, research identifies that suicide ideation is a more sensitive indicator of acute risk of suicide than depressive symptomatology, in comparison to the general population.[31-33] Abuse and trauma especially is recognised as being a major pathway to homelessness and a strong predictor of suicide ideation amongst homeless adults and youth, intensified by different sources of emotional distress when living on the streets.[32-35] We found that nearly 70 % of case had evidence of stressful and traumatic life events that reverberate through the rate of suicide ideation we uncovered. Hence, we would argue assessing suicide ideation should be part of routine screening provided by health providers in contact with homeless patients.

The strengths of this study include detailed data on the deaths of a group of patients who are often hard to identify from routine data sources. Our sample included homeless persons who did not receive regular healthcare, and this reflects the considerable challenges of meeting the healthcare needs amongst this population. It has been argued that the concept of amenable mortality suffers from a lack of accurate determination of the underlying cause of death.[13] By using findings from forensic examination, this pitfall has been avoided. The study has some limitations. The study focused on a specific subset of homeless people identified as having "no fixed abode" at the time of death. People living in transitional housing, motels or private dwellings are provided with an address and have not been identified. Thus, our findings are relevant to those who were the most isolated and deprived in terms of support and access to healthcare as suggested by the extremely low rate of deaths in hospital settings for a population without a home. It is also conceivable that some relevant coroners' reports could have been missed. The proportion of natural causes differs

significantly from previous hospital-based studies in England and New Zealand that evidenced cardiovascular diseases, cancers and respiratory diseases as being the main underlying causes of deaths.[7-8] Our sample framing relied on deaths that must be legally reported to coroners due to their violent or undetermined causes and which represented nearly half of all deaths. This has likely led to underestimate the contribution of natural causes of deaths to the overall mortality. Ethnicity being not individually reported on the coroners' findings, means that data regarding Māori and Pasifika people who are mainly impacted by homelessness within New Zealand, was not available.[1]

Implications and need for future research

Our findings carry important implications for the development of health policy to enable earlier identification of homeless patients at high risk of premature mortality. This involves enhancing access to care, as well as providing the continuity and quality of care for homeless people with life limiting conditions. Considering cardiovascular disease and suicide are leading causes of amenable mortality, regular access to a source of care is an imperative for this population. Within primary care, access to homeless tailored services that emphasise outreach programs and free care delivery have shown positive outcomes in terms of accessibility and continuity of care, and should therefore be facilitated.[36] Components of an effective response should also promote a holistic and patient-centred approach (or whānau-centred approach if appropriate) to support self-esteem recovery.[29] Treatment plans that actively encourage participation of the homeless patients are needed to ensure adherence to care and follow-up. A first step in this direction could be to implement homeless sensitive care training programmes for health providers within primary care and Emergency Departments with special attention given to suicide ideation identification. For homeless patients with mental health issues or dual diagnosis, assertive community treatment seems the most encouraging response regarding regularity of health contacts and housing stability .[37] That said, many homeless people are not mentally ill or substance user. Future research should assess more specifically heath care utilisation and access barriers in various settings and for different sub-groups of the homeless population. Lastly, this study has also provided the opportunity to highlight the lack of systematic caption of homelessness through different administrative data sets, otherwise than by using a reductive identification of homeless persons by the "no fixed abode" criterion. Equally

important, the use of the Z.590 code should be encouraged within DHBs including during the completion of the Medical Certificate of Cause of Death, if we are to understand how to improve adequately and effectively the healthcare of the homeless population. This would be facilitated if the Law Commissions' recommendations for modernising the legislation relating to death, burial, cremation and funerals in New Zealand became the responsibility of the Ministry of Health.[38] This should allow a better recording of the homeless deaths and would also ensure better recording of ethnicity data.

Conclusion

Homeless people experience considerable challenges when accessing the healthcare system, as uncovered by the dramatic rate of amenable mortality. Our findings outline the pressing necessity to implement specific models of care that are designed to meet the social and healthcare needs of homeless persons and address the significant health inequalities they face. This research highlighted an extreme situation of social isolation and disengagement from the healthcare system that point out the challenges for accessing regular sources of care and for receiving comprehensive and culturally sensitive care. Future work should provide a more comprehensive picture of healthcare utilisation for the diverse groups of homeless patients to assist policy decisions as part of comprehensive and effective response to homelessness.

Competing interests

Nil

References

1- Amore K, Severe housing deprivation in Aotearoa/New Zealand: 2001-2013. He Kainga Oranga/Housing & Health Research Programme, University of Otago, Wellington.2016.

2- Statistics New Zealand - 2013 Census Usually Resident Population Counts (Accessed 10/08/20 at http://archive.stats.govt.nz/browse_for_stats/population/census_counts/2013CensusUsuallyResidentPopulationCounts_HOTP2013Census.aspx#gsc.tab=0).
3- MacKenzie,D. Homelessness:Definitions. Elsevier Ltd. 2012. 25-35.
4- New Zealand Coalition to End Homelessness. *Homeless in Aotearoa: Issues and Recommendations*. 2009; Regional Public Health, New Zealand.
5- Fazel S, Geddes JR, Kushel M. The health of homeless people in high-income countries: descriptive epidemiology, health consequences, and clinical policy recommendations. Lancet.2014; 384:1529-40.
6- Medcalf P, Russell GK. Homeless healthcare: raising the standards. Clin Med (Lond). 2014; 14:349-53.
7- Aldridge RW, Menezes D, Lewer D, et al. Causes of death among homeless people: a population-based cross-sectional study of linked hospitalisation and mortality data in England. Welcome Open Res. 2019; 4:49.
8- Thornley S, Marshall R. Lack of housing, hospital treatment and premature mortality in Counties Manukau district. N Z Med J. 2016; 129:84-93.
9- Baggett TP, O'Connell JJ, Singer DE, Rigotti NA. The unmet health care needs of homeless adults: a national study. Am J Public Health. 2010; 100: 1326-33.
10- Corrigan P, Pickett S, Kraus D, et al. Community-based participatory research examining the health care needs of African Americans who are homeless with mental illness. J Health Care Poor Undeserved. 2015; 26: 119-33.
11- Martins DC. Experiences of homeless people in the health care delivery system: a descriptive phenomenological study. Public Health Nurs. 2008; 25: 420-30.
12- Lebrun-Harris LA, Baggett TP, Jenkins DM, et al. Health status and health care experiences among homeless patients in federally supported health centers: findings from the 2009 patient survey. Health Serv Res. 2013; 48: 992-1017.
13- GBD 2015 Healthcare Access and Quality Collaborators. Healthcare Access and Quality Index based on mortality from causes amenable to personal health care in 195 countries and territories, 1990-2015: a novel analysis from the Global Burden of Disease Study. Lancet. 2017;390 :231-66.

14- Nolte E, McKee M. Does healthcare save lives? Avoidable mortality revisited. 2004. (Accessed 18/06/2020 at hhtps://researchonline.lshtm.ac.uk/id/eprint/15535).
15- Ministry of Health. Saving lives: Amenable mortality in New Zealand, 1996-2006. Wellington: Ministry of Health;2010.
16- Ministry of Health. A guide using amenable mortality as a system level measure. Wellington: Ministry of Health; 2018. (Accessed 18/06/2020 at https://nsfl.health.govt.nz/dhb-planning-package/system-level-measures-framework/data-support-system-level-measures/amenable).
17- Bugeja L, Ibrahim JE, Ferrah N, et al. The utility of medico-legal databases for public health research: a systematic review of peer-reviewed publications using the National Coronial Information System. Health Res Policy Syst. 2016; 14:28.
18- Andrews JY, Kinner SA. Understanding drug-related mortality in released prisoners: a review of national coronial records. BMC Public Health. 2012 ;12 :270.
19- Sinyor M, Kozloff N, Reis C, Schaffer A. An Observational Study of Suicide Death in Homeless and Precariously Housed People in Toronto. Can J Psychiatry. 2017; 62:501-05.
20- New Zealand Coroners Act 2006. New Zealand legislation. (Accessed 31/07/20 at www.legislation.govt.nz/act/public/2006/;atest/whole.html)
21- Randall D, Roxburgh A, Gibson A, Degenhardt, L. Mortality among people who use illicit drugs: A toolkit for classifying major causes of death. Sydney: National Drug and Alcohol Research Centre, University Of NSW. 2009.
22- Otalunde O, Windsor-Shellard B, Campbell A. Revisited Definition of Avoidable Mortality and New Definition for Children and Young People 2016.
23- Organisation for Economic Co-operation and Development. Avoidable mortality: OECD/Eurostat list of preventable and treatable causes of death. 2019. (Accessed 18/06/2020 at https://wwww.oecd.org/health/health-systems/Avoidable-mortality-2019-Joint-OECD-Eurostat-List-preventable-treatable-causes-of-death.pdf)
24- Walsh M, Grey, C. The contribution of avoidable mortality to the life expectancy gap in Māori and Pacific populations in New Zealand- a decomposition analysis. N Z MJ. 2019; 132:46-60.

25- New Zealand Period Life Tables: 2012-14. 2015.(Accessed 18/06/2020 at http:// archive.stats.govt.nz/`~/media/Statistics/Browse%20for%20stats/NZ lifeTables/HOTP12-14.pdf).
26- Page SA, Thurston WE, Mahoney CE. Causes of death among an urban Homeless population considered by the medical examiner. J Soc Work End Life Palliat Care. 2012,8*:* 265-271.
27- Morrison DS. Homelessness as an independent risk factor for mortality: results from a retrospective cohort study. Inter J Epid.2009*, 38* :877-83.
28- Arnautovska, U., Sveticic, J., & De Leo, D. (2014). What differentiates homeless persons who died by suicide from other suicides in Australia? A comparative analysis using a unique mortality register. *Soc Psychiatry Psychiatry Epidemiol 49*, 583-589.
29- Omerov P, Craftman AG, Mattsson E et al. Homeless persons 'experiences of health and social care: A systematic integrative review.Health Soc Care Community.2020;28:1-11.
30- White BM, Newman S. Access to primary care services among the homeless: A synthesis of the literature using the Equity of Access to Medical Care framework. J Prim Care Community Health.2015; 6: 77-87.
31- Fitzpatrick KM, Irwin J, Lagory M, Ritchey F. Just thinking about it: social capital and suicide ideation among homeless persons. J Health Psychol. 2007; 12:750-60.
32- Coohey C, Easton SD, Kong J, Bockenstedt JK. Sources of psychological pain and suicidal thoughts among homeless adults. Suicide Life Threat Behav. 2015 ; 45 : 271-80.
33- Prigerson HG, Desai RA, Liu-Mares W, Rosenheck RA. Suicidal ideation and suicide attempts in homeless mentally ill persons: age-specific risks of substance abuse. Soc Psychiatry Epidemiol. 2003 ; 38 : 213-19.
34- Moskowitz A, Stein JA, Lightfoot M. The mediating roles of stress and maladaptive behaviors on self-harm and suicide attempts among runaway and homeless youth. J Youth Adolesc. 2013; 42:1015-27.
35- Panadero S, Martin R, Vasquez JJ. Suicide attempts and stressful life events among homeless people in Madrid (Spain). J Community Soc. Psychol.2018; 28: 200-212.

36- Jego M, Abcaya J, Stefan DE, et al. Improving healthcare management in primary care for homeless people: A literature review. Int J Environ Res Public Health.2018;15:309.
37- de Vet R, van Luijtelaar MJ, Brilleslipjer-Kater S, et al. Effectiveness of case management for homeless persons: A systematic review. Am J Public Health.2013; 103: e13-e26.
38- Death, burial and cremation: A new law for contemporary New Zealand.2015; New-Zealand Law Commission (accessed 10/09/2020 at r.134.publications.lawcom.govt.nz/uploads/NZLC-R134-Death-Burial-and-cremation.pdf).