Type 2 diabetes management in the homeless population: health inequality and the Housing First approach

FEE BENZ

Abstract
Homelessness is a significant public health concern, with a substantial homeless population in England. Homeless individuals face unique challenges, including a heightened risk of violence, inadequate nutrition, limited healthcare access and increased prevalence of co-morbidities. Type 2 diabetes (T2DM) is notably more prevalent among homeless individuals compared to the general population, leading to higher rates of diabetes-related emergency department visits and hospitalisations.

There is limited research examining diabetes management specifically in homeless populations, and a comprehensive review addressing the barriers and targeted interventions for this vulnerable group is currently lacking. This article aims to explore the health inequalities experienced by homeless individuals in relation to T2DM management, and to evaluate the Housing First approach as a potential intervention. Housing First, which provides immediate access to permanent housing, has demonstrated efficacy in enhancing housing stability and healthcare behaviours among homeless populations. Moreover, the available evidence suggests that Housing First programmes may improve diabetes-related outcomes, including HbA1c testing and medication adherence, and may lead to fewer hospitalisations.

Br J Diabetes 2023;23:69-76
https://doi.org/10.15277/bjd.2023.421

Key words: type 2 diabetes mellitus, housing first intervention, homelessness

Case Study
A 56-year-old homeless man with a history of hypertension, alcoholism and poorly controlled type 2 diabetes (T2DM) was brought to the emergency department by paramedics after being found unresponsive at night on the street. He was noted to be hypotensive, febrile and severely dehydrated. A glucose measurement revealed severe hyperglycaemia at 31 mmol/L, and subsequent blood tests confirmed a diagnosis of diabetic ketoacidosis (DKA). The medical team started the patient on IV fluids, insulin and potassium.

On physical examination, the patient was further noted to have multiple necrotic ulcers with surrounding erythema and purulent discharge on his lower legs. The examination also revealed several other infected scrapes and cuts on his extremities. The medical team added IV antibiotics and sterile saline irrigation to the treatment regimen to treat the patient’s wounds.

During his hospital stay, his care was complicated by his poorly managed co-morbidities, alcoholism and general aversion to the hospital setting. Eventually, despite the medical team’s best efforts, the wound care was declared unsuccessful, and the decision was made to amputate the patient’s left second and third toes.

Introduction
Homelessness is a significant public health concern. There are more than 271,000 homeless individuals living in England, among whom 3,069 are rough sleepers without access to hostels, shelters or campsites on any night.1,2 The homeless population is a uniquely vulnerable patient group, facing increased risk of sexual and physical violence, poorer nutritional status, lower medication compliance rates, less dependable wound care, reduced access to healthcare causing delayed presentations, and higher rates of co-morbidities.3–5 As the case study exemplifies, these complexities complicate and hamper T2DM care for homeless individuals. Indeed, it is estimated that the prevalence of T2DM is 33% more common in homeless individuals (8–22%) compared to the UK population-wide prevalence (6%).6–8 Within a given year, homeless individuals with T2DM are five times as likely to report diabetes-related emergency department visits or hospitalisations compared to stably-housed individuals.9 These figures highlight the need for effective public health interventions to address poor T2DM management and to reduce severe complications among the homeless population.

Despite the significant burden of homelessness on diabetes management, limited research has been conducted on diabetes management in the homeless population. To the author’s best knowledge, there is no specific review addressing the unique barriers to diabetes treatment and efficacy of the Housing First approach in homeless individuals living with diabetes. Hence,
this paper examines homelessness as a source of health inequality, addresses the specific barriers to T2DM management that homeless individuals face, and evaluates the Housing First public health initiative as a potential prevention tool for poor T2DM management among homeless individuals.

**Homelessness and health inequality**

The 1996 UK Housing Act defines homelessness as:

1. having no accommodation available for continued occupation,
2. having accommodation without secure entry to it, or
3. having moveable accommodation (e.g. a tent, car) without a permanent legal space to place it.9

Here, we expand upon this legal definition and define homelessness as individuals sleeping rough (e.g. in the open air, in tents, bus shelters or parks), sleeping in temporary accommodation (e.g. shelters or hostels) or sleeping in unsuitable housing (e.g. sofa surfing).10

Health inequality is a systematic discrepancy in health outcomes between different populations.

Homelessness is associated with significant health inequality and poor health outcomes. The UK Office for National Statistics (ONS) found that homeless individuals are up to three times more likely to die prematurely compared to the general population, with an average life expectancy of just 47 years compared to 87 years in the general population.11,12 Moreover, the estimated number of deaths among homeless people has increased by 53.7% since ONS began recording homeless deaths in 2013.12 In 2020-2021, approximately one in three deaths were related to drug poisoning, 13% were due to suicide, 10% were caused by alcohol-specific pathology and 8% were due to assault.12

Homelessness is also associated with T2DM-specific health inequalities. In 2021, T2DM accounted for 1% of deaths in homeless individuals aged 20-44 years, compared to 0.01% of deaths in the same age group in the general population.11,12

Homeless people with diabetes also report higher average glycated haemoglobin levels (HbA1c), indicating poorer diabetes control; one cross-sectional study reported that 40% of homeless participants measured an HbA1c level above 64 mmol/mol.11,12 Moreover, people with diabetes without housing are four times more likely to experience diabetes-related hospitalisation;5 56% of hospitalisations were due to mixed hyperglycaemic coma with acidosis and 36% due to diabetic ketoacidosis (DKA).14 Lastly, homeless people with diabetes have significantly higher rates of lower limb amputations than housed people with diabetes.5

**Causes of health inequalities in homelessness**

Two Canadian interview-based studies15,16 of 96 participants with lived experience of homelessness and diabetes highlighted the significant challenges faced by homeless individuals living with T2DM. 15,16 These studies identified ten key barriers to diabetes management in this population: (i) pre-existing mental health disorders, (ii) alcohol/drug addiction, (iii) chronic medical conditions, (iv) exposure to harsh weather, (v) poor access to T2DM-friendly food, (vi) theft of medication and footwear, (vii) inaccessible sanitation, (viii) lack of housing, (ix) difficult-to-navigate services and (x) stigma/discrimination (see Table 1).

Homless individuals experience significantly higher rates of mental illness, alcohol/drug dependency and chronic physical illness than housed individuals. In 2020/2021, ONS found that 59% of individuals sleeping rough have a history of mental health problems, 47% of alcohol/drug dependency, 33% of chronic physical illness, and the incidence of chronic health conditions is three times greater in the homeless population compared to housed individuals.17,18

Homeless individuals are also exposed to harmful environmental/communal factors, including extreme weather conditions, poor food supply, abuse and inadequate access to facilities. Up to 62% of homeless individuals are affected by heat-related illness,19 and 43-78% of homeless individuals report being unable to meet their daily nutritional needs.20,21 Further, 80% of homeless individuals have experienced antisocial behaviour or sexual/physical abuse within the last year, including being deliberately urinated on or kicked.22 Individuals who lack secure housing have limited access to sanitation facilities such as restrooms and showers, which puts them at a significant risk of being exposed to hazardous chemicals, waterborne diseases, pollution, and unsafe water sources.23

Homeless individuals also face barriers to accessing medical care. They experience higher rates of discrimination and...
unprofessional behaviour from healthcare professionals, which leads to a lack of confidence, feelings of professional inadequacy, and negative attitudes towards the care environment.\textsuperscript{24} This can decrease and delay seeking healthcare, which may lead to more severe illness at presentation.\textsuperscript{14,24} Notably, failure to see a primary care physician in the previous year was the strongest predictor of diabetes-related hospital admission in a study exploring hospitalisation among diabetic homeless individuals.\textsuperscript{14}

The evidence presented here highlights the need for public health interventions to address barriers to T2DM management in the homeless population. Figure 1 summarises the various factors contributing to health disparities in diabetes management among homeless individuals. Each of these factors presents a potential opportunity for intervention.

**Public health interventions for the management of T2DM**

Public health interventions for T2DM traditionally focus on improving individual health behaviours and healthcare access. While such interventions have moderate to good success in the general population, homeless individuals face unique and often complex barriers to diabetes care that population-wide interventions do not address.\textsuperscript{19} Table 2 presents the findings of a brief scoping review of traditional public health interventions offered to homeless individuals with type 2 diabetes.\textsuperscript{26-31}

We identified seven studies assessing diabetes management interventions among homeless individuals, including a meta-analysis of six studies not otherwise included in our total. Offered interventions included diabetes education programmes, medicine distribution, food resource guidance and provision of targeted medical care. Notably, all studies reported high attrition rates: only a median 32\% of participants were retained for the full duration of the intervention. Participants reported several barriers to continued participation, including lacking facilities (e.g. to inject medication, charge electronic devices or prepare food), competing priorities (e.g. securing a sleeping place) and (iii) inaccessible services (e.g. inability to track scheduled appointments, lack of online resource and limited access to transportation).

Findings of the included studies were mixed. Two studies reported short-term declines in HbA\textsubscript{1c} levels, but these did not persist after six months. Three studies reported improved diabetes knowledge and perceived peer support, although perceived empowerment did not increase in any study. Lastly, two studies reported improved quality of diet compared to baseline, but most participants were unable to achieve a diet of three adequate meals per day.

Importantly, despite some positive outcomes, the high drop-out rate indicates low efficacy of the evaluated interventions among the homeless populations. Overall, the identified barriers to continued participation highlight the need for secure housing prior to engaging with secondary, diabetes-specific interventions.\textsuperscript{25}

**The Housing First approach**

Housing First is an intervention that emerged in the last decade. It is rooted in the belief that housing is a fundamental human right, access to which should be provided immediately and without requiring proof of ‘readiness’ for housing.\textsuperscript{32-34} The Housing First intervention provides wholistic, open-ended support typically supplemented with specialist support and additional services such as addiction counselling. Conventional housing initiatives require homeless individuals to progress stepwise from emergency shelters to transitional accommodation before they become eligible for permanent supportive housing. Moreover, access to permanent housing is often conditional on meeting strict requirements, such as sobriety and acceptance of psychiatric treatment, to demonstrate ‘housing readiness.’\textsuperscript{32}

The Housing First approach was developed in 1992 in New York and has since been widely adopted across North America, Denmark, Finland and France.\textsuperscript{35} The first UK Housing First project was established in Scotland in 2010 and since then several Housing First projects have been set up in London, Liverpool, Greater Manchester and the West Midlands.\textsuperscript{35} In 2017, the UK government released £28 million pounds of funding for Housing First pilot projects across the UK.\textsuperscript{36} In 2020, a total of 87 services had been established that supported a total of 1,995 individuals.\textsuperscript{37}
### Table 2. T2DM interventions in the homeless population

<table>
<thead>
<tr>
<th>Target</th>
<th>First author (year)</th>
<th>Sample size</th>
<th>Country</th>
<th>Description of intervention</th>
<th>Assessment of intervention</th>
<th>Summary of outcomes</th>
<th>Attrition</th>
<th>Barrier to care</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual behaviour</td>
<td>Davis (2016)</td>
<td>26</td>
<td>USA</td>
<td>A 4-week peer-led diabetes education programme</td>
<td>Surveys and interviews</td>
<td>Participants’ self-reported knowledge of diabetes, but not self reported empowerment increased</td>
<td>33% of participants were retained</td>
<td>Inability to implement learned knowledge due to lack of resources</td>
</tr>
<tr>
<td></td>
<td>Wilk (2002)</td>
<td>23</td>
<td>USA</td>
<td>Free-of-charge insulin pens distributed via a community centre</td>
<td>HbA1c levels at three and six months</td>
<td>Average HbA1c measurements did not change significantly</td>
<td>70% of participants were retained</td>
<td>Inability to safely inject and store medication (theft) and poor access to top-up medication.</td>
</tr>
<tr>
<td></td>
<td>Marpadga (2019)</td>
<td>143 (10 homeless)</td>
<td>USA</td>
<td>A food resource referral programme for food-insecure diabetics</td>
<td>Semi-structured interview</td>
<td>10/31 interviewed participants successfully connected to food resources</td>
<td>18% of referrals resulted in engagement with the referred services 21% of participants were retained</td>
<td>Perceived ineligibility, inaccessibility due to location/ opening hours, and lack of access to cooking facilities</td>
</tr>
<tr>
<td>Healthcare access</td>
<td>Nelson (2021)</td>
<td>506 (58 homeless)</td>
<td>USA</td>
<td>Monthly phone coaching to improve diabetes care</td>
<td>HbA1c levels at six and 12 months</td>
<td>HbA1c scores significantly decreased at six months, but not at 12 months</td>
<td>88% of participants were retained</td>
<td>Lack of mobile phones, lack of resources to implement learned knowledge, competing priorities and poor family/ friend support</td>
</tr>
<tr>
<td></td>
<td>Savage (2008)</td>
<td>43</td>
<td>USA</td>
<td>A nurse-run clinic set up in a meal-providing facility for homeless individuals, open on two evenings per week</td>
<td>Survey</td>
<td>At two months, mental health and self-reported vitality improved but physical health did not</td>
<td>32% of participants were retained</td>
<td>Limited availability of care, competing priorities, and difficulty tracking opening times</td>
</tr>
<tr>
<td></td>
<td>Moczygemba (2021)</td>
<td>30</td>
<td>USA</td>
<td>Free smartphones with an in-built app linking hospital staff to community paramedics to facilitate post-discharge care</td>
<td>Survey</td>
<td>Mental health and medication adherence improved when the app was used</td>
<td>The app was only used in 19% of hospital visits</td>
<td>Theft of phones, lack of charging facilities and competing priorities</td>
</tr>
<tr>
<td>Meta-analysis</td>
<td>Constance &amp; Lusher (2020)</td>
<td>6 studies</td>
<td>Canada (3), USA (3)</td>
<td>Diabetes education (4), blood glucose monitoring supplies (2), medication and prescription assistance (3), food resources (4)</td>
<td>Interview (2), surveys (2), HbA1c levels (2), LDL levels (1)</td>
<td>One of four studies reported improved diet, although only 27% consumed three meals as they left the shelter after breakfast</td>
<td>Where participant retention was reported it ranged from 5% to 56%</td>
<td>Inability to implement learned knowledge, inability to safely inject medication. Limited exposure to interventions, due to leaving shelters after breakfast Poor access to transportation and appointment management tools</td>
</tr>
</tbody>
</table>
Housing First has demonstrated significant success in increasing housing stability. Analysis from the multi-site Canadian Housing First project ‘Chez Soi’ following 7,862 adults over two years found that Housing First clients were over four times (RR=4.12) more likely to remain housed after two years compared to treatment as usual (TAU). In England and Scotland, Housing First pilots achieved a tenancy sustainment rate between 80-89% over two years (2018 to 2020). Moreover, a recent report from the Centre for Social Justice concluded that Housing First can prevent vulnerable individuals from becoming homeless by expanding services to at-risk groups (e.g. prison leavers, care leavers and victims of domestic abuse).

Although Housing First programmes effectively improve housing stability and physical health, some authors have raised concerns about the lack of compulsory engagement with supportive services. They suggest this may negatively affect health outcomes, as individuals may not have the necessary incentives to engage with employment, social and psychological/addiction counselling. Indeed, Housing First users have a high rate of mental health and substance-use comorbidities. Despite this criticism, evidence from European Housing First projects in Amsterdam, Copenhagen and Glasgow indicate good uptake of supportive services, with clients receiving support for 4.5 to 10 hours each week. Moreover, data from the Canadian Chez Soi project indicate improved mental health and quality of life in Housing First clients compared to TAU.

Findings relating to substance abuse among Chez Soi users are mixed. While most studies report significant reductions in substance abuse among Housing First clients, some have found no significant effects and one study reported increases in alcohol consumption compared to baseline.

In England, 66% of surveyed Housing First users reported improved mental health since joining the programme and reduced rates of severe mental illness (ARR=34%), although a minority of individuals experienced deteriorating mental health. A 2015 evaluation of nine Housing First services in England found that Housing First programmes reduced the incidence of drinking alcohol on the street (ARR=22%), drinking alcohol until intoxication (ARR=15%) and illicit drug consumption (ARR=13%) compared to baseline. Similarly, an international review of Housing First projects in Canada, Australia, the Netherlands, Denmark, Portugal and the UK concluded that overall Housing First is associated with improvement or stabilisation of mental health and substance use symptoms, and that Housing First programmes perform at least as well as TAU in addressing mental health and substance use disorders.

A second concern with Housing First programmes is the cost-effectiveness of its implementation and the integration of programmes into existing housing markets. In 2020, the National Housing Federation (NHF) assessed the willingness of Housing Associations to participate in Housing First models. NHF found that Housing Associations overwhelmingly considered participation in Housing First projects ‘attractive’ and that participating associations incurred no additional costs in providing Housing First services compared to other general needs properties. Further, a 2022 report published by the UK Department for Levelling Up, Housing and Communities estimated that the provision of 16,450 Housing First places over three years would cost £9,700 per client per annum, while an additional £15,100 per client would be saved each year on other costs such as homelessness services, criminal justice systems, the NHS, mental health services and substance disorder services.

**Housing First and diabetes management**

To the author’s best knowledge, only two studies are currently available that assessed the impact of Housing First programmes on diabetes management in homeless individuals. One of the studies was conducted on a small scale and involved 10 homeless individuals with diabetes who were enrolled in a Housing First programme and followed up for three months. The study found that the Housing First programme led to a significant reduction in HbA1c levels (an average reduction of 22%), and a significant increase in self-efficacy and diabetes foot self-care.

The second study was conducted by Lim et al. and followed 7,525 previously homeless individuals participating in a Housing First programme based in New York over two years. The programme provided permanent housing to chronically homeless adults with serious mental illness, substance use disorders, HIV/AIDS, and former foster youth at risk of homelessness. The evaluation focused on 7,862 eligible adults who were Medicaid recipients during at least 80% of their follow-up time. The study evaluated two subgroups: 1,489 adults diagnosed with diabetes and 6,036 without a record of a diabetes diagnosis.

Overall, persons in the Housing First programme received more medical evaluations (RR=1.05) and experienced fewer hospitalisation (RR=0.73) and fewer emergency department visits (RR=0.73). Among individuals with diabetes, those in the Housing First programme were more likely to receive HbA1c testing (RR=1.10), lipid testing (RR=1.09) and diabetes medication prescriptions (RR=1.23). Moreover, diabetic individuals in the Housing First programme experienced fewer diabetes-related hospitalisations (RR=0.77) and emergency department visits (RR=0.63). Finally, Housing First participants without diabetes at baseline had a lower risk of developing new-onset diabetes than TAU participants during the two-year follow-up period (RR=0.87).

In summary, Housing First interventions have successfully improved housing stability and reduced the burden on the healthcare system for homeless individuals, including those with serious mental illness and substance use disorders. Two studies on the impact of Housing First programmes on diabetes management in homeless individuals have found that Housing First participants received more medical evaluations, experienced fewer hospitalisations and emergency department visits, and were more likely to receive diabetes-related testing and medications. While these findings are promising, there is still a lack of research on the specific impact of Housing First.
**Key messages**

- T2DM Prevalence and Complications: There is a higher prevalence and rate of T2DM complications among the homeless population, leading to increased emergency visits and hospitalisations.
- Complex Barriers to Management: Homeless individuals face multifaceted barriers to T2DM management, including mental health issues, substance abuse, and environmental challenges.
- Limited Success of Traditional Interventions: Conventional public health interventions for T2DM show high attrition and limited efficacy in homeless populations.
- Housing First Efficacy: The Housing First approach improves housing stability, healthcare behaviours and T2DM management outcomes in the homeless population.
- Research Gap in Homeless Diabetes Care: There is a need for more focused research on the effectiveness of Housing First in T2DM management among the homeless.

Programmes on diabetes management in homeless populations. Future studies could explore the long-term effects of Housing First programmes on diabetes outcomes and investigate potential barriers to diabetes management in homeless people and how Housing First programmes can address these challenges. More research is needed to determine the appropriate population for Housing First programmes and to integrate substance use services better.

**Conclusions**

Homelessness is a significant public health concern that leads to health inequality and poor health outcomes, particularly in the management of T2DM. Homeless individuals face unique and complex barriers to diabetes care that traditional public health interventions do not adequately address.

The Housing First approach has emerged as a promising public health intervention that has demonstrated significant success in increasing housing stability, healthcare behaviours and overall survival. In addition, Housing First programmes have been shown to reduce the financial burden of homelessness on the healthcare system significantly, with an average cost reduction of £15,100 per person per annum.

Although there is a lack of research on the specific impact of Housing First programmes on diabetes management in homeless populations, the available studies suggest that Housing First programmes may improve diabetes-related testing and medications, reduce diabetes-related hospitalisations and emergency department visits, and increase self-efficacy and diabetic foot self-care. Further research is needed to determine the appropriate population for Housing First programmes and to explore the long-term effects of Housing First programmes on diabetes outcomes.

Overall, effective public health interventions are urgently needed to address the barriers to T2DM management faced by homeless individuals and to reduce serious T2DM complications among this vulnerable population.

**Conflict of interest** None.

**Funding** None.

**References**

16. Grewal EK, Campbell RB, Booth GL, et al. Using concept mapping...


---

### ACCU-CHEK®

**Turn numbers into better outcomes**

The Accu-Chek Instant meter and mySugr® app help your patients better self-manage their diabetes, supporting personalised treatment decisions for better therapy outcomes.¹

By encouraging your patients to connect their Accu-Chek Instant meter to our mySugr app*, you could help them reduce estimated HbA1c (eHbA1c) and improve glycaemic control.²

---

**Find out more**

Diabetes.Roche.com/hcp-gb/RWD

---

¹ The image and the product are not meant to replace professional medical advice. It is intended for healthcare professionals to use when discussing with patients. Roche does not make any representations or warranties, express or implied, with respect to the accuracy or completeness of the information presented. The product information is subject to change and should be reviewed regularly for the most current information.

² The mySugr logbook is licensed for people with diabetes over the age of 18 years. The mySugr Blood Glucose Calculator is licensed for people with diabetes over the age of 18 years. (References: 1. Debong F, Mayer H, and Kober J. Real-World Assessments of mySugr Mobile Health App. Diabetes Technol Ther. 2019; 2. MacC, Mayer R, Ruch B. Real World Data Analysis shows a significant improvement in glycaemic management when using a blood glucose monitor connected with a mobile health application in UK users with type 2 diabetes. Diabetes.UK Professional Conference 2023 poster session: 26-28 April, Liverpool, UK.) Roche Diabetes Care Limited. All rights reserved. ACCU-CHEK®, ACCU-CHEK® INSTANT® and mySugr® are trademarks of Roche. All other trademarks or brand names are the property of their respective owners. © 2023 Roche Diabetes Care Limited. All rights reserved. Roche Diabetes Care Limited. Charles Avenue, Burgess Hill, West Sussex, RH15 9RY, UK. Company Registration Number: 01555399. Date of preparation: November 2023. BIRE0225-UK-6721) For healthcare professional use only in the UK and Ireland. Not for distribution.