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Review

Homeless adults' access to dental services and strategies to improve their oral health: a systematic literature review

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Abstract. Homeless people have poor oral health and high treatment needs, yet tend to make problem-based dental visits. This review aimed to determine how and where homeless adults receive oral health care, the barriers that prevent homeless adults accessing dental care and find strategies to promote oral health to homeless adults. The databases MEDLINE via OvidSP, PubMed, CINAHL and Scopus were searched using the keywords: homeless, roofless, houseless, rough sleeper, couch surfer, shelter, hostel, dental and oral health. The inclusion criteria were: participants over the age of 17 years, studies written in English, based in developed countries and published after 2003. Selected articles were assessed using the Mixed Methods Appraisal Tool and data extracted were thematically analysed. Twenty-two studies met the inclusion criteria. Five main themes were found: how homeless people accessed dental care; factors affecting the uptake of care; strategies used to improve access to care; the effect of non-dental staff on dental care; and challenges with providing care to homeless people. Dental care for homeless adults was affected by numerous factors. Improving their access to dental services requires collaboration between support service providers, dental care to be near homeless populations and flexibility by dental services.

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Introduction

Globally, the oral health of homeless adults is poor (De Palma *et al*. 2005; Conte *et al*. 2006; Luo and McGrath 2006; Collins and Freeman 2007; Daly *et al*. 2010*a*; Simons *et al*. 2012; Figueiredo *et al*. 2013; de Pereira *et al*. 2014; Ford *et al*. 2014) and is reflected as observed need for restorative dental treatment (De Palma *et al*. 2005; Luo and McGrath 2006; Figueiredo *et al*. 2013; de Pereira *et al*. 2014; Ford *et al*. 2014), the presence of calculus or gingival bleeding on probing (De Palma *et al*. 2005; Luo and McGrath 2006; Collins and Freeman 2007; Daly *et al*. 2010*a*; Figueiredo *et al*. 2013; Ford *et al*. 2014). There is also a high need for emergency dental treatment by homeless adults (Conte *et al*. 2006; Figueiredo *et al*. 2013). In Adelaide, over two-thirds of homeless adults felt they needed dental treatment (Parker *et al*. 2011).

Having a need for dental treatment, does not always result in seeking care (Simons *et al*. 2012; Ford *et al*. 2014). Populations reliant on publicly funded dental programs are affected by system-level barriers to care. In the United States (US), dentists were discouraged from taking on Medicaid patients by poor remuneration rates, denial of claims and a high administrative burden (Nebeker *et al*. 2014). In Canada, a lack of dentists willing to accept publicly funded patients limited their access to care (Bedos *et al*. 2003). Cuts to US Medicaid dental programs resulted in an increase in dental presentations to hospital emergency departments, suggesting that dental care could not be considered as isolated from other healthcare systems (Cohen *et al*. 1996).

A better understanding of how and where homeless adults access dental care, the factors that prevent access and the strategies that have been used to promote oral health to that population will assist in the development of dental programs to facilitate regular preventive dental visits and improved oral health. In 2003, two review articles were published about homelessness and oral health; one in the United Kingdom (UK) (British Dental Association 2003) and one in the United States (US) (King and Gibson 2003). They highlighted the poor oral and general health of homeless people, the barriers they faced when accessing health care and suggested how dental access could be improved.

This review updates the literature describing programs to improve homeless adults' access to dental services and to promote oral health.

Methods

Review questions

1. How and where do homeless people seek dental care and advice?
2. What barriers prevent homeless adults from accessing dental care?
3. What strategies exist for the promotion of oral health to homeless people?

Selection criteria

The review included studies written in English, based in developed countries, published after 2003, and that reported primary research focussing on homeless adults. Studies of young adults and adolescents were included if participants made independent oral health decisions. It excluded studies that focussed on homeless mothers making care decisions about their children's dental care and homeless young children.

Search strategy

The MEDLINE via OvidSP, PubMed, Cumulative Index to Nursing Allied Health Literature (CINAHL) and Scopus databases were searched using Boolean operators and the following keywords: homeless, roofless, houseless, rough sleeper, couch surfer, shelter, hostel, dental and oral health.

The search was conducted by a single reviewer (J. Goode). After removing duplicates, the titles of the remaining studies were screened and irrelevant studies excluded. The abstracts of the remaining studies were reviewed for relevance by two reviewers (J. Goode, H. Hoang) before the full text was reviewed. Reference lists of the selected studies were searched for additional references.

Assessment of methodological quality

The methodological quality of the selected studies was assessed and scored using the Mixed Methods Appraisal Tool (MMAT) (Pluye *et al*. 2011). Studies meeting all of the assessment criteria scored one; scores of less than one indicated that fewer criteria had been met (Pluye *et al*. 2011). Two reviewers (J. Goode, H. Hoang) independently assessed and rated the studies and any disagreements were resolved through discussion or with a third reviewer (L. Crocombe).

Data extraction

Data extracted from the reviewed articles included country, participant details, study design and a description of the findings that related to the three review questions. Extracted data were analysed and common themes were recorded and sorted to produce a narrative description of the theme.

Results

From a pool of 235 articles, 22 met the inclusion criteria (Fig. 1). Quality analysis outcomes are reported in Tables 1–4. The characteristics and main findings of the studies are shown in Table 5. Eight studies were conducted in the UK, seven in the US, two in Australia, two in Canada, two in Ireland and one in Sweden.

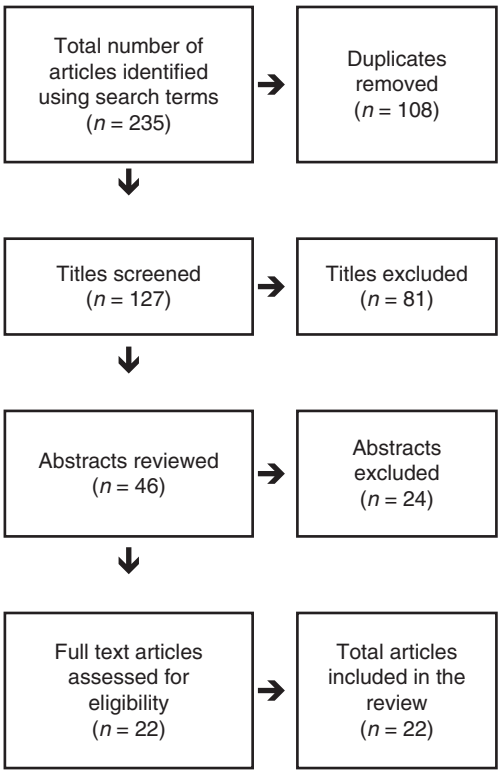

Fig. 1. Search strategy for the systematic review.

Accessing dental care

The review found that homeless people access dental care from dental practitioners (Hill and Rimmington 2011; Parker *et al*. 2011; Simons *et al*. 2012), students of dentistry (Lashley 2008; Seirawan *et al*. 2010; Abel *et al*. 2013) and dental hygiene (Rowan *et al*. 2013), doctors (Lashley 2008; Van Hout and Hearne 2014) and hospital emergency departments (EDs) (Robbins *et al*. 2010; Figueiredo *et al*. 2016). Dental visits were commonly made by homeless people for dental problems (Hill and Rimmington 2011; Parker *et al*. 2011; Coles *et al*. 2013). Problems were often self-managed using prescription or illicit drugs, alcohol or self-treatment (Van Hout and Hearne 2014). Alternatively, symptomatic relief was sought from doctors (Lashley 2008; Van Hout and Hearne 2014) or at an ED (Robbins *et al*. 2010; Figueiredo *et al*. 2016). In Toronto, homeless people were over twice as likely as people living on low incomes to attend an ED with a non-traumatic dental problem and almost half of those homeless people who did attend an ED for dental care made multiple visits (Figueiredo *et al*. 2016).

Factors affecting the uptake of dental care

The inability to pay for dental care was the most cited factor preventing uptake of dental services (De Palma and Nordenram 2005; Robbins *et al*. 2010; Hill and Rimmington 2011; Parker *et al*. 2011; Simons *et al*. 2012; Ford *et al*. 2014; Van Hout and Hearne 2014; Caton *et al*. 2016). Knowing that safety net dental insurance would cover the cost of care increased the likelihood of seeking care by homeless adults (Robbins *et al*. 2010). The process of registering for government assistance, which enabled

Table 1. Qualitative critical review form analysis of seven studies

Critical Appraisal Checklist QUALITATIVE	Coles *et al.* (2013)	Caton *et al.* (2016)	Van Hout and Hearne (2014)	Pritchett *et al.* (2014)	Coles *et al.* (2013)	Abel *et al.* (2012)	De Palma and Nordenram (2005)
1. Are there clear qualitative research questions (objectives)?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2. Do the collected data address the research question (objective)?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3. Are the sources of qualitative data (archives, documents, informants, observations) relevant to address the research question?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
4. Is the process for analysing the data relevant to address the research question (objective)?	Yes	Yes	Yes	No	Yes	Unclear	Yes
5. Is appropriate consideration given to how findings relate to the context (e.g. setting in which data were collected)?	Yes	No	Unclear	No	Yes	Unclear	Yes
6. Is appropriate consideration given to how findings relate to the researchers' influence (e.g. through their interactions with participants)?	Unclear	No	No	No	Yes	No	Yes
Overall quality score	0.75	0.5	0.5	0.25	1	0.25	1

Table 2. Quantitative critical review form analysis of three studies

Critical Appraisal Checklist QUANTITATIVE	Figueiredo *et al.* (2016)	Ford *et al.* (2014)	Parker *et al.* (2011)
1. Are there clear quantitative research questions (objectives)?	Yes	Yes	Yes
2. Do the collected data address the research question (objective)?	Yes	Yes	Yes
3. Is the sampling strategy relevant to address the quantitative research question?	Yes	Yes	Yes
4. Is the sample representative of the population under study?	Yes	Yes	Yes
5. Are the measurements appropriate (standard instrument)?	Yes	Yes	Yes
6. Is there an acceptable response rate?	Yes	No	Yes
Overall quality score	1	0.75	1

government-funded dental care, could be seen as onerous by homeless people (Simons *et al.* 2012; Van Hout and Hearne 2014).

In the US, over one-third of homeless adults did not know where to find dental care (Conte *et al.* 2006). Dental services were poorly advertised (Hill and Rimmington 2011; Rowan *et al.* 2013), but even when government-funded care was available and clinic location known, there was a poor uptake of care by homeless people (Ford *et al.* 2014).

Dental care can be a low priority for homeless people, especially during periods of drug and alcohol misuse (De Palma and Nordenram 2005; Van Hout and Hearne 2014; Caton *et al.* 2016). Homeless people were more likely to seek emergency rather than comprehensive dental care (Coles and Freeman 2016).

Psychosocial factors also affected the uptake of dental services by homeless people (Caton *et al.* 2016). Higher levels of dental anxiety and dental phobia were found in the homeless adult population than in the general population (Coles *et al.* 2011) and affected access to dental care (Collins and Freeman 2007).

The attitudes of dental health service providers to homeless people affected the uptake of services by homeless adults. Homeless adults reported being treated with a lack of respect (De Palma and Nordenram 2005) and having bad experiences at dental practices (Caton *et al.* 2016).

Strategies used to improve access to dental care and improve oral health

Several strategies have been developed to improve access to dental care for homeless adults, including the development of homeless-dedicated dental services (Seirawan *et al.* 2010; Hill and Rimmington 2011; Simons *et al.* 2012; Rowan *et al.* 2013). A key feature of these services was that dental service staff worked in close collaboration with homeless support agencies. Dental team members visited community centres, shelters and hostels to build and maintain good working relationships with support organisations (Simons *et al.* 2012; Caton *et al.* 2016).

Table 3. Mixed-methods critical review form analysis of two studies

	Rowan *et al*. (2013)	Lashley (2008)
Critical Appraisal Checklist MIXED-METHODS design component		
1. Are there clear mixed-methods research questions (objectives)?	Yes	Yes
2. Do the collected data address the research question (objective)?	Yes	Yes
3. Is the mixed-methods research design relevant to address the qualitative and quantitative research questions (or objectives) or the qualitative and quantitative aspects of the mixed-methods question (or objective)?	Yes	Unclear
4. Is the integration of qualitative and quantitative data (or results) relevant to address the research question (objective)?	Yes	Yes
5. Is appropriate consideration given to the limitations associated with this integration (e.g. the divergence of qualitative and quantitative data (or results) in a triangulation design)?	Yes	No
Quality score for the mixed-methods component of the study	1	0.33
Critical Appraisal Checklist QUALITATIVE component of mixed-methods study		
1. Are there clear qualitative research questions (objectives)?	Yes	Yes
2. Do the collected data address the research question (objective)?	Yes	Yes
3. Are the sources of qualitative data (archives, documents, informants, observations) relevant to address the research question?	Yes	Yes
4. Is the process for analysing the data relevant to address the research question (objective)?	Yes	Unclear
5. Is appropriate consideration given to how findings relate to the context (e.g. setting in which data were collected)?	Yes	Unclear
6. Is appropriate consideration given to how findings relate to the researchers' influence (e.g. through their interactions with participants)?	Yes	Unclear
Quality score for the qualitative component of the study	1	0.25
Critical Appraisal Checklist QUANTITATIVE component of mixed-methods study		
1. Are there clear qualitative research questions (objectives)?	Yes	Yes
2. Do the collected data allow address the research question (objective)?	Yes	Yes
3. Is the sampling strategy relevant to address the quantitative research question (quantitative aspect of the mixed-methods question)?	Yes	Yes
4. Is the sample representative of the population under study?	Yes	Yes
5. Are measurements appropriate (clear origin, or validity known, or standard instrument)?	Yes	No
6. Is there an acceptable response rate (60% or above)?	Yes	Unclear
Quality score for the qualitative component of the study	1	0.5
Overall quality score for the mixed-methods study	1	0.25

Another important feature of dental services for the homeless was that they were located in close proximity to the homeless population. This involved delivering outreach dental programs, including on-site dental screening examinations at homeless hostels, shelters and drop-in centres (Lashley 2008; Simons *et al*. 2012; Caton *et al*. 2016). These programs gave the opportunity to identify treatment needs, provide oral hygiene advice and referral to a fixed-site clinic (Simons *et al*. 2012). On-site treatment was also provided using dental vans (Simons *et al*. 2012) and portable dental equipment (Simons *et al*. 2012; Abel *et al*. 2013). Fixed-site homeless dental clinics were co-located with other homeless health services to provide a 'one-stop-shop' for homeless health (Seirawan *et al*. 2010; Simons *et al*. 2012; Rowan *et al*. 2013).

Oral health care was also provided by universities (Lashley 2008; Seirawan *et al*. 2010; Abel *et al*. 2013; Rowan *et al*. 2013; Pritchett *et al*. 2014). Students of dentistry (Seirawan *et al*. 2010) and dental hygiene students (Rowan *et al*. 2013) provided care at fixed-site clinics within homeless support agency sites and postgraduate dental students used portable dental equipment to provide care within a homeless women's shelter (Abel *et al*. 2013). Outreach screening examinations resulted in referral to university dental teaching clinics (Lashley 2008). Outreach programs involving dental (Pritchett *et al*. 2014) and nursing students (Lashley 2008) provided homeless adults with well-received oral health advice (Abel *et al*. 2013; Rowan *et al*. 2013; Pritchett *et al*. 2014).

In the US, homeless people who were engaged with drug rehabilitation and social welfare programs could receive extensive dental treatment, whereas those not engaged with programs could only receive emergency dental care (Seirawan *et al*. 2010). Homeless drug users felt that drug rehabilitation centres made good sites for dental clinics (Van Hout and Hearne 2014). However, delivering outreach dental services at hostels and shelters tended to exclude homeless people living in bed-and-breakfast accommodation and those aged over 40 years, and resulted in them having a poorer uptake of dental services compared to those living in shelters or using drop-in centres (Gray 2007).

Increasing access by increasing knowledge of non-dental staff

Referrals to dental services were made by non-dental health professionals. Registered nurses who gave health checks referred clients to dental services. More referrals occurred from shelters employing nurses than from those shelters that did not (Gray 2007). The 'Something to Smile About' program (STSA) trained support agency staff to give oral health education and help

Table 4. Quantitative descriptive review form analysis of 10 studies

Critical Appraisal Checklist QUANTITATIVE DESCRIPTIVE	Abel *et al.* (2013)	Simons *et al.* (2012)	Conte *et al.* (2006)	Coles *et al.* (2011)	Hill and Rimmington (2011)	Robbins *et al.* (2010)	Seirawan *et al.* (2010)	Chi and Milgrom (2008)	Gray (2007)	Collins and Freeman (2007)
1. Are there clear quantitative research questions (objectives)?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2. Do the collected data address the research question (objective)?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3. Is the sampling strategy relevant to address the quantitative research question?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
4. Is the sample representative of the population under study?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
5. Are measurements appropriate (clear origin, or validity known, or standard instrument)?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
6. Is there an acceptable response rate (60% or above)?	Yes	Yes	Unclear	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Overall quality score	1	1	0.75	1	1	1	1	1	1	1

connect homeless people with dental services. This had the potential benefit of building a network of oral health advocates who worked with homeless people on a daily basis. However, support workers felt their homeless clients had more pressing needs, such as food and shelter, and that those needs have priority over dental care. The STSA program failed to affect the most at-risk homeless group: single young adult males (Coles *et al*. 2013). Support workers involved in the STSA program found contact details of dentists who treated homeless people, oral health information leaflets and supplies of oral health products to be valuable resources (Coles *et al*. 2013). The STSA program highlighted the need for oral health messages to be delivered at an appropriate time and not at a time of crisis (Coles *et al*. 2013).

Homeless people can become overtaken by their 'homeless identity' (Coles and Freeman 2016, p. 58), making them less able to maintain oral hygiene and organise and attend dental appointments (Coles and Freeman 2016). During such periods, homeless people prioritised the short-term over the longer-term issues, making them more likely to seek emergency rather than preventive dental treatment (Coles and Freeman 2016). To accommodate this, dental services needed to be flexible and respond to the immediate needs of the homeless person (Caton *et al*. 2016). One aspect of this flexible approach was the ability for homeless people to drop in for care without an appointment (Simons *et al*. 2012).

Challenges associated with delivering dental services to homeless people

Mobile dental services were expensive to set up and maintain, required extensive logistical planning and were prone to disruption from unexpected events, such as not being able to park the dental van due to roadworks (Simons *et al*. 2012). There were high rates of failure to attend dental appointments (Caton *et al*. 2016). Less than half of the homeless adults attending a mobile dental service in London completed their recommended treatment plan (Simons *et al*. 2012). Similar findings were reported for other dental services dedicated to homeless people (Seirawan *et al*. 2010; Hill and Rimmington 2011). Dental staff found missed appointments and incomplete treatment plans to be the least rewarding aspect of working with homeless people (Hill and Rimmington 2011). In the UK, missed appointments resulted in fines for some homeless individuals (Coles and Freeman 2016) or being excluded from some dental practices (Caton *et al*. 2016).

Service providers were also affected financially when emergency treatment was provided to homeless people who were unable to pay for their treatment and ineligible for free care (Simons *et al*. 2012). Support agency and dental support staff spent time and effort following up with clients, ensuring documentation was completed and encouraging attendance (Lashley 2008; Simons *et al*. 2012). The University of Southern California homeless dental clinic only provided comprehensive treatment for those enrolled in a rehabilitation or social welfare program. This reduced the number of missed appointments and improved the efficiency of the clinic (Seirawan *et al*. 2010).

Discussion

This review found several barriers prevented homeless people from accessing dental care; cost, fear of the dentist or dental

Table 5. Characteristics of selected studies of homeless adults' access to dental services and strategies to improve their oral health

Reference	Country	Participants	Design	Main findings
1. Caton *et al.* 2016	UK	Convenience sample of 20 homeless people attending a homeless dental service (17 males, 3 females). Nine members of staff involved in providing the service including management, dentists and dental nurses, and four staff members from the community centres providing services for the homeless.	A qualitative phenomenological design to develop a greater understanding of the experiences of both service users and providers.	Failure to attend dental services is high. The group had low self-esteem. When people are struggling with homelessness, dental care is simply not high on their priorities until they experience pain, at which point it becomes urgent. Services should address patient needs, it is important to go into community settings, talking to people and getting people into the system. Services were developed around the principle of accommodating chaotic lives and adapting to the needs of the patients.
2. Coles and Freeman 2016	UK	Convenience sample of 34 homeless people recruited with the help of charity organisations.	A qualitative study using grounded theory methodology.	Few people attended for regular/routine dental care. Physical and practical problems made it difficult for homeless people to brush their teeth and attend dental appointments. Socioeconomic and psychosocial issues disrupt people's lives, a homeless identity is assumed and oral health takes a low priority. At this time, toothache pain can bring oral health back into focus and prompt emergency care seeking. When moving on from homelessness, people assumed their pre-homeless identity, can better organise in the long term and are more likely to seek non-emergency dental care. The experience of oral health when homelessness can be described as a process of deconstruction and reconstruction.
3. Pritchett *et al.* 2014	UK	Dental students providing oral health advice to 35 homeless people.	Qualitative evaluation of a student-led oral health education program for homeless people. Advice was delivered at dedicated homeless dental clinics after treatment had been provided.	Oral health advice given by students was useful and positively received. Following the session, patients were more aware of oral health and intended to make changes to their oral hygiene practices.
4. Coles *et al.* 2013	UK	In total, 14 support agency staff members were involved with the 'Something To Smile About' program.	Qualitative evaluation of an oral health promotion intervention using focus group interviews and content analysis.	Oral health messages are perceived to be important by support staff but, to be effective, need to be tailored to an individual and delivered at an appropriate time, when other basic needs have been met. The intervention failed to change the oral health behaviour of high-risk individuals (single young males). Pain is a driver when seeking dental care. As a homeless person, registration with a National Health Service (NHS) dentist can be difficult. Support staff knowledge of oral health increased. Toothpaste supplies, oral health information leaflets and a list of accessible dental services were considered valuable.
5. Simons *et al.* 2012	UK	Review of 350 randomly selected dental records belonging to homeless adults using the Community Dental Service (CDS) in two London boroughs, Tower Hamlets and the City of Hackney over a 30-month period.	Quantitative descriptive study using descriptive statistics to describe the dental treatments provided. Also included is a narrative description of the dental services provided by the CDS.	Dental care is provided using a flexible, collaborative approach guided by input from multiple stakeholders. Care is provided at fixed sites including: at a multidisciplinary dedicated homeless health centre, at CDS clinics, which are not dedicated to caring only for the homeless and at a CDS out-of-hours emergency dental clinic.

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Table 5. (*continued*)

Reference	Country	Participants	Design	Main findings
				A dedicated community outreach team provide care and advice at multiple sites using portable dental equipment and a mobile dental van. The outreach team actively engages with support organisations to facilitate access to care for vulnerable people. Mobile dental vans visit homeless organisations and shelters on a regular basis. Appointments are made on the day the dental van visits. The outreach team provides information about the service, likely costs and how to get an appointment, while link workers encourage shelter users to attend their appointments. Mobile dental services are expensive to set up and maintain, and require extensive logistical planning. Over half of the mobile dental service users (54%) made a drop-in appointment with a dental problem. Of these, nearly half (45%) could not pay for their treatment and only attended once. In contrast, at the dedicated service located within a multidisciplinary health centre, 13% of patients attended as a drop-in with a dental problem. The rate of failing to return for a second appointment is associated with drug use, ethnicity and receipt of government benefits. Failure rates were higher (46.2%) for the mobile clinic than for the dedicated fixed clinic (11.7%).
6. Coles *et al.* 2011	UK	Convenience sample of 853 homeless people in Scotland aged 16–78 years. In total, 598 (70%) completed the survey.	Participants were recruited from health clinics, hostels, day centres, night shelters and soup kitchens, over a 9-month period. Participants had an oral exam and completed a questionnaire that included: demographic information, the Modified Dental Anxiety Scale (MDAS), Oral Health Impact Profile (OHIP-14) and the Centre for Epidemiological Studies Depression Scale (CES-D).	Overall, 20% of homeless people had dental phobia (MDAS score of 19 or more) and 24% felt embarrassed 'very often about the appearance of their teeth'.
7. Hill and Rimmington 2011	UK	Convenience sample of 17 staff working in specialist community dental services in four cities in the UK (London, Cardiff, Glasgow and Birmingham), including nine dentists, seven dental assistants and one therapist, and 27 homeless adults: 22 receiving care at a dedicated homeless clinic and five not receiving care.	Participants completed a questionnaire that had both closed and open-ended questions. Descriptive statistics described service use and qualitative data were analysed using the framework method.	Pain was the most common reason to seek care and dental health was poor. Rates of registration with a dentist were poor suggesting poor access to care. Staff believed general dental practices to be unwelcoming and unable to cater to the needs of homeless people. Staff felt that homeless people had difficulties accessing mainstream dental services and were better served by dedicated homeless dental services. However, homeless people appeared to be more inclined to want treatment in general dental practices. It was suggested that a flexible model of delivery involving both dedicated and general dental practices would best serve the needs of the homeless.

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Table 5. (*continued*)

Reference	Country	Participants	Design	Main findings
				Only about half of all treatment plans were completed and cost, dental care being a low priority and anxiety about treatment were reported as barriers. Staff identified failed appointments and incomplete treatment as the least rewarding aspects of working with homeless people. Staff were unaware of other homeless dental services in the area.
8. Collins and Freeman 2007	UK	Convenience sample of 317 single homeless adults recruited from 14 hostels in Belfast using snowballing techniques (84% male, 16% female).	Quantitative descriptive study to determine oral health needs. Participants answered survey questions relating to dental anxiety, demographics, mental health, general health, drug and alcohol use and their oral health-related quality of life. The Modified Dental Anxiety Scale (MDAS) determined anxiety. Clinical oral health was assessed by dental examination.	Over one in four participants had MDAS scores indicating dental phobia compared to 1 in 10 for the general population. There is an association between mental health problems and dental anxiety. Participants with dental anxiety had significantly fewer restored teeth.
9. Abel *et al.* 2013	USA	In total, 37 female residents residing at domestic violence shelters around Fort Lauderdale were surveyed before and after receiving dental care at the shelter.	Quantitative descriptive study using questionnaires to assess residents' Oral Health-Related Quality of Life (OHRQoL) and satisfaction with dental care provided at the shelter.	Participants were satisfied with on-site dental care and their OHRQoL improved. Collaborations between organisations working with domestic violence victims and educational institutions can be successful and improve the lives of domestic violence victims living in shelters.
10. Abel *et al.* 2012	USA	Participants included 50 women survivors of domestic violence living in shelters near Fort Lauderdale and 10 Advanced Dental Education in General Dentistry residents (AEGC).	Description of a collaboration between Nova South-eastern University's College of Dental Medicine (NSU-CDM) and three local organisations that provide dental services to survivors of domestic violence - assessing the oral healthcare needs of clients and the readiness of NSU-CDM Advanced Education in General Dentistry (AEGD) residents to provide the needed care.	Dental care provided at the agency would be highly valued and of enormous benefit. There were also 10 Advanced Education in General Dentistry residents (AEGC) were also studied.
11. Robbins *et al.* 2010	USA	Participants included 340 homeless adult active injection drug users in San Francisco, recruited from homeless resource centres.	Six months' prospective cohort study using face-to-face interviews to assess self-perceptions of mental, general and oral healthcare seeking behaviour, drug use and utilisation of drug treatment services.	Self-reported need for oral health care was common, but seeking care was less common, only 27% sought oral health care when they had a perceived need. Almost one-third of the sample (31%) reported needing oral health care at least six times in the previous 6 months. Of those seeking care, 8% visited an emergency department and 30% the homeless resource centre. Being eligible for safety net dental services or having insurance increased the likelihood of seeking dental care. High rates of needing care were associated with low rates of accessing care.

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Table 5. (*continued*)

Reference	Country	Participants	Design	Main findings
12. Seirawan *et al.* 2010	USA	The study included 1088 patients that attended a dedicated community dental clinic located within the Union Rescue Mission (URM) facility in Los Angeles. The clinic was used for teaching and was managed by and the University of Southern California (USC).	Analysis of patients' dental records provided a description of the dental services provided over 1 year. A description of the collaborative service was included.	The clinic is staffed by students and Faculty members and offers emergency and comprehensive dental treatment free-of-charge. To be eligible for comprehensive dental treatment, clients need to be enrolled in a rehabilitation program with a support organisation. This improves compliance and the likelihood of a course of care being completed. An analysis of the services provided in a 12-month period showed that 62% of patients received emergency care and 38% received comprehensive treatment. The failure-to-attend rate for patients having comprehensive treatment was 10%.
13. Chi and Milgrom 2008	USA	Convenience sample of 45 homeless youth and young adults attending a health clinic.	Quantitative descriptive design using questionnaires.	It was found that 40% of respondents suffered some level of fear about dental appointments.
14. Lashley 2008	USA	Convenience sample of homeless men who were enrolled in a rehabilitation program, and nursing and dental students in Baltimore. In total, 279 men received oral health education and 203 had an oral health examination.	Mixed-methods design describing the oral health component of an addiction recovery program for homeless men. Service user demographics and the uptake of dental services were described using descriptive statistics. Client perceptions of the service were recorded using questionnaires, nursing student perceptions were recorded using reflective journals and dentistry student perceptions were recorded using surveys and email correspondence.	Dental students and dental volunteers made outreach visits to screen clients and arrange referral for those with a need for care. Nursing students delivered both general and oral health advice and encouraged attendance at scheduled dental appointments. Treatment was provided at the university dental clinics. Assistance with application forms, appointment scheduling and transport was provided by shelter staff.
15. Conte *et al.* 2006	USA	Convenience sample of 46 homeless people recruited at a homeless services event.	Quantitative descriptive design using face-to-face structured interviews followed by a dental screening check-up.	In response to the question 'If you needed to seek care where would you go?', just over one-third (35.6%) of participants didn't know where to seek care. One-third of participants did not smile because of their teeth.
16. Ford *et al.* 2014	Australia	Convenience sample of 58 homeless adults recruited from a homeless accommodation and support service in Brisbane.	Cross-sectional study using a survey asked closed questions, which was completed by participants with assistance from support workers. In total, 34 of the participants had a dental examination.	Participants were more likely to be eligible for public dental care and avoid the dentist because of cost, and were less likely to have visited a dentist or had a dental check-up in the previous 12 months than the general population.
17. Parker *et al.* 2011	Australia	Convenience sample of 248 homeless people recruited from support agencies in Adelaide.	Quantitative cross-sectional study. Survey asked closed questions and results were compared to age-matched results from the general metropolitan population of Adelaide.	Homeless people were twice as likely to avoid the dentist because of cost, more likely to visit a government-funded dental clinic and more likely to visit the dentist with a dental problem compared with the general population.

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Table 5. (*continued*)

Reference	Country	Participants	Design	Main findings
18. Figueiredo *et al.* 2016	Canada	Random sample of 1165 homeless people previously recruited from shelters and meal programs. Control group of age- and sex-matched people living on low income.	Personal health insurance numbers were used to track hospital emergency department (ED) visits for non-traumatic dental problems over a 4-year period. Homeless persons' ED use was compared with the ED use by sex and age-matched low-income earners.	Homeless people are 2.27-fold more likely to use an ED for a non-traumatic dental problem compared with a matched low-income population. Almost three-quarters of visits (72%) were for toothaches, abscesses or dental decay and nearly half (46%) of people attending with a non-traumatic dental condition attended multiple times.
19. Rowan *et al.* 2013	Canada	Street youth aged 12–21 years. Quantitative component included 72 people (30% male and 70% female). Qualitative component included nine male and four female and six practitioners, one physician clinical supervisor, one dental hygiene clinical supervisor, two public health nurses, a nurse practitioner and a chiropodist.	Mixed-methods study to evaluate an interdisciplinary teaching medical and dental hygiene clinic for street youth.	The clinic was used by homeless youth as intended. Dental care and oral health education was provided by hygiene students under supervision. Delivering an inter-professional practice proved difficult. Care providers had concerns about the continuity of care and a lack of continual client flow. Improvements were suggested regarding better advertising of the clinic, the services provided and how to access services. Many clients believed they needed to register with the clinic, which proved to be a barrier to access. Practitioners were interviewed and service users had three focus group interviews. Electronic medical records were analysed to give descriptive statistics on: demographic information, number of visits per person, number and type of chronic problems, medications prescribed and vaccination status.
20. Van Hout and Hearne 2014	Ireland	Purposive sample of 15 homeless drug users undergoing drug rehabilitation.	Qualitative study utilising focus group interviews and a thematic analysis of transcripts.	Dental attendance is affected by the need for a medical card, cost of treatment, fear, not liking medical card dentists and continued drug use and dependency. Enablers of dental visiting are knowing your dentist and having a dentist onsite in healthcare settings such as rehabilitation centres. Oral health is neglected when using drugs, but improves when in a recovery phase. Self-management of dental problems included attempted self-extractions, attempting to escape the pain using over-the-counter painkillers, putting toothpaste on the decay, using illicit drugs and drinking alcohol. Some participants did not access a dentist and instead visited a doctor. Poor oral health leads to a loss of self-confidence.
21. Gray 2007	Ireland	In total, 237 dental records of patients using the homeless dental service were reviewed (163 men, 74 women).	Review of the age, accommodation, source of referral and substance use of homeless people using two dedicated dental clinics.	Hostels were a referral source. Hostels employing trained nurses incorporated oral health in the initial assessment and referred more clients. Referral could be encouraged by delivering outreach screening and health promotion services. Certain groups within the homeless population were underrepresented as patients. Services needs to target these underrepresented groups.

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Table 5. (*continued*)

Reference	Country	Participants	Design	Main findings
22. De Palma and Nordenram 2005	Sweden	Eight homeless adults who had used a dedicated homeless dental service.	Qualitative study using a phenomenological-hermeneutical method.	Themes described included the neglect of oral health and drug use, making oral health an insignificant concern unless there was an aesthetic effect. During periods of drug use, barriers preventing care are the cost of care, shame, bad memories of past dental experiences and fear. The social cost of poor oral health was described as a loss of self-confidence and self-esteem, resulting in a reduction of the ability to function socially. Improving oral health, being treated with dignity and being respected by service providers leads to a recovery of oral health and of self-confidence. Dental service providers need to deliver emergency care at times of crisis and rehabilitative, preventive care when homeless people are in a positive and constructive phase.

treatment, not knowing where to find dental care, feeling embarrassed about their teeth, dental care being a low priority, previous unpleasant experiences at the dentist and having to be registered to receive government benefits. Cost was the most commonly reported barrier to receiving dental care and when it was removed as a barrier, the likelihood of seeking care improved. Previous bad experiences at the dentist included the perception of feeling unwelcome. Dental services provided by students were well-received by the homeless population. However, there is evidence that dental student attitudes' towards treating homeless people worsen as they progress through their dental course (Major *et al*. 2016) and that despite working with underserved populations as part of their university training, dentists were unlikely to treat homeless people as part of their everyday practice (McQuistan *et al*. 2010).

Dental service providers should not operate in isolation, but work collaboratively with other homeless service providers. This enables them to connect with the homeless population through an established network. The process of developing and maintaining collaborations and outreach programs was time-consuming, and constant effort was required to keep the services running effectively and efficiently.

In addition to being within the reach of homeless people, services need to be flexible, provide the opportunity to drop-in for an appointment and respond to the immediate dental needs of a homeless person. Drop-in appointments offer maximum flexibility, but may result in people having to wait, on the day, for an appointment, which, in itself, has been identified as a barrier to dental care (Jaafar *et al*. 1992; Daly *et al*. 2010*b*; Freeman *et al*. 2011).

Homeless people were more likely to attend non-emergency dental appointments when they were moving on from homelessness, such as when they were enrolled in a rehabilitation program. It is therefore important to maintain a connection with the homeless by visiting shelters and centres regularly to provide oral health advice, information about available dental services, screening examinations and oral health products.

This review was limited by the methodological quality of the studies included. The studies often had small convenience samples that increased the risk of selection bias. The transient nature of the homeless population made long-term follow up difficult. Studies were located in different countries, which meant that generalisations could not always be drawn regarding barriers and services. However, this review gave a valuable insight into how homeless people access dental services, the barriers they face and the strategies used by service providers.

Conclusion

The uptake of dental services by homeless adults was affected by cost, fear of the dentist, the perceived attitude of dental service providers and dental care being a low priority. Improving access to dental services for the homeless population requires collaboration with other support service providers, dental care being provided near the homeless populations and flexibility by dental service providers.

Conflicts of interest

The authors declare that they have no conflicts of interest.

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