

Multimorbidity and emergency department visits by a homeless population

Bowen, Matthew ; Marwick, Sarah ; Marshall, Tom; Saunders, Karen; Burwood, Sarah ; Yahyouche, Asma; Stewart, Derek ; Paudyal, Vibhu

DOI:
[10.3399/bjgp19X704609](https://doi.org/10.3399/bjgp19X704609)

License:
None: All rights reserved

Document Version
Peer reviewed version

Citation for published version (Harvard):
Bowen, M, Marwick, S, Marshall, T, Saunders, K, Burwood, S, Yahyouche, A, Stewart, D & Paudyal, V 2019, 'Multimorbidity and emergency department visits by a homeless population: a database study in specialist general practice', *British Journal of General Practice*, vol. 69, no. 685, pp. E515-E525.
<https://doi.org/10.3399/bjgp19X704609>

[Link to publication on Research at Birmingham portal](#)

Publisher Rights Statement:
Checked for eligibility: 02/07/2019

This document is the Author Accepted Manuscript version of a published work which appeared in its final form in the British Journal of General Practice. The final version of record can be accessed at: <https://doi.org/10.3399/bjgp19X704609>

General rights

Unless a licence is specified above, all rights (including copyright and moral rights) in this document are retained by the authors and/or the copyright holders. The express permission of the copyright holder must be obtained for any use of this material other than for purposes permitted by law.

- Users may freely distribute the URL that is used to identify this publication.
- Users may download and/or print one copy of the publication from the University of Birmingham research portal for the purpose of private study or non-commercial research.
- User may use extracts from the document in line with the concept of 'fair dealing' under the Copyright, Designs and Patents Act 1988 (?)
- Users may not further distribute the material nor use it for the purposes of commercial gain.

Where a licence is displayed above, please note the terms and conditions of the licence govern your use of this document.

When citing, please reference the published version.

Take down policy

While the University of Birmingham exercises care and attention in making items available there are rare occasions when an item has been uploaded in error or has been deemed to be commercially or otherwise sensitive.

If you believe that this is the case for this document, please contact UBIRA@lists.bham.ac.uk providing details and we will remove access to the work immediately and investigate.

Demographic characteristics, disease prevalence, multi-morbidity and visits to emergency department by registrants of a general practice for the homeless

Background: Estimating healthcare needs of the homeless is associated with challenges in identifying eligible population.

Aim: To explore demographic characteristics, disease prevalence, multi-morbidity and visits to accident and emergency (A&E) departments by the homeless population.

Design and setting: EMIS electronic database of patient medical records and Quality and Outcomes Framework (QOF) data of all 928 patients registered with a major specialist homeless primary healthcare centre based in West Midlands of England were analysed.

Methods: Demographic characteristics, prevalence data on 21 health conditions, multi-morbidity and visits to the A&E were explored and compared to the general population using official national data sources or peer-reviewed literature.

Results: Majority were male (89.5%) with a mean (SD) age of 38.3 (11.5) years, and White British (26.3%). Prevalence of substance (13.5%) and alcohol dependence (21.3%), hepatitis C (6.3%) and multi-morbidity (21.3%) were markedly higher than those in the general population. A third (32.5%) visited the A&E in the preceding 12 months. A&E visits were associated with patient history of substance (adjusted OR 2.69) and alcohol dependence (adjusted OR 3.14).

Conclusions: A high prevalence of substance and alcohol dependence and hepatitis C exists amongst the homeless population. Their A&E visit rate is 60 times that of the general population and the extent of multi-morbidity, despite their lower mean age, is comparable to 60-69 year-olds in the general population. Due to the multi-morbidity, the homeless population are at risk of fragmentation of care. Diversification of services under one roof, preventative services and multi-disciplinary care is imperative.

Keywords: homeless persons; general practice; epidemiology, healthcare utilisation

How this fits in

Homeless population face extreme social exclusion. There is a dearth of literature in the United Kingdom (UK) on the healthcare needs of the homeless, as such, most of the literature around healthcare issues of the homeless are of international origin. This research sought to identify demographic characteristics, disease prevalence, multi-morbidity and visits to the A&E department by the registrants of a specialist primary healthcare centre for the homeless using a large sample size. The findings of this study show that homeless populations are at risk of facing fragmentation of care due to high levels of multi-morbidity and demonstrates the need for the provision of preventative health care and multi-sector approaches in addressing their complex healthcare needs and minimising their use of emergency care.

Introduction

Homelessness in England

Homelessness is a widespread issue in the UK,¹ with an estimated 250,000 people known to be currently homeless in England alone.² Over 4,000 people sleep rough on any given night in England with numbers of rough sleepers are rising, particularly in urban areas; in London for example, the number of rough sleepers has doubled in the last six years.³

Healthcare needs of the homeless

There exists a dearth of literature investigating healthcare issues amongst the homeless in the UK. International literature suggest that those experiencing homelessness are significantly disadvantaged in achieving and maintaining a healthy lifestyle.⁴ They face up to twelve times higher mortality rates compared to the general population, mostly due to opioid overdose, accidents, heart failure and infectious diseases.⁴ The negative health consequences of social exclusion are noted to be greater in females than male individuals. A recent UK study identified that rough sleepers and those occupying homeless shelters die at an average age of 47 years.⁵ Health status worsens with increasing length of time as homeless.⁶ Historical estimates have suggested that homelessness is independently linked with high A&E usage.⁷ However, there is limited literature exploring rate of A&E visits and the characteristics within homeless populations associated with increased use of emergency care.

Primary healthcare service provision for the homeless

There has been an emergence of some specialist primary care support for the homeless across the UK. There is at least one such practice in most major cities of the UK offering primary healthcare centres for homeless people and some general practices with particular expertise in homelessness.⁸ The lack of studies in the UK that have investigated the prevalence of key health conditions necessitates the strengthening of the evidence around the primary healthcare needs of homeless populations. Identifying the burden of disease is often challenging in socially excluded populations as

social disadvantage is often not recorded in medical records and the UK general register of births and deaths. Homeless populations also have very limited coverage in routine health surveys due to their often secluded and unstable locations. There is also a need to address the current gap in the range of methodology that has been used to explore the healthcare issues of the homeless. Gathering and analysing healthcare utilisation datasets from a large specialist centre can provide useful data for use by primary healthcare service providers, researchers and decision makers to identify unmet need. It can also aid in the redesigning of services and widening preventative measures for public sector action.

The aim of this study was to explore demographic characteristics, disease prevalence, multi-morbidity and visits to A&E departments by homeless population.

Methods

This study was conducted in a specialist primary healthcare centre for the homeless in the West Midlands. The healthcare centre provides general practice services to the homeless population. Registrants have access to a general practitioner (GP), nurse practitioners, psychotherapy counsellor, podiatrist, alcohol dependence intervention nurse, and street outreach services. The centre does not provide treatment for drug use disorders patients are referred to a dedicated service based in the City.

The QOF and EMIS electronic data of patient medical records were used. The QOF is an annual reward programme for general practice achievements, an aspect of which involves the building of disease registers.^{9,10} EMIS is an online database, which is used by the majority of general practices across the UK to store the clinical data of patients.¹¹ A search function allows the prevalence of health conditions to be gathered amongst the practice registrants. For disease prevalence data, all patient records were searched with relevant read codes.

The data search was undertaken in November 2017 by staff at the general practice with routine access to the datasets using queries specific for a health condition. All data were cleaned and anonymised prior to their handing to the research team. The prevalence of 21 key health conditions were explored. These conditions included cardiovascular disease, mental health, infection, respiratory, neurological disorders, cancer and endocrine disorders. For A&E attendance, a search was run to identify patients' EMIS datasets for the last 12 months (October 2016 – 11 October 2017). Demography data including age, gender, ethnicity and smoking status were extracted. The World Health Organisation (WHO) definition of multi-morbidity, 'the coexistence of two or more chronic conditions in the same individual', was used'.¹²

All data were stored on secure password protected computers. Data were analysed using descriptive and inferential statistics. The comparison of prevalence data across age and gender was undertaken based on the evidence from international literature that health inequality is found to affect socially excluded females and higher aged populations more than the male population.⁴ Comparative data relating to the English or UK general population was taken from a variety of sources including the QOF, national statistics and published literature. In addition, comparison was made to prevalence data as available in the international literature that related to homeless populations. Binary logistic regression analysis was conducted to identify factors that were associated with patient A&E attendance. A&E attendance in the last 12 months was used as an outcome variable. Explanatory variables related to disease areas and any demographic characteristics which showed an association ($p \text{ value} \leq 0.25$)¹³ with the outcome 'A&E attendance in the last 12 months' in the univariate analysis.

Ethical approval was obtained from the University of Birmingham Research Ethics Committee. Birmingham and Solihull Mental Health NHS Foundation Trust classified this research and provided approval as an 'audit' and hence a detailed NHS Ethical submission was not required.

Results

Datasets for all nine hundred and twenty-eight (n=928) registrants were available.

Demography characteristics

The majority of registrants were male (n=831, 89.5%) with 97 (10.5%) female registrants. The mean (SD) age of registrants was 38.3 (11.5) years, with a range of 17-81 years. White British constituted the largest ethnic category (table 1). Ethnicity data of 510 (55%) registrants were not recorded.

A total of 487 (52.3%) were current smokers, which is more than three times the adult smoking rate of 15.5% in the English general population. There were no significant differences between the proportion of male (n=437, 52.3%) and female (n=50, 51.5%) registrants who smoked ($p=0.931$). The highest proportion (% within age groups) of male and female patients who smoked were in the age brackets 40-49 and 50-59 respectively (table 1).

Table 1 to appear here

Prevalence of health conditions

Mental health conditions

Prevalence data was available for depression (as a diagnosis), patients on the mental health register (which includes those diagnosed with schizophrenia, bipolar affective disorder, and other psychoses,

and other patients on lithium therapy), alcohol dependence, and substance dependence. The highest prevalence was observed with alcohol dependence (n=198, 21.3%) followed by substance dependence (n=125, 13.5%). Prevalence rates were not associated with gender (table 2). Those with alcohol dependence were significantly older than those without the diagnosis (table 2).

Cardiovascular health conditions

Prevalence data for a total of four cardiovascular health conditions were available. These included Coronary Heart Disease (CHD), stroke/transient ischaemic stroke (TIA), hypertension and atrial fibrillation. Those with a diagnosis of any of the four cardiovascular conditions were significantly older and predominantly males (table 2).

Infectious diseases

Of the observed prevalence rates amongst three infectious diseases (table n), hepatitis C had the highest prevalence rate of 6.3%. A total of six patients (0.6%) were diagnosed with a HIV infection, and 87 (9.4%) with a sexually transmitted infection (STI). No statistically significant differences in the prevalence rates were identified across gender groups (table 2).

Respiratory health conditions

Data were available for Chronic Obstructive Pulmonary Disease (COPD) and Asthma (table 2). Prevalence rates of 1.5% and 4.2% respectively were observed. In both disease areas, those with confirmed diagnosis were significantly older than those without a diagnosis. Female registrants had significantly higher prevalence rates for asthma than males (table 2).

Neurological disorders

A prevalence rate of 1.5% and 1.1% was observed for epilepsy and migraine respectively (table 2).

Other chronic health conditions

Data were available for six other health conditions including diabetes, cancer, learning disabilities, rheumatoid arthritis, leg ulcers and gastro-intestinal ulcers or bleed. Low prevalence rates were observed for diabetes (2.8%) and cancer (0.4%) (table 2).

Multi-morbidity

A total of 452 (48.7%) patients had at least one chronic medical condition, with 198 (21.3%) patients having at least two chronic medical conditions. There was no difference in the mean (SD) of the number of chronic medical conditions across the gender groups.

Visits to A&E

A total of 302 (32.5%) registrants visited an A&E department in the last 12 months.

A&E attendance data were linked to diagnosis of individual health conditions. In univariate analysis, alcohol dependence (unadjusted OR=3.951, p value<0.001), substance dependence (unadjusted OR=2.688, p value<0.001), epilepsy (unadjusted OR=4.776, p value=0.013), hepatitis C (unadjusted OR=2.735, p value<0.001), leg ulcers (unadjusted OR=2.191, p value=0.004) and STI (unadjusted OR=2.196, p value<0.001) were significantly associated with A&E visits. Patients who had these health conditions were significantly more likely to have visited A&E in the last 12 months. There were no significant differences in the mean ages of those attending and not attending A&E in the last 12 months. A&E attendance was not associated with gender (table 3).

In the binary regression analysis, alcohol dependence and substance dependence were associated with A&E attendance with adjusted OR (95% CI, p value) of 2.85 (2.27-4.34, p<0.001) and 2.31 (1.83-3.94, p=0.001) respectively (table 4).

Discussion

Summary

This study aimed to explore the demographic characteristics, disease prevalence and visits to A&E by the registrants of a specialist centre in West Midlands. Datasets of all registered 928 patients were retrieved and analysed. Demographic characteristics, a range of health conditions, including alcohol and drug use disorder, and A&E attendance data were explored. This study adds to the limited evidence that exists around the prevalence of health conditions and multi-morbidity in homeless population by using a large sample size. This study has demonstrated a high prevalence of multi-morbidity, mental health conditions, particularly substance and drug misuse, and infectious diseases, notably hepatitis C, amongst the homeless population compared to the general population.

A high rate of A&E attendance was observed amongst the study population. Considering all A&E visitors amongst study participants made a minimum of one visit to the A&E, this translates to approximately 60 times the rate of A&E attendance made by the general population.⁴⁸

Strengths and limitations

Similar to other studies utilising routinely collected datasets in investigating disease prevalence and multi-morbidity, this study relied on the diagnosis of the health conditions being accurately recorded in patient medical records; therefore, the prevalence of the health conditions and multi-morbidity, as identified in this study, are likely to be an under-estimation. Particularly, we noted that health conditions such as CHD, stroke, diabetes, cancer, asthma, learning disabilities, and rheumatoid arthritis were found to be under-prevalent in the study participants compared to the findings in the literature.

This study analysed datasets of those who presented at the specialist homeless healthcare centre. This study did not explore the level of engagement of the registrants with the healthcare centre; therefore, the datasets may have been limited because of the inclusion of information of those who regularly attend the practice.

Comparison with existing literature

Substance and/or alcohol dependence have been cited as both a cause and consequence of homelessness.⁴⁹ Previous studies have looked at the extent of self-harm,⁵⁰ mortality linked to mental health conditions, including suicide, amongst homeless population.⁵¹ This study demonstrates that substance and alcohol dependence are important risk factors that makes homeless populations seek emergency care.

This study has also demonstrated a high rate of multi-morbidity amongst the homeless registrants. Given the mean (SD) age of the registrants of the homeless healthcare centre was 38.3 (11.5) years, the proportion of patients with at least two long-term health conditions compares to those aged 60-69 years old in general population.⁵² The proportion of patients who are multi-morbid was identified to be less than that reported in a Scottish study.²¹ The reasons for these differences should be explored; however, it is likely that despite a small sample size in the Scottish study,²¹ researchers had access to individual patient medical notes. Similarly, in our study, the prevalence of mental health conditions, particularly depression, alcohol and drug use disorder, despite being higher than in the general population, was less compared to other studies with the homeless population in the UK.

The prevalence of some cardiovascular health conditions such as hypertension, as well as respiratory health conditions, diabetes and cancer were also noted to be lower. However, literature suggests that the homeless and socioeconomically disadvantaged have both higher mortality rates contributed by these health conditions than the general population and less deprived backgrounds.^{38,53,54} It is highly likely that some of these conditions were not appropriately coded in patient medical records or due to potential under-diagnosis. Health conditions such as hypertension are asymptomatic and it may not be routine practice to record blood pressure in every consultation given the constrained resources that are available in these settings. Information on the length of time the registrants were registered at the practice was not available for this study. Registrants of similar services in other studies have demonstrated participants also reported using mainstream general practices.¹⁸

The number of health conditions investigated for the multi-morbidity analysis in this study compares favourably with other studies. There are no international standards on how many long-term conditions

should feature in the measurement of multi-morbidity, however an average of 18.5 chronic health conditions were featured in a systematic review of international literature featuring 39 studies.⁵⁵ The prevalence of all cardiovascular health conditions, COPD, hepatitis C, diabetes, cancer and leg ulcers were linked to older age and this supports the epidemiological trend in general population.^{23,56-64}

We did not look into repeat attendance of A&E. A previous study has identified that the homeless population constitute approximately 8% of all repeat users.⁷ There is a lack of research investigating in-depth the reasons for such repeat attendance. Repeat attendance could be linked to their poor general health and lifestyle, as well as non-access to or non-use of available primary healthcare services.⁶⁵ Greater use of A&E may impact on patient care, as patients seeing a known and trusted clinician in primary care is imperative for ensuring the continuity of care.⁶⁶

Implications for research and/or practice

This study provides compelling evidence that there exists a high prevalence of key chronic health conditions and multi-morbidity amongst the homeless population. Healthcare professionals facing homeless patients are more likely to encounter multi-morbidity than in mainstream healthcare centres. The extent of multi-morbidity seen in this population is often only encountered in the older population and hence specialist clinical knowledge, alongside multi-disciplinary management, is required for many of these patients. Patients with multi-morbidity often are disadvantaged due to the fragmentation of care.⁶⁷

The high level of multi-morbidity in this population could both be linked to socioeconomic deprivation as well as to the uptake of behaviours such as smoking, alcohol and drug use disorder or both.⁶⁷ Public health, NHS and local government interventions, particularly preventative services in the community and primary care, can prevent multi-morbidity where such outcomes are linked to the implications of the uptake of risky behaviours. The groundwork for further collaboration between such public bodies is already being laid down in the UK, for example through the Homelessness Reduction Act (2017).⁶⁸ The Act places emphasis on multiagency approaches to preventing homelessness and provides an opportunity for public bodies to work more closely with partners and co-produce an approach to homelessness prevention through collaboration and cooperation.

Future longitudinal studies are needed in identifying the contribution of key factors linked to multi-morbidity. There is a continued need to diversify the provision of mental health support including those for substance and alcohol dependence that are easily accessible for this population. Community screening of blood borne viruses, particularly opportunistic screening when presenting for other services, as has been recently piloted in some areas of England,⁶⁹ are recommended.

The barriers associated with access and positive experiences around homeless people's use of primary care and wider community services also needs to be addressed given the health inequalities as demonstrated by this study. Findings of our recent study⁷⁰ shows that there are organisational barriers (e.g. difficulty in registering with a general practice, lack of integration of services including suboptimal communications and transition of care across services) and patient-related barriers (including lack of knowledge and awareness of primary healthcare services, inadequate skills and health literacy) to access and positive experiences of primary healthcare services amongst homeless population. There appear to be confusion around eligibility of homeless people's registration with a general practice and patients have been often denied access contrary to the guidelines that are available for them which states that people do not need a fixed address or identification to register or access treatment at GP practices.⁷¹ Awareness of such policy amongst frontline staff, homeless people and any partner agencies should be strengthened. Patients are often less aware of specialist services for the homeless people existing in their areas. Provision of such specialist services are often temporary solutions and mostly located in areas with a high homelessness. Long term planning could incorporate improving capacity in mainstream general practices. Such improvement will require skills in management of multi-morbidity and the communication skills required to develop rapport with homeless people along with minimising perceived stigma and discrimination for this group in the society and healthcare settings.

A&E attendance data as reported in this study should be treated with caution due to the possibility of unknown confounders and also the chance that visits were not linked to the conditions. It is recommended that data should be supplemented from A&E departments to identify key reasons for repeat attendance.

Future studies should consider using multiple data sources in estimating disease burden. These include consideration of aggregated datasets as utilised in this study, access to individual medical notes, health related data available from other partners including housing and the voluntary sector, datasets from outreach services, surveys of homeless populations to gather self-reported data, prescribing and medicines dispensing data and inclusion of datasets from homeless populations using mainstream services.

Additional information

Funding: This study was funded by the external grant received from Public Health England in the West Midlands and the West Midlands Combined Authority.

Ethical approval: Ethical approval was granted by University of Birmingham. Birmingham and Solihull Mental Health NHS Foundations Trust also approved the study as an audit.

Acknowledgements: We would like to thank staff at the specialist centre for help with extraction and anonymization of the data.

References

1. Fitzpatrick S, Pawson H, Bramley G, Wilcox S, Watts B. *The homelessness monitor: Great Britain*, https://www.crisis.org.uk/media/236829/the_homelessness_monitor_england_2016_es.pdf (accessed: 22 June 2018).
2. Shelter England. *Life on the margins: Over a quarter of a million without a home in England today [press release]. 2016.*
https://england.shelter.org.uk/media/press_releases/articles/life_on_the_margins_over_a_quarter_of_a_million_without_a_home_in_england_today (accessed 9 June 2017).
3. Ministry of Housing, Communities & Local Government. Rough sleeping.
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/682001/Rough_Sleeping_Autumn_2017_Statistical_Release_-_revised.pdf (accessed 02 October 2018).
4. Aldridge RW, Story A, Hwang SW, Nordentoft M, Luchenski SA, Hartwell G, Tweed EJ, Lewer D, Katikireddi SV, Hayward AC.. Morbidity and mortality in homeless individuals, prisoners, sex workers, and individuals with substance use disorders in high-income countries: a systematic review and meta-analysis. *Lancet* 2017; 391(10117): 241-250.
5. Thomas B. *Homelessness kills: an analysis of the mortality of homeless people in early twenty-first century England. 2012.*
https://www.crisis.org.uk/media/236799/crisis_homelessness_kills_es2012.pdf (accessed 6 December 2017).
6. White MC, Tulskey JP, Dawson C, Zolopa AR, Moss AR. Association between time homeless and perceived health status among the homeless in San Francisco. *J Community Health* 1997; 22(4): 271-282.
7. Lynch RM, Greaves I. Regular attenders to the accident and emergency department. *J Accid Emerg Med* 2000; 17(5): 351-354.
8. Crane M, Cetrano G, Joly L, Coward S, Daly B, Ford C, Gage H, Manthorpe J, Williams P. *Mapping of specialist primary health care services in England for people who are homeless*, <https://www.kcl.ac.uk/sspp/policy-institute/scwru/res/hrp/hrp-studies/HEARTH/HEARTH-study-Mapping-FullReport-2018.pdf> (accessed 23 June 2018).

9. NHS digital. *Quality and Outcomes Framework*. 2017. <http://content.digital.nhs.uk/qof> (accessed: 2017 October 31).
10. NHS Employers. *2016/17 General Medical Services (GMS) contract Quality and Outcomes Framework (QOF) 2017*.
<http://www.nhsemployers.org/~media/Employers/Documents/Primary%20care%20contracts/QOF/2016-17/2016-17%20QOF%20guidance%20documents.pdf> (accessed: 2017 October 31).
11. EMIS health. *EMIS Web*. <https://www.emishealth.com/products/emis-web/> (accessed: 2017 October 31).
12. World Health Organization. (2016) *Multimorbidity*.
<http://apps.who.int/iris/bitstream/handle/10665/252275/9789241511650-eng.pdf;jsessionid=AC8442B67FCCDCCD3B29F2479173D9B1?sequence=1> (accessed 7 June 2018).
13. Bursac Z, Gauss CH, Williams DK, Hosmer DW. Purposeful selection of variables in logistic regression. *Source Code Biol Med* 2008; 3(1):17.
14. NHS Digital. *Quality and Outcomes Framework (QOF) - 2016-17*,
<http://digital.nhs.uk/catalogue/PUB30124> (accessed: 2017 December 8).
15. Queen AB, Lowrie R, Richardson J, Williamson AE. Multimorbidity, disadvantage, and patient engagement within a specialist homeless health service in the UK: an in-depth study of general practice data. *BJGP Open* 2017; 1(3): 1-10. DOI: 10.3399/bjgpopen17X100941
16. Homeless link. *The unhealthy state of homelessness: Health audit results*. 2014.
<https://www.homeless.org.uk/sites/default/files/site-attachments/The%20unhealthy%20state%20of%20homelessness%20FINAL.pdf> (accessed 7 June 2018).
17. Hewett N, Hiley A, Gray J. Morbidity trends in the population of a specialised homeless primary care service. *Br J Gen Pract* 2011; 61(584): 200-202.
18. Keogh C, O'Brien KK, Hoban A, O'Carroll A, Fahey T. Health and use of health services of people who are homeless and at risk of homelessness who receive free primary health care in Dublin. *BMC Health Serv Res* 2015; 15: 58.
19. Pryce R, Buykx P, Gray L, Stone T, Drummond C, Brennan A. *Estimates of Alcohol Dependence in England based on APMS 2014, including Estimates of Children Living in a Household with an Adult with Alcohol Dependence*, <http://www.nta.nhs.uk/uploads/estimates-of-alcohol-dependency-in-england%5b0%5d.pdf> (accessed: 2017 December 8).
20. Fazel S, Khosla V, Doll H, Geddes J. The prevalence of mental disorders among the homeless in western countries: systematic review and meta-regression analysis. *PLoS Med* 2008; 5(12): e225.

21. Roberts C, Lepps H, Strang J, Singleton N. *Adult Psychiatric Morbidity Survey: Survey of Mental Health and Wellbeing, England, 2014: Chapter 11 - Drug Use and Dependence*, <https://digital.nhs.uk/catalogue/PUB21748> (accessed: 2017 December 8).
22. Institute of Medicine (US) Committee on Health Care for Homeless People. *Homelessness, Health, and Human Needs*. Washington: National Academies Press; 1988.
23. Bernstein RS, Meurer LN, Plumb EJ, Jackson JL. Diabetes and hypertension prevalence in homeless adults in the United States: a systematic review and meta-analysis. *Am J Public Health* 2015; 105(2): 46.
24. Harris RJ, Ramsay M, Hope VD, Brant L, Hickman M, Foster GR, De Angelis D. Hepatitis C prevalence in England remains low and varies by ethnicity: an updated evidence synthesis. *Eur J Public Health* 2012; 22(2): 187-192.
25. Public Health England. *HIV in the UK - 2016 report*, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/602942/HIV_in_the_UK_report.pdf (accessed: 2017 December 8).
26. Williams SP, Caccamo AE, Kachur R. STI rates among homeless persons in the US. *Sex Transm Infect* 2017; 93(Supplement 2): A227.
27. Snyder LD, Eisner MD. Obstructive Lung Disease Among the Urban Homeless. *Chest* 2004; 125(5): 1719-1725.
28. Kanervisto M, Vasankari T, Laitinen T, Heliövaara M, Jousilahti P, Saarelainen S. Low socioeconomic status is associated with chronic obstructive airway diseases. *Respir Med* 2011; 105(8): 1140-1146.
29. Simpson CR, Hippisley-Cox J, Sheikh A. Trends in the epidemiology of chronic obstructive pulmonary disease in England: a national study of 51 804 patients. *Br J Gen Pract* 2010; 60(576): 277-284.
30. Laporte A, Rouvel-Talleg A, Grosdidier E, Carpentier S, Benoît C, Gerard D, Emmanuelli X. Epilepsy among the homeless: prevalence and characteristics. *Eur J Public Health* 16(5): 484-486.
31. George SL, Shanks NJ, Westlake L. Census of single homeless people in Sheffield. *BMJ* 1991; 302(6789): 1387-1389.
32. Khandor E, Mason K. *The Street Health Report 2007*. <http://www.streethealth.ca/downloads/the-street-health-report-2007.pdf> (accessed: 2017 December 8).
33. Steiner TJ, Scher AI, Stewart WF, Kolodner K, Liberman J, Lipton RB. The Prevalence and Disability Burden of Adult Migraine in England and their Relationships to Age, Gender and Ethnicity. *Cephalalgia* 2003; 23(7): 519-527.
34. Hwang SW, Wilkins E, Chambers C, Estrabillo E, Berends J, MacDonald A. Chronic pain among homeless persons: characteristics, treatment, and barriers to management. *BMC Fam Pract* 2011; 12: 73.

35. Topolovec-Vranic J, Schuler A, Gozdzik A, Somers J, Bourque PÉ, Frankish CJ, Jbilou J, Pakzad S, Lazgare LI, Hwang SW. The high burden of traumatic brain injury and comorbidities amongst homeless adults with mental illness. *J Psychiatr Res* 2017; 87: 53-60.
36. Scott J, Gavin J, Egan AM, Avalos G, Denny MC, Bell M, Dunne F. The prevalence of diabetes, pre-diabetes and the metabolic syndrome in an Irish regional homeless population. *QJM* 2013; 106(6): 547-553.
37. Arnaud A, Fagot-Campagna A, Reach G, Basin C, Laporte A. Prevalence and characteristics of diabetes among homeless people attending shelters in Paris, France. *Eur J Public Health* 2009; 20(5): 601-603.
38. Fazel S, Geddes JR, Kushel M. The health of homeless people in high-income countries: descriptive epidemiology, health consequences, and clinical and policy recommendations. *Lancet* 2014; 384(9953): 1529-1540.
39. Oakes PM, Davies RC. Intellectual disability in homeless adults. *J Intellect Disabil* 2008; 12(4): 325-334.
40. Patterson ML, Moniruzzaman A, Frankish CJ, Somers JM. Missed opportunities: childhood learning disabilities as early indicators of risk among homeless adults with mental illness in Vancouver, British Columbia. *BMJ Open* 2012; 2(6): e001586.
41. Van Straaten B, Schrijvers CT, Van der Laan J, Boersma SN, Rodenburg G, Wolf JR, Van de Mheen D. Intellectual Disability among Dutch Homeless People: Prevalence and Related Psychosocial Problems. *PLoS One* 2014; 9(1): e86112.
42. Nishio A, Yamamoto M, Ueki H, Watanabe T, Matsuura K, Tamura O, Uehara R, Shioiri T. Prevalence of mental illness, intellectual disability, and developmental disability among homeless people in Nagoya, Japan: A case series study. *Psychiatry Clin Neurosci* 2015; 69(9): 534-542.
43. Agale SV. Chronic Leg Ulcers: Epidemiology, Aetiopathogenesis, and Management. *Ulcers* 2013: 1-9.
44. Ford AC, Gurusamy KS, Delaney B, et al. Eradication therapy for peptic ulcer disease in Helicobacter pylori-positive people. *Cochrane Database Syst Rev* 2016; 4: CD003840.
45. Sung JJ, Kuipers EJ, El-Serag HB. Systematic review: the global incidence and prevalence of peptic ulcer disease. *Aliment Pharmacol Ther* 2009; 29(9): 938-946.
46. O'Carroll A, O'Reilly F. Health of the homeless in Dublin: has anything changed in the context of Ireland's economic boom? *Eur J Public Health* 2008; 18(5): 448-453.
47. Lane DA, Lip GY. Ethnic differences in hypertension and blood pressure control in the UK. *QJM* 94(7): 2001; 391-396.
48. Public Health England. *Rate of accident and emergency (A&E) attendances per population by PCT. 2015.* https://fingertips.phe.org.uk/documents/Atlas_2011_EmergencyCare.pdf (accessed 13 June 2018).

49. Johnson G, Chamberlain C. Homelessness and Substance Abuse: Which Comes First? *Australian Social Work* 2008; 61(4): 342-356.
50. Bickley H, Kapur N, Hunt IM, Robinson J, Meehan J, Parsons R, McCann K, Flynn S, Burns J, Amos T, Shaw J. Suicide in the homeless within 12 months of contact with mental health services. *Soc Psych Psychiatric Epidem* 2006; 41(9):686-91.
51. Hassanally K, Asaria M. Homeless mortality data from East London. *London J Prim Care* 2018; DOI: 10.1080/17571472.2018.1458443
52. Department of Health and Social Care. *Long Term Conditions Compendium of Information: Third Edition. 2012.* <https://www.gov.uk/government/publications/long-term-conditions-compendium-of-information-third-edition> (accessed 7 June 2018).
53. Hwang SW. Homelessness and health. *CMAJ* 2001; 164(2): 229-233.
54. Baggett TP, Chang Y, Porneala BC, Bharel M, Singer DE, Rigotti NA. Disparities in Cancer Incidence, Stage, and Mortality at Boston Health Care for the Homeless Program. *Am J Prev Med* 2015; 49(5): 694-702.
55. Diederichs C, Berger K, Bartels DB. The measurement of multiple chronic diseases--a systematic review on existing multimorbidity indices. *J Gerontol A Biol Sci Med Sci* 2011; 66(3): 301-311.
56. Jones CA, Perera A, Chow M, Ho I, Nguyen J, Davachi S. Cardiovascular Disease Risk Among the Poor and Homeless – What We Know So Far. *Curr Cardiol Rev* 2009; 5(1): 69-77.
57. Jousilahti P, Vartiainen E, Tuomilehto J, Puska P. Sex, Age, Cardiovascular Risk Factors, and Coronary Heart Disease. *Circulation* 1999; 99(9): 1165-1172.
58. Nichols M, Townsend N, Scarborough P, Rayner M. Trends in age-specific coronary heart disease mortality in the European Union over three decades: 1980-2009. *Eur Heart J* 2013; 34(39): 3017-3027.
59. Kirkman MS, Briscoe VJ, Clark N, Florez H, Haas LB, Halter JB, Huang ES, Korytkowski MT, Munshi MN, Odegard PS, Pratley RE.. Diabetes in older adults. *Diabetes Care* 2012; 35(12): 2650-2664.
60. Fukuchi Y. The Aging Lung and Chronic Obstructive Pulmonary Disease: Similarity and Difference. *Proc Am Thorac Soc* 2009; 6(7): 570-572.
61. Driver JA, Djoussé L, Logroscino G, Gaziano JM, Kurth T. Incidence of cardiovascular disease and cancer in advanced age: prospective cohort study. *BMJ* 2008; 337: a2467. DOI: 10.1136/bmj.a2467
62. Karamichalakis N, Letsas KP, Vlachos K, Georgopoulos S, Bakalakos A, Efremidis M, Sideris A. Managing atrial fibrillation in the very elderly patient: challenges and solutions. *Vasc Health Risk Manag* 2015;11: 555-562.
63. Graham ID, Harrison MB, Nelson EA, Lorimer K, Fisher A. Prevalence of lower-limb ulceration: a systematic review of prevalence studies. *Adv Skin Wound Care* 2003; 16(6): 305-316.

64. High KP, Marcus E, Tur-Kaspa R. Chronic Hepatitis C Virus Infection in Older Adults. *Clin Infect Dis* 2005; 41(11): 1606-1612.
65. Gunner E, Chandan C, Marwick S, Saunders K, Yahyouche A, Paudyal V. Perspectives of homeless people on their access and use of primary healthcare services: A qualitative study. Submitted to British Journal of General Practice.
66. Freeman G, Hughes J. *Continuity of care and the patient experience*. 2010. https://www.kingsfund.org.uk/sites/default/files/field/field_document/continuity-care-patient-experience-gp-inquiry-research-paper-mar11.pdf (accessed 22 June 2018).
67. Barnett K, Mercer SW, Norbury M, Watt G, Wyke S, Guthrie B Epidemiology of multimorbidity and implications for health care, research, and medical education: a cross-sectional study. *Lancet* 2012; 380(9836): 37-43.
68. Paudyal V, Saunders K. Homeless reduction act in England: impact on health services. *The Lancet* 2018; 392(10143) 195–197.
69. The hepatitis C Trust. Pharmacy-based testing for hepatitis B and hepatitis C. <http://www.hcvaction.org.uk/sites/default/files/resources/Pharmacybased%20testing%20for%20hepatitis%20B%20and%20hepatitis%20C%20%28hep%20c%20trust%29.pdf>. (accessed 26 June 2018).
70. Gunner E, Chandan S, Marwick S, Saunders K, Burwood S, Yahyouche A, Paudyal V. Perspectives of homeless individuals on the provision and accessibility of primary healthcare services: A qualitative study. Submitted to British Journal of General Practice 2018.
71. NHS England. Patient Registration Standard Operating Principles for Primary Medical Care (General Practice). <http://d1c7lpjmvh0qr.cloudfront.net/uploads/d/c/n/pat-reg-sop-pmc-gp.pdf> (accessed 11 December 2018).