Effectiveness of permanent supportive housing and income assistance interventions for homeless individuals in high-income countries: a systematic review

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Summary

Background Permanent supportive housing and income assistance are valuable interventions for homeless individuals. Homelessness can reduce physical and social wellbeing, presenting public health risks for infectious diseases, disability, and death. We did a systematic review, meta-analysis, and narrative synthesis to investigate the effectiveness and cost-effectiveness of permanent supportive housing and income interventions on the health and social wellbeing of individuals who are homeless in high-income countries.

Methods We searched MEDLINE, Embase, CINAHL, PsycINFO, Epistemonikos, NIHR-HTA, NHS EED, DARE, and the Cochrane Central Register of Controlled Trials from database inception to Feb 10, 2020, for studies on permanent supportive housing and income interventions for homeless populations. We included only randomised controlled trials, quasi-experimental studies, and cost-effectiveness studies from high-income countries that reported at least one outcome of interest (housing stability, mental health, quality of life, substance use, hospital admission, earned income, or employment). We screened studies using a standardised data collection form and pooled data from published studies. We synthesised results using random effects meta-analysis and narrative synthesis. We assessed certainty of the evidence using the Grading of Recommendations Assessment, Development, and Evaluation approach.

Findings Our search identified 15 908 citations, of which 72 articles were included for analysis (15 studies on permanent supportive housing across 41 publications, ten studies on income interventions across 15 publications, and 21 publications on cost or cost-effectiveness). Permanent supportive housing interventions increased long-term (6 year) housing stability for participants with moderate support needs (one study; rate ratio [RR] 1·13 [95% CI 1·01–1·26]) and high support needs (RR 1·42 [1·19–1·69]) when compared with usual care. Permanent supportive housing had no measurable effect on the severity of psychiatric symptoms (ten studies), substance use (nine studies), income (two studies), or employment outcomes (one study) when compared with usual social services. Income interventions, particularly housing subsidies with case management, showed long-term improvements in the number of days stably housed (one study; mean difference at 3 years between intervention and usual services 8·58 days; p<0·004), whereas the effects on mental health and employment outcomes were unclear.

Interpretation Permanent supportive housing and income assistance interventions were effective in reducing homelessness and achieving housing stability. Future research should focus on the long-term effects of housing and income interventions on physical and mental health, substance use, and quality-of-life outcomes.

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See Online for appendix

Introduction

Despite advances in public health and social welfare, the number of individuals who are homeless has continued to increase in most high-income countries (appendix p 1).[1,2] Acquiring or maintaining permanent supportive housing and a stable income can be life-changing for homeless individuals.[3] Compared with the general population, people who are homeless have higher all-cause mortality and higher prevalence of multiple morbidities, infectious diseases, and disabilities.[4–10]

In the past 20 years, many interventions have emerged to help homeless individuals to obtain and maintain stable housing and incomes.[11,12] Until the early 2000s, housing interventions prioritised people with mental illness symptoms and those who abstained from alcohol and substance use.[13] However, newer interventions, such as permanent supportive housing, reversed the sequence of treatment and housing, and access to housing was not contingent on adherence to treatment or abstinence.[14] Permanent housing has become a strategy that is often combined with coordinated case management.[15–18] The

Research in context

Evidence before this study

Much of the existing research on housing interventions for homeless populations has focused on housing programmes contingent on the achievement of sobriety to access or retain services. Furthermore, most of the studies investigating income have focused on assistance programmes for individuals with a lower socioeconomic status, but who are not necessarily homeless. We searched MEDLINE, Embase, CINAHL, PsycINFO, Epistemonikos, NIHR-HTA, NHS EED, DARE, and the Cochrane Central Register of Controlled Trials from database inception to Feb 10, 2020, for randomised controlled trials, quasi-experimental studies, and cost-effectiveness studies on permanent supportive housing and income interventions for homeless populations using the search terms "homeless", "low income", "marginalized", and "vulnerable". Our search yielded 15 908 articles.

Added value of this study

Our systematic review represents the most up-to-date evidence on permanent supportive housing and income assistance and is the only existing review, to our knowledge, that includes long-term housing stability outcomes with up to 6 years of follow-up data. Our review also examined the mental health, quality of life, substance use, hospital admission, earned income, and employment status of homeless individuals after receiving housing or income services. Replication of the findings from previously published reviews is important to ensure robustness and generalisability of systematic review findings to inform policy and practice.

Implications of all the available evidence

Evidence from our review suggests that, compared with usual care, permanent supportive housing programmes result in a significant increase in the number of days spent stably housed, which enables individuals with serious mental disorders to achieve housing stability. Additionally, income assistance programmes showed promising housing benefits. We found no evidence of any major harms associated with mental health, substance use, quality of life, and other outcomes of implementing housing and income interventions among homeless individuals. However, more research on subsequent access to primary care is needed. Our findings provide public health professionals, health-care policy makers, practitioners, and other stakeholders a comprehensive review and high-quality evidence that demonstrates the effectiveness and safety of permanent supportive housing and show promising outcomes for income interventions.

absence of an adequate stable income can be a barrier to housing stability and access to social support.[19] Interventions to increase income have been found to improve health-related quality of life in low-income individuals,[20] and are strongly associated with disease prevalence.[21] Income assistance interventions might include housing subsidies, financial education and empowerment, and employment support.[22–24] These interventions help individuals meet essential costs of living, including housing, food, and transportation.[25] Improved socioeconomic status might reduce costs to society by decreasing expenditure on health care, social services, and the legal system.[26]

Stakeholders in health and social sectors, including people with experience of homelessness and policy makers, can benefit from an updated synthesis of evidence on the effectiveness of permanent supportive housing and income interventions. This review is part of a series of reviews that will be used to inform a Canadian clinical practice guideline.[27] The aim of this systematic review and meta-analysis was to assess the effectiveness of permanent supportive housing and income assistance on the health and social outcomes of homeless individuals.

Methods

Search strategy and selection criteria

For this systematic review and meta-analysis, a health librarian developed and peer reviewed a search strategy to identify eligible studies on the effectiveness or cost-effectiveness of permanent supportive housing and income interventions to address homelessness. We systematically searched MEDLINE, Embase, CINAHL, PsycINFO, Epistemonikos, NIHR-HTA database, NHS EED, DARE, and the Cochrane Central Register of Controlled Trials from database inception to Feb 10, 2020, without language restrictions, using the search terms "homeless", "low income", "marginalized", and "vulnerable". We only included randomised controlled trials, quasi-experimental studies, and cost-effectiveness studies done in homeless populations in high-income countries, which reported at least one outcome of interest (appendix p 7). We used a combination of indexed terms, free text words, and subject headings; the full search strategy is shown in the appendix (p 9). The electronic database searches were supplemented with manual searches of the reference lists of primary studies and systematic reviews, citations suggested by experts, grey literature, and all results were reviewed using Rayyan reference manager software.[28] We assessed each study in duplicate and any discrepancies were resolved through discussion or by a third reviewer. We extracted summary estimates from included studies.

This systematic review was done in accordance with a peer-reviewed Campbell Collaboration protocol,[29] and the PRISMA[30] and SWiM[31] reporting guidelines (appendix p 5).

Interventions and outcomes

Our review working group, consisting of expert health professionals and individuals with experience of homelessness, used a modified Delphi consensus method to

identify the most important interventions to evaluate in this systematic review.[32] This process identified permanent housing and income assistance as priorities, therefore we included only studies of these interventions in our systematic review. The main outcomes selected by the review working group[33] were housing stability, mental health, quality of life, substance use, hospital admission, employment, and earned income.

Data analysis

Two reviewers independently extracted data from the included studies using a standardised data collection form, which included study design, population characteristics and size, interventions, comparators, outcomes of interest, conclusions, and funding sources. A third reviewer resolved any discrepancies. Results from some studies were reported in multiple publications. Therefore, to prevent double counting of data, individual records were screened to identify unique studies and evaluated for potential overlap by comparing study design, enrolment and data collection dates, authors and their associated affiliations, and the reported selection and eligibility criteria. We included only unique data from each study when reviewing multiple publications. We contacted authors of included publications to obtain missing data when possible. Two independent reviewers used the Cochrane Risk of Bias tool to assess the methodological quality of included studies.[34] We tabulated the effects of permanent supportive housing and income interventions on housing stability, mental health, quality of life, substance use, hospital admission, employment, and income outcomes for all timepoints (appendix pp 28–50).

We did a meta-analysis using RevMan 5.3 software with a random-effects model. We calculated measures of effects as standardised mean differences for continuous outcomes and odds ratios for dichotomous outcomes. We used the Z score to calculate p values for the comparison of effect sizes between groups; p values of less than 0·05 were considered statistically significant. We assessed statistical hetergeneity using the I^2 statistic. Where clinical heterogeneity (ie, different studies reporting different types of outcomes) was high between studies and thus did not allow for meta-analysis, we used narrative synthesis.[31,35] We classified outcomes as short term (≤6 months), medium term (7–17 months), and long term (≥18 months). When effect estimates were reported, we did not convert to a common measure of effect. We assessed the certainty of the evidence using the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) framework (appendix p 52).[36]

Role of the funding source

The funders had no role in the study design, data collection, data analysis, data interpretation, or the writing of the report. The corresponding author had full access to all of the data in the study and had final responsibility for the decision to submit for publication.

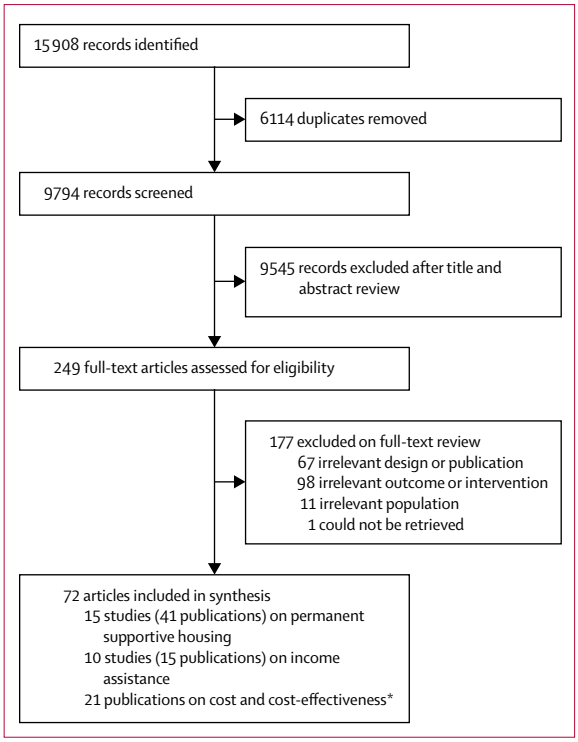

Figure 1: **Study selection**
*Five publications included in the cost-effectiveness analysis were also included in the analysis of permanent supportive housing or income assistance interventions.

Results

Our search yielded 15 908 citations, of which 249 full-text articles were screened, and 72 met inclusion criteria and were included in our systematic review (figure 1; appendix pp 11–27). The 72 articles included data from 15 studies (across 41 publications) on permanent supportive housing,[13,15,17,37–74] data from ten studies (across 15 publications) on income assistance,[12,24,75–87] and data from 21 publications (of which five publications were also included for the analysis of permanent supportive housing and income assistance) with cost-effectiveness data.[12,13,56,62,72,88–103] All included studies were done in the USA or Canada. Characteristics of included studies are summarised in tables 1, 2, and 3. We identified methodological limitations in random sequence generation, allocation concealment, and masking of participants and study personnel in most of the included studies (appendix p 51). GRADE evidence profiles and certainty assessments for patient-important outcomes (ie, outcomes that patients consider most important)[104] are presented in the appendix (pp 53–55).

Housing stability was significantly improved by permanent supportive housing compared with usual care. In the Canadian At Home/Chez Soi (AHCS) study,

	Study type and total sample size	Follow-up	Population and setting	Intervention	Control	Outcomes of interest
At Home/Chez Soi (high needs); Aubry et al (2016)[13] and others[15,17,37–50]	Randomised control trial; N=950	≤24 months	Homeless individuals or individuals living in a single room occupancy, rooming house, or hotel who have had two or more episodes of being absolutely homeless with serious mental illness and high support needs; Toronto (ON), Montreal (QC), Moncton (NB), Winnipeg (MB), and Vancouver (BC), Canada	Housing First provides immediate access to independent housing and mental health supports; rent supplements were provided that ensured housing costs did not exceed 30% of participant's income; housing coordinators provided assistance to find and move into housing; support services were provided via assertive community treatment; study participants agreed to observe the terms of their lease and be available for a weekly visit by programme staff; n=469	Treatment as usual (participants had access to existing interventions and programmes available in their community including any housing and community support other than the Housing First programme); n=481	Housing stability, mental health, quality of life, substance use, hospital admission, employment, income
Housing First in Ottawa; Cherner et al (2017)[51]	Quasi-experimental trial; N=178	24 months	Homeless individuals or people at risk of homelessness with problematic substance use; Ottawa, ON, Canada	A partnership between a community mental health agency and a programme located in a community health centre; each participant received a rent supplement and paid a maximum of 30% of their income towards rent; housing comprised private market rental units of participant's choice; participants also had access to opioid agonist treatment and substance use treatment; n=89	Treatment as usual (access to all social and health services available in the community other than the Housing First programme); services were scattered across a service-rich city and included supportive housing, mental health, and substance use services available to people who are homeless and services that can be accessed while people are in a shelter; n=89	Housing stability, mental health, quality of life, substance use
The Boston McKinney Research Demonstration Project; Goldfinger et al (1999)[52] and others[53–55]	Randomised control trial; N=118	18 months	Homeless adults with mental illness; Boston, MA, USA	Evolving Consumer Household model; a shared housing arrangement that provides more independence while minimising the presumed risks of living independently or in traditional group homes; the model is designed to offer residents permanent secure housing without the requirement of treatment compliance; staff are trained to facilitate consumer independence, and the number of staff is expected to be gradually reduced as consumers learn the skills needed to manage the house themselves; n=63	Independent-living apartments (one-room or two-room single apartments in public housing projects or large multi-unit sites subsidised by the Boston Housing Authority); n=55	Housing stability, quality of life
The Evangel Hall Mission Housing Program; Hwang et al (2011)[74]	Quasi-experimental trial; N=112	18 months	Financially disadvantaged homeless adults; Toronto, ON, Canada	Supportive housing programme located in one building with 84 units; tenants had access to a drop-in centre offering meals and outreach services, as well as a medical and dental clinic providing free services; individuals received rental subsidies and paid rent tailored to their income (not exceeding 30% of income); the programme partnered with COTA Health, a mental health and community support services organisation that provided onsite support to tenants; n=46	Individuals who were on the waitlist for the same programme; n=66	Housing stability, mental health, quality of life, substance use, hospital admission
St Francis Residence; Lipton et al (1988)[57]	Randomised control trial; N=52	12 months	Patients presenting to the Bellevue Hospital (New York, NY) psychiatric emergency service who were homeless, chronic mentally ill, and in need of inpatient psychiatric treatment; New York, NY, USA	The programme provided a furnished room, and offered individualised case management, coordination of public assistance or social security benefits, medication monitoring, money management, meals, activity therapy, and, when appropriate, referrals to psychosocial and rehabilitation programmes; n=26	Routine discharge planning; n=26	Housing stability, mental health, hospital admission
Martinez et al (2006)[59]	Controlled before-and-after study; N=236	4 years	Formerly homeless single adults with disabilities; San Fransisco, CA, USA	Two supportive housing programmes, which housed residents in single-room occupancy units and provided rent subsidies in addition to an array of on-site services provided by a local interagency collaborative, including case management, psychiatric care, health care, and vocational training; service receipt was voluntary and abstinence from drug or alcohol use was not a requirement of residency	Individual outcomes were compared 24 months before the start of the intervention and 24 months after the start of the intervention	Hospital admission

(Table 1 continues on next page)

	Study type and total sample size	Follow-up	Population and setting	Intervention	Control	Outcomes of interest
(Continued from previous page)						
McHugo et al (2004)[58]	Randomised control trial; N=125	18 months	Homeless adults with severe mental illness; Washington, DC, USA	Integrated housing programme (case management and housing services provided by teams within a single agency); additional comprehensive mental health services were provided through intensive case management and housing services through dedicated teams that controlled a variety of housing settings; agency did not adhere to the scattered-site model and congregate settings were considered appropriate for some individuals; n=63	Parallel housing condition (case management services provided by mobile assertive community treatment teams and housing by routine community-based landlords); mental health services were provided by assertive community treatment teams from three community mental health agencies, and housing services were provided by community-based realtors and landlords; assertive community treatment teams assisted individuals in finding and affording housing, but the teams had no control over housing stock; n=62	Housing stability, mental health, quality of life, substance use
Project Return and the Boley Centres for Behavioural Healthcare Housing Programs; Rich et al (2005)[60]	Quasi-experimental trial; N=152	12 months	Homeless persons with severe mental illness; Tampa and St Petersburg, FL, USA	Two comprehensive housing programmes with extensive housing services including: guaranteed access to housing; the provision of housing support services; case management; and priority linkages to psychiatric, psychosocial, and vocational services; case management and housing support services were maintained as long as the consumer had a need, and for most participants extended throughout the project; n=83	Specialised case management (active outreach and engagement, on-site counselling, medication and medication management, vouchers and assistance with obtaining housing and linkages for other psychiatric, substance abuse and other psychosocial services); all participants were eligible for housing vouchers for short-term rent and deposit support; n=69	Housing stability, mental health, quality of life, substance use, income
The Chicago Housing for Health Partnership's Housing and Case Management Program; Sadowski et al (2009)[61] and others[62]	Randomised control trial; N=407	≤18 months	Chronically ill homeless adults; Chicacgo, IL, USA	An intervention developed by a consortium of 14 hospitals, respite care centres, and housing agencies in Chicago, which had three integrated components: provision of transitional housing at respite care centres, subsequent placement in stable housing, and case management, which was provided on-site at primary study sites, respite care facilities, and stable housing sites; n=201	Usual care (participants referred back to the original hospital social worker and received the usual discharge planning services with no continued relationship after hospital discharge); typically patients would be provided transportation to an overnight shelter if no other accommodation could be arranged before discharge; n=206	Housing stability, hospital admission
The Substance Abuse and Mental Health Services Administration (New York site); Siegel et al (2006)[63]	Quasi-experimental trial; N=157	18 months	Homeless individuals with severe mental illness; New York, NY, USA	Tenants mostly lived alone, resided in studio or one-bedroom apartments located in the city, and paid 30% of their income toward rent; sobriety and treatment not preconditions for housing; an assertive community team saw tenants at least once a week and provided medication and money management; n=75	Tenants lived in a renovated residential hotel in studio apartments, each with a bathroom and kitchenette; 30% of units in the hotel are for people with mental illness; all tenants are prescreened for evidence of 6 months of sobriety, and can be asked to leave if they behave in a manner that negatively affects their neighbours; on-site crisis services are continuously available to tenants in coordination with a psychiatric emergency service; on-site case managers available to all tenants; n=82	Housing stability, mental health, quality of life, hospital admission
Pathways to Housing and a consortium of local agencies; Stefancic et al (2007)[64]	Randomised control trial; N=260	Around 4 years	Individuals with severe mental illness who were chronic recidivists in the county homeless shelter system; Mount Vernon, NY, USA	Pathways to Housing and a newly formed consortium of treatment and housing agencies from the county operating Housing First offered immediate access to permanent independent housing, without requiring treatment compliance or abstinence from drugs or alcohol; n=104	Treatment as usual group received traditional housing and treatment services; n=51	Housing stability

(Table 1 continues on next page)

	Study type and total sample size	Follow-up	Population and setting	Intervention	Control	Outcomes of interest
(Continued from previous page)						
At Home/ Chez Soi (moderate needs); Stergiopoulos et al (2015)[56] and others[65,66]	Randomised control trial; N=1198	≤24 months	Absolutely homeless or precariously housed individuals with mental illness and moderate support needs; Toronto (ON), Montreal (QC), Moncton (NB), Winnipeg (MB), Vancouver (BC), Canada	Scattered-site supportive housing with mobile, off-site intensive care management services, offering rapid, low-barrier permanent housing in independent units with supports fostering participant empowerment, choice, personalised goals, hope, and resilience; participants paid up to 30% of their income toward rent, with a monthly rent supplement of CAN$375–600, paid by the programme directly to landlords; n=689	Treatment as usual (participants had access to existing housing programmes and community services, including services targeting the homeless population [drop-in centres, emergency shelters, meal programmes, street outreach services, supportive and alternative housing], and several mental health services available to both homeless and housed individuals); n=509	Housing stability, mental health, quality of life, substance use, hospital admission
The At Home/ Chez Soi extension trial; Stergiopoulos et al (2019)[67]	Extension of a multicentre randomised control trial; N=414	≤6 years	Absolutely homeless or precariously housed individuals with mental illness with moderate or high support needs; Toronto, ON, Canada	Permanent housing with assertive community treatment offering multidisciplinary team-based care, available 24 h per day and 7 days per week, and providing services primarily in the community, for participants with high support needs; permanent housing with intensive case management support, for up to 12 h per day for 7 days a week, with a case load of 17 participants per case manager for participants with moderate support needs; participants with moderate needs who self-identified as ethnoracial individuals were provided with ethnoracial-specific intensive case management services; high needs n=79, moderate needs n=160	Treatment as usual (participants had access to housing, health, and social services in the community, including primary, specialty and hospital care, case management, and supportive housing); n=62 high needs participants; n=113 moderate needs participants	Housing stability, quality of life, substance use
The Pathways to Housing Project; Tsemberis et al (2004)[68] and others[69–72]	Randomised control trial; N=225	24 months	Homeless individuals with dual diagnoses; New York, NY, USA	Pathways to housing; immediate provision of an apartment of the participant's own without any prerequisites for psychiatric treatment or sobriety; participants were also offered treatment, support, and other services by the programme's assertive community treatment team with two modifications (a nurse practitioner and housing specialist); n=99	Usual care (Continuum of Care supportive housing programmes, which subscribe to the abstinence-sobriety model based on the belief that without strict adherence to treatment and sobriety, housing stability is not possible); n=12	Housing stability, mental health, quality of life, substance use, hospital admission
The Keystone Residential Program and Hillsborough Assertive Community Treatment Team; Young et al (2009)[73]	Quasi-experimental trial; N=163	6 months	Individuals who were homeless or at risk of homelessness due to incarceration and who had severe co-occurring mental health and substance use disorders; FL and CA, USA	CCISC-RT; residential treatment facility with services that included comprehensive screening and assessment and individualised treatment planning, including case management, individual counselling, group therapy, recreational therapy, vocational training, and medication management as needed; CCISC-RT staff did random urine screening of clients, and abstinence was expected of all clients in the programme, however, relapse did not result in immediate discharge from the programme; n=96	The Assertive Community Treatment with supportive housing programme offered participants housing, individually tailored treatment, rehabilitation, and support services based on their most salient needs ranging from grocery shopping to filling prescriptions; n=67	Housing stability, mental health, substance use

Cited references for each study include related publications. CCISC-RT= Comprehensive Continuous Integarted System of Care in a Residential Treatment Facility.

Table 1: **Characteristics of included studies on permanent supportive housing**

74% of participants with high support needs who received permanent supportive housing with assertive community treatment were in stable housing at 24 months compared with 41% of the high need participants in the usual services group (odds ratio [OR] 4·10; 95% CI 2·98–5·63; p<0·0001; moderate certainty evidence).[13] Participants with moderate support needs spent a higher percentage of days stably housed than did individuals in the usual services group, although adjusted mean differences varied across the four sites (33·0% [95% CI 26·2–39·8] for site A; 49·5% [41·1– 58·0] for site B; 35·6% [29·4–41·8] for site C; and 45·3% [38·2–52·5] for site D; p<0·01 for interaction).[56] An extension study of AHCS in Toronto (ON, Canada) showed long-term benefits over 6 years; participants who received permanent supportive housing spent more days stably housed than did those who received usual care (rate ratio [RR] of days stably housed 1·42 [95% CI 1·19–1·69] for the high needs group *vs* RR 1·13 [95% CI 1·01–1·26] for the moderate needs group). The magnitude of effect estimates decreased with time for both the high needs and moderate needs groups.[67] Similar findings were observed in the US-based Pathways study,[68,69] and a Canadian quasi-experimental study at 6 and 24 months.[51] Results of a meta-analysis of data from the US Pathways and Canadian AHCS studies showed that permanent supportive housing resulted in

	Study type and total sample size	Follow-up	Population and setting	Intervention	Control	Outcomes of interest
The Building Wealth and Health Network (the network randomised controlled trial); Booshehri et al (2017)[75]	Randomised control trial; N=103	15 months	Low-income families with a child; 65% of whom had housing insecurity; Philadelphia, PA, USA	Partial intervention included assistance opening a credit union savings account, with participants' savings matched throughout the trial and 28 weeks of 3 h financial empowerment education classes, which focused on developing internal and external resources to support self-sufficiency; education included saving for education, retirement, housing, entrepreneurial activities, improving credit, and reducing debt; the full intervention was the same as the partial intervention plus a simultaneous 28 weeks of trauma-informed peer support; partial intervention n=35, full intervention n=37	Standard Temporary Assistance for Needy Families programme consisting of 20 h per week of scheduled supervised job training and job search activities; n=31	Housing stability, mental health, employment, income
Social enterprise intervention and individual placement and support; Ferguson et al (2018)[77] and others[76]	Randomised control trial; N=72	20 months	Homeless youth with mental illness; Los Angeles, CA, USA	The social enterprise intervention model was implemented in four stages: vocational skill acquisition (4 months), small business skill acquisition (4 months), social enterprise intervention formation and product distribution (12 months), and case-management services (ongoing for 20 months); social enterprise intervention participants attended vocational and small business classes twice a week (1·5 h per session) and received case-management services continuously throughout the 20-month study period; n=36	Individual placement and support; participants met individually with the employment specialist, one case manager, and one clinician at least weekly; meetings took place either in person within the agency or in the community, by phone, or through social media check-ins; n=36	Housing stability, mental health, quality of life, employment, income
Forchuk et al (2008)[78]	Randomised control trial; N=14	6 months	Individuals discharged from psychiatric wards to shelters and who are precariously housed; ON, Canada	Assistance finding housing through a housing advocate and so-called fast tracked income support; n=7	Usual care that did not include direct or immediate assistance with housing, but included referral to social work for housing support if requested by the health-care team during inpatient stay; n=7	Housing stability
The Family Options Study; Gubits et al (2018)[79]	Randomised control trial; N=2282	37 months	Homeless families with a child aged 15 years or younger; Alameda country (CA), Atlanta (GA), Balitmore (M), Boston (MA), Bridgeport and New Haven (CT), Denver (CO), Honolulu (HI), Kansas City (MO), Louisville (KY), Minneapolis (MN), Phoenix (AZ), and Salt Lake City (UT), USA	Permanent housing subsidy, community-based rapid rehousing, or project-based temporary housing: permanent housing subsidy participants received a choice voucher; community-based rapid rehousing participants received temporary rental assistance, renewable for up to 18 months paired with limited, housing-focused services; project-based temporary housing participants received temporary housing for up to 24 months in agency-controlled buildings or apartment units, paired with supportive services; permanent housing subsidy n=599, community-based rapid rehousing n=569, project-based temporary housing n=368	Usual care (access to any housing services in the community) with some additional stay in the emergency shelter; n=746	Housing stability, mental health, substance use, employment, income
The McKinney Project in San Diego; Hurlburt et al (1996)[80] and others[81]	Randomised control trial; N=362	24 months	Individuals diagnosed with severe and persistent mental illness, who were either currently homeless or at high risk of becoming homeless; San Diego, CA, USA	Comprehensive or traditional case management and housing vouchers from the Department of Housing and Urban Development to local housing authorities, allowing participants to choose and obtain independent housing in the community; comprehensive case management included private mental health services (under contract with the county) with smaller maximum caseloads; available to clients 24 h a day, 7 days per week; a formal team approach was used with participants, and access to housing support groups and employment search support was offered	Case management alone	Housing stability

(Table 2 continues on next page)

more participants in stable housing than in usual services at 18 months or later (OR 3·58 [95% CI 2·36– 5·43]; between 211 and 386 more participants in the intervention group in stable housing than the usual group; moderate certainty evidence; figure 2).[13,64] The benefits of permanent supportive housing were also observed among the subgroups of young people (aged 18–24 years),[43] frequent emergency department users,[41] and adults aged 50 years or older.[39] Several studies compared housing models,[17,49,52] models of care provision,[58,60] and abstinence requirements (table 1);[63,73] housing stability outcomes for these studies are summarised in the appendix (pp 27–50).

	Study type and total sample size	Follow-up	Population and setting	Intervention	Control	Outcomes of interest
(Continued from previous page)						
The Compensated Work Therapy Program; Kashner et al (2002)[24]	Randomised control trial; N=162	12 months	Homeless veterans with substance dependence; Bedford and Northampton (MA), Topeka (KS), St Cloud (MN), USA	Compensated work therapy, which provided work opportunities (continued employment, higher wages, hours, promotion, and responsibility) based on measures of participant work performance and health behaviour (sobriety and use of recommended addiction services) as determined using client observation, random drug screenings, and chart reviews; the intervention combined elements of supported employment (non-trivial wages paid from revenues earned from private sector contracts) and stepwise programmes (clinician supervision and Veterans Affairs related workshops); participants were offered employment as soon as a compensated work therapy-sponsored job became available, usually within 6 days; n=127	Access to comprehensive rehabilitation, addictions, psychiatric, and medical services; n=35	Housing stability, mental health, substance use, hospital admissions
The Housing Assistance with Support Rent Assistance Study; Pankratz et al (2017)[82]	Quasi-experimental trial; N=60	6 months	Individuals experiencing chronic homelessness; Waterloo, ON, Canada	The housing assistance with support rent assistance pilot provides participants with a CAN$350 to use towards rent; n=28	Support to End Persistent Homelessness Program provides support only, which includes street outreach, housing liaison support, intensive support, peer support, support from informal circle of friends; n=32	Housing stability, quality of life, income
Individual Placement and Support within the At Home/ Chez Soi project; Poremski et al (2015)[83]	Randomised control trial; N=90	8 months	Individuals with mental illness who are precariously housed or have been homeless for at least 7 nights; Montreal, QC, Canada	Individual placement and support, which helped participants to obtain and maintain competitive employment of their choice; employment specialists were trained and supervised by a senior member of an experienced local individual placement and support service, and worked closely with the clinical teams; n=45	Participants were free to seek employment by any means of their choice, with some support from their case managers; n=45	Housing stability, substance use, hospital admissions, employment, income
HUD-VASH Supported Housing Program; Rosenheck et al (2003)[12] and others[84-86]	Randomised control trial; N=460	3 years	Veterans who are homeless (live in a homeless shelter or on the streets), or had been homeless for 1 month or longer, with a diagnosis of a major psychiatric disorder or alcohol or drug disorder; San Fransisco and San Deigo (CA), New Orleans (LA), Cleveland (OH), USA	Case management and priority access to housing vouchers; housing vouchers were administered by local housing authorities, and case managers facilitated access and use of the voucher, and supported transitions to independent living; the case management model used was modified from the assertive community treatment and encouraged at least weekly face-to-face contact, community-based service delivery, and more intensive involvement in crisis situations; n=182	In the case management-only group, case managers were to provide the same intensity of the services in the intervention group and used whatever housing resources could be obtained (no voucher); standard care condition consisted of case management provided by Health Care for Homeless Veterans programme outreach workers (short-term broker model of case management); n=90 case management only, n=199 usual care	Housing stability, mental health, quality of life, substance use, employment, income
Housing Opportunities for People with AIDS; Wolitski et al (2009)[87]	Randomised control trial; N=630	18 months	Homeless or unstably housed people with HIV; Baltimore (MD), Chicago (IL), Los Angeles (CA), USA	A federal programme providing immediate housing opportunities for people with AIDS in the form of rental assistance with case management; n=315	Customary housing services with case management; n=315	Housing stability, mental health, hospital admission

Cited references for each study include related publications. HUD-VASH=Housing and Urban Development and the US Department of Veterans Affairs Supported Housing.

Table 2: **Characteristics of included studies on income assistance**

Ten studies assessed the effect of permanent supportive housing on mental health.[13,51,56–58,60,63,68,73,74] All studies comparing permanent supportive housing with usual services reported no additional benefits of permanent supportive housing on mental health outcomes.[13,51,56,57,68,74] Permanent supportive housing with integrated on-site case management services was associated with greater reductions in psychiatric symptoms than permanent supportive housing with parallel external assertive community treatment services.[58] In two studies, at short-term (6 months) and long-term (24 months) follow-up, the mental health of the comparison groups had improved significantly compared with the permanent supportive housing group.[51,73]

Ten studies reported the effect of permanent supportive housing on subjective quality of life across different life domains.[13,51,52,56,58,60,63,67,68,74] Quality-of-life scores among permanent supportive housing participants with high

	Study design	Population	Intervention	Control	Resource required	Cost or cost-effectiveness
Aubry et al (2016)[13]	Cost analysis and randomised controlled trial	Adult participants (aged ≥18 years) who had a high need for treatment (ie, absolutely homeless or precariously housed, had a current mental disorder, not receiving assertive community treatment or intensive case management) with legal status as a Canadian citizen, landed immigrant, or refugee claimant	Housing First programmes with assertive community treatment	Treatment as usual (any housing and community support services other than for the Housing First programme)	Annual cost of Housing First with assertive community treatment services (CAN$22 257 per participant)	The Housing First programme led to a reduction in the mean cost to $21 367 per person per year; this cost offset was associated with office visits, hospital admissions, emergency shelter visits, home visits, and incarceration; the savings gained by Housing First did not fully offset its cost
Basu et al (2012)[62]	Cost analysis and randomised controlled trial	Adult participants who were fluent in English or Spanish, without stable housing during the 30 days before admission to hospital, with no child dependents, who had at least one of 15 chronic medical illnesses documented in the medical record	Housing and case management intervention based on the Housing First model	Usual care (usual discharge planning services with no continued relationship after hospital discharge)	Intervention cost not estimated; compared with usual care, the intervention group spent 2·6 fewer days in hospital (p=0·08), had 1·2 fewer emergency room visits (p=0·04), spent 7·5 fewer days in residential substance abuse treatment (p=0·004), spent 9·8 fewer days in nursing homes (p=0·08), and had 3·8 more outpatient visits each year (p=0·01); during the study period, the intervention group spent 7·7 fewer days in prison (p=0·07), 62 more days in stable housing (p=0·001), and 12 more days in respite care (p=0·002), used case management services more frequently and had a mean of 18 more telephone calls or face-to-face meetings with case managers per year (p<0·001) than the usual care group	Housing and case management intervention was associated with lower total cost than usual care (–US$6307 [95% CI –16 616 to 4002]; p=0·23)
Culhane et al (2002)[88]	Cost analysis, based on administrative databases maintained by eight agencies	Homeless people who received services or support from eight agencies in New York (NY, USA)	New York-New York housing placement	No supportive housing placement	Compared with a control group, participants on the New York-New York placement spent significantly fewer days in hospital, with decreased Veterans Affairs hospital use, and fewer days spent in prison	The total mean cost of service utilisation for the New York-New York placement period was US$40 451 per placement per year; the annualised cost per placement was $13 570; New York-New York housing was associated with a $12 146 net reduction in health, corrections, and shelter service use annually per person over the first 2 years of the intervention; a New York-New York placement had a net additional cost of $1425 per placement per year
Dickey et al (1997)[89]	Cost analysis based on a prospective experimental design from state or local government	Individuals with a current diagnosis of severe mental illness	Evolving consumer household	Independent apartment living	Evolving consumer household costs were US$3600 per month per person, which included personnel costs (including fringe benefits and payroll taxes), utility costs, supply costs, and client transportation; overhead cost was about 10% of evolving consumer household costs; independent apartment living costs were $715 per person per month, which included occupancy, personal, and start-up costs; treatment cost included cost of acute psychiatric inpatient stays, ambulatory acute treatment, community support services costs, case management costs	Individuals assigned to evolving consumer households had mean annual housing expenditures of $42 829 compared with $13 042 for individuals assigned to independent living apartments; difference in annual mean treatment costs of individuals in the evolving consumer household group ($11 293) and the independent apartment living group ($14 541) were not statistically different; the mean annual cost per person for individuALS in the evolving consumer households group was statistically higher than that for individuals in independent living apartments ($56 434 *vs* $29 838)
Evans et al (2016)[90]	Cost-benefit analysis based on Chicago administrative data	Chicago residents at risk of becoming homeless who contacted the Homelessness Prevention Call Center and requested for rent or security deposits	Callers who were referred for a temporal funding assistance	Callers who were not referred for funding assistance	Operating costs of the call centre and delegate agencies and the cost of the financial assistance ($720 per caller referred)	The averted cost per homeless individual was US$10 300; the per-person cost of averting a new case of homelessness among very low-income families was $6800 (35% lower than the per-person cost among all eligible callers)

(Table 3 continues on next page)

	Study design	Population	Intervention	Control	Resource required	Cost or cost-effectiveness
(Continued from previous page)						
Gilmer et al (2009)[91]	A cost analysis based on a quasi-experimental difference-in-difference design	Homeless people in San Diego county	REACH clients	Non-REACH individuals (control)	Mental health services costs for case management, outpatient, inpatient plus emergency, and criminal justice system services; inpatient and emergency services included hospital admissions, stays at crisis residential facilities, emergency psychiatric unit services, and psychiatric emergency response team services; criminal justice system services included mental health services provided in the county jail	Compared with the control group, case management costs increased by US$6403 (p<0·001), inpatient and emergency costs declined by $6103 (p=0·034), and criminal justice system costs declined by $570 (p=0·020); no significant differences were identified in outpatient or total costs; REACH clients incurred additional total cost of $417 over 2 years compared with the control group, but the difference was not statistically significant; the total cost of the service was $20 241
Gilmer et al (2010)[92]	A cost analysis of San Diego County Adult and Older Adult Mental Health Services encounter-based management information system	Homeless adults and residents with severe mental illness in San Diego county	Residents who received the full-service partnerships	Residents who did not receive full-service partnerships (control)	Cost of residentials (US$680 per person per month for independent living, $640 per person per month for congregate living); programme-level cost including staff, telephone and utilities ($779 per person per year); service use costs (outpatient, emergency, and inpatient services); housing cost for full-service partnership clients was $3180	Full-service partnerships increased annual per person outpatient costs by $9180 (p<0·001), but decreased annual costs per person by $6882 for inpatient costs (p<0·001), by $1721 for emergency services (p=0·002), and by $1641 for mental health services received in jail (p<0·001); the difference-in-difference estimate of the effect of full-service partnerships on total costs was not significant ($2116; p=0·45).
Gulcur et al (2003)[72]	A cost analysis based on a randomised trial	Chronically homeless individuals with severe mental illness and often substance abuse (including people living on the streets and those who had lived on the streets previously, but who resided in psychiatric hospitals immediately before study entry)	Housing First programme provided immediate access to independent apartments and supportive services, without prerequisites for sobriety or participation in psychiatric treatment and support services through a multi-disciplinary assertive community treatment team	Continuum of care programme (control)	Cost of the intervention was not considered; total number of days each participant spent in different locations for each timepoint	Costs associated with days spent on the streets, such as costs of outpatient services and societal costs were excluded; overall costs accrued by the control group were significantly higher than the intervention group (p<0·05); costs decreased to a greater extent among individuals recruited from the hospital than the sample recruited from the streets
Hunter et al (2017)[93]	A cost analysis based on a before-and-after study using administrative databases	Homeless individuals who participated in the Housing for Health programme	Before and after providing the permanent supportive housing component of the Housing for Health programme	NA	Emergency room visits, Department of Health Services inpatient hospital stays, outpatient medical visits, Department of Mental Health crisis stabilisation visits, Department of Mental Health inpatient days, outpatient mental health visits, substance use treatment times, months of general relief receipt, days spent in jail, days spent on probation	Permanent supportive housing was associated with an 80% reduction in emergency room visits, a 61% reduction in days spent as an inpatient, a 47% reduction in medical health outpatient visits, a 44% reduction in mental health outpatient visits, a 28% reduction in general relief receipt, and a two-fold increase in days spent incarcerated; a 20% programme cost offset was observed for direct service costs for 1 year before housing provision versus 1 year after housing provision, suggesting that permanent supportive housing expenses might be partially offset by savings from other Los Angeles county funds

(Table 3 continues on next page)

service needs improved more quickly than the usual services group in the first year of follow-up and had higher mean scores at 2 years (adjusted standardised mean difference 0·15 [95% CI 0·04–0·24]; p<0·01). However, this difference decreased over time (adjusted standardised mean difference at 24 months 0·05 [95% CI –0·08 to 0·18]; p=0·43; low certainty evidence).[13] Among participants with moderate support needs, the difference favoured permanent supportive housing at 6 months (mean change from baseline 5·91 [95% CI 3·41–8·41]; p<0·001) and at

	Study design	Population	Intervention	Control	Resource required	Cost or cost-effectiveness
(Continued from previous page)						
Holtgrave et al (2013)[94]	Cost-utility analysis based on data from the Housing and Health Study	Homeless and unstably housed people with HIV in Baltimore, Chicago and Los Angeles	Housing and health services	No supportive housing	Cost of housing and health services (US$12 228); mean medical cost per individual (emergency department; $97); net present value of downstream medical care costs saved when an HIV infection is averted was $315 904	Among Housing and Health Study participants, 0·01567 HIV transmissions were averted per person, and QALYs increased by 0·0324 due to improvements in perceived stress; averting one case of HIV transmission saved 9 years of life, 11·55 undiscounted QALYs, and 5·33 QALYs discounted at 3%; the cost per QALY-gained by the provision of housing services in the Housing and Health Study was $62 493
Larimer et al (2009)[95]	Cost analysis based on a quasi-experimental study	Chronically homeless individuals who incurred the highest total costs in 2004 for use of alcohol-related hospital emergency services, the sobering centre, and incarceration at King County jail (Seattle, WA, USA)	Housing First Programme	Waitlist control	Per-person costs for the housing and services (US$1120 per month); Medicaid costs; Harborview Medical Center costs; emergency medical services costs	A significant difference in total costs was identified between the Housing First and control groups whereby Housing First participants accrued an approximate 53% reduction in costs compared with controls during the first 6 months of the study (relative rate 0·47; 95% CI, 0·25–0·88); housed participants had $3569 fewer costs per month during the housed period than control participants; housing costs were $1120 per person per month but housed participants had $3569 fewer costs per month during the housed period, yielding a total mean cost offset of $2449 per person per month for Housing First participants
Latimer et al (2019)[96]	A cost-effectiveness analysis using data from the At Home/ Chez Soi randomised controlled trials	Adults with mental disorders (at least one of six disorders, including psychotic disorder, major depressive disorder, and post-traumatic stress disorder) who were absolutely homeless or precariously housed with previous episodes of absolute homelessness	Housing First plus intensive case management	Treatment as usual	Shelters, substance use treatment, supportive housing, ambulatory visits, emergency department visits, hospital admission (physical and psychiatric), other (eg, helplines, day centres), police contacts and court appearances, incarcerations, welfare and disability benefits, income earned, intervention cost (programme expenses and housing cost)	The cost of providing the Housing First with intensive case management intervention was CAN$14 496; 46% of this cost was offset by a reduction in costs associated with health care, social services, and justice-related services; compared with treatment as usual, Housing First plus intensive case management was associated with an additional cost of $7868 and 140 days spent stably housed, with the incremental cost-effectiveness ratio of $56 per day of stable housing (95% CI 30–85); Housing First with intensive case management was considered cost-effective if society was willing to pay at least $56 for each additional day of stable housing
Lenz-Rashi (2017)[97]	A cost analysis based on a cross-sectional, descriptive before-and-after study	Children who had resided in Cottage Housing Serna Village (CA, USA) supportive housing programme with one or more of their parents sometime between 2002 and 2009 in Northern California	Cottage Housing supportive housing placement	NA	Costs of county foster care including family maintenance services (US$162 per month) and out-of-home placement (ie, foster care placement) costs; foster family costs were $1140 per month and group home placement costs were $5100 per month.	The total child welfare costs for all families after clients graduated or exited the Cottage Housing programme decreased by $1 017 630 compared with before they entered the programme ($295 632 *vs* $1 313 262)
Lim et al (2018)[98]	Cost analysis from the perspective of government (Medicaid)	Adults with serious mental illness and chronic homelessness or dual diagnoses of mental illness and substance use	Placed and unplaced individuals to the New York City supportive housing programme (housing placement not contingent on adhering to treatment or services)	NA	Cost of the intervention was not considered; total Medicaid costs (outpatient care, inpatient care, emergency department visits, and prescription drugs); other costs mainly consisted of those from home health agencies and personal care, and residential care	The housing programme was associated with total Medicaid cost savings (–$9526 [95% CI –19 038 to –2003]).

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	Study design	Population	Intervention	Control	Resource required	Cost or cost-effectiveness
(Continued from previous page)						
Chalmers et al (2010)[99]	A cost analysis based on administrative databases (before-and-after study)	Homeless people with mental illness who were formerly homeless in the state of Maine (USA)	Before and after providing permanent supported housing	NA	Health care, mental health care, substance abuse treatment, community support, prescription drugs, ambulance calls, police contact, nights spent in jail, housing costs, shelter night stays, hospital emergency room visits, and public transportation	Supportive housing was associated with a 57% reduction in mental health care costs, a 97% reduction in emergency shelter costs, a 14% reduction in jail costs, and 32% savings in ambulance costs; total savings to the system were US$584 907 after 12 months in housing, representing a mean saving of $2182 per participant in the study
Mares and Rosenheck (2011)[100]	Cost analysis based on a prospective cohort study	Chronically homelessness individuals	Comprehensive housing and health-care services through the federal Collaborative Initiative on Chronic Homelessness programme	Usual care	Medical and dental treatment, mental health services, substance abuse services, and the total for all three types of services	Collaborative Initiative on Chronic Homelessness participants incurred higher total health-care costs than the usual care group (US$4544 *vs* $3325; p<0·001).
Pauley et al (2016)[101]	Cost analysis based on a feasibility, before-and-after study	All residents of the three participating supportive inner-city housing facilities who received service in the 16-month study period	Inner City Access Programme, which combines supportive housing services and health care for homeless, underhoused, and marginalised populations using the shelter system	NA	Cost of the intervention was not considered; engagement or social interaction, hospital admission, hospital discharge, laboratory services, reminder or client accompaniment, occupational therapy, physical therapy, other professional requests or visits, wound care, foot care, diabetic education, health status monitoring and teaching, education about mental health issues, medication management monitoring, medication cueing, prescription retrieval, oral or denture care, urinary incontinence care, sponge bath, hair care and shampoo, laundry, cleaning assistance, assistance with meal preparation, monitoring and observation of activities of daily living, grocery shopping	Participating in the programme was associated with a 60% decrease in average cost per client (US$5357 *vs* $2159)
Rosenheck et al (2003)[12]	Cost-effective analysis based on a randomised, prospective experimental study	Homeless veterans with psychiatric or substance disorders or both	HUD-VASH programme with housing vouchers; or case management only without housing vouchers	Standard Veterans Affairs care	Outpatient care costs (mental health care, medical-surgical care, homeless case management); inpatient and residential care costs (mental health care, medical-surgical care, residential care); non-health costs (shelter, incarceration, administrative cost of housing vouchers and earned income, productivity)	From the perspective of the health-care system, Veterans Affairs health costs for HUD-VASH participants were 18% higher (US$6962) than those in the standard care group; from a societal perspective, HUD-VASH clients consumed 15% ($6200) more resources than standard care clients; each additional day housed among HUD-VASH clients cost $58 (95% CI 4 to 111) from the perspective of Veterans Affairs, $50 (–17 to 117) from the perspective of the health-care system, and $45 (–19 to –108) from a societal perspective
Schinka et al (1998)[102]	Cost analysis based on a pseudorandomised experimental study	Men with moderate to severe substance dependence with consecutive voluntary admissions to the substance abuse treatment programme of a metropolitan Veterans Affairs hospital (undisclosed location)	Supportive housing	Inpatient treatment	Personnel costs (professionals such as psychiatrists, nurses, occupational therapists, and support staff), housing costs, treatment space costs, meal costs	The weekly per-patient cost for inpatient treatment was US$1674 ($719 for personnel costs and $955 for housing costs); for the supportive housing patients, the weekly cost was $899 ($624 for personnel costs and $275 for housing costs); the cost-saving was $775; the mean costs of a successful treatment were $9524 and $4291 for the inpatient and supportive housing groups, respectively

(Table 3 continues on next page)

24 months (mean change from baseline 4·37 [95% CI 1·60–7·14]; p=0·002; low certainty evidence).[56] At 6 years, no significant differences in quality of life were observed between the groups, regardless of participants' level of need.[67] One study showed a significant improvement in permanent supportive housing participants' satisfaction in living situations (p<0·01); however, no significant differences were identified between groups in health-related quality-of-life measures (p=0·99).[74] A second study reported higher quality of life in the comparison group

	Study design	Population	Intervention	Control	Resource required	Cost or cost-effectiveness
(Continued from previous page)						
Stergiopoulos et al (2015)[56]	Cost analysis based on a randomised controlled trial	Absolutely homeless or precariously housed individuals with mental illness, with or without a concurrent substance use disorder, served by community agencies and institutions	Scattered-site supportive housing with mobile, off-site intensive case management services, offering rapid, low-barrier permanent housing in independent units with supports fostering participant empowerment, choice, personalised goals, hope, and resilience	Usual care (access to existing housing and support services in their communities)	Programme cost (contributions by private donors and government sources, welfare and disability payments, capital cost); residential health, social, and justice services (hospital admission, nursing and long-term care facilities, psychiatric rehabilitation residential programme, addictions treatment or residential recovery, detox facilities, crisis housing, single room occupancy with support, emergency shelters, jails or prisons, corrections half-way house, all other housing; non-residential services (outpatient consultations, emergency department visits, ambulance transports, crisis lines, mobile crisis teams, day [drop-in] centres, community meal centres or meal programmes, food banks, community-based provider visits, police contacts, arrests, detentions, court appearances); Housing First intervention (rent supplements and housing teams, intensive case management teams); government assistance earnings (social assistance, disability, and other benefits)	The mean annual cost of supportive housing with intensive case management services was CAN$14 177 per participant, resulting in a mean net cost offset of $4849 per participant per year, or 34% of the cost of the intervention
Srebnik et al (2013)[103]	Cost analysis based on a before-and-after study without control group	Adults who met the federal definition of individuals who are chronically homeless with significant disabling physical or psychiatric conditions who were referred either from King County Public Health's REACH homeless outreach team (Seattle, WA, USA) or from medical respite with incurred inpatient paid claims of at least US$10 000 in the previous year	Received a Housing First programme (Begin at Home)	Individuals who did not receive the Begin at Home intervention	Emergency department visits, sobering centre visits, inpatient episodes, jail use, medical respite use	The difference in service use associated cost reductions between the Housing First participants and comparison group of $36 579 outweighed the programme operating costs of $18 600 per person per year

REACH=Reaching Out and Engaging to Achieve Consumer Health. QALYs=quality-adjusted life years. NA=not applicable. HUD-VASH=Housing and Urban Development and the US Department of Veterans Affairs Supported Housing.

***Table 3*: Characteristics of included studies on cost-effectiveness**

than the permanent supportive housing group (p<0·01).[51] Single-site permanent supportive housing with integrated on-site case management support was associated with greater life satisfaction among male participants than male participants who had permanent supportive housing and access to parallel external assertive community treatment services. In contrast, female participants reported similar levels of life satisfaction for both types of housing.[58]

The effect of permanent supportive housing on substance use was assessed in nine studies.[13,51,56,58,60,67,68,73,74] In the AHCS study, no significant differences in substance-use related problems were identified in permanent supportive housing participants compared with usual services over 6 years (p=0·15).[67] In another study, the proportion of permanent supportive housing participants who reported severe drug-use problems was significantly higher than those receiving usual services (mean difference 1·40 [95% CI 0·44–2·36]; p=0·004), whereas no significant differences in severe alcohol-use problems were identified between the groups (p=0·09).[51] Permanent supportive housing was not found to have any additional benefits on substance-use outcomes in four other studies.[58,68,73,74]

Data from the AHCS study showed a larger decrease in emergency department visits among high needs permanent supportive housing participants than individuals in the usual services group at 6 months (incidence rate ratio 0·68 [95% CI 0·52–0·90]; p=0·007), but not at subsequent follow-up or among moderate needs participants.[13,56] In contrast, the US-based Pathways study reported that participants in the usual care group spent significantly more time in hospital than did participants in the permanent supportive housing group (p<0·01).[72]

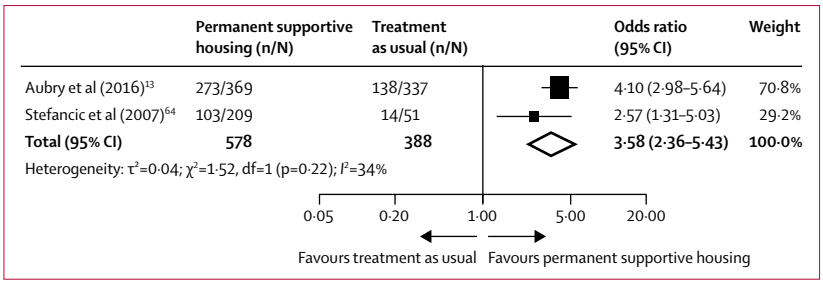

Figure 2: **Forest plot of the effect of permanent supportive housing versus usual services on the number of participants in stable housing at 18 months or later**
Weights were assigned by random effects analysis. The diamond represents the overall pooled effect estimate of the number of participants in stable housing.

Furthermore, one study found that permanent supportive housing participants had fewer admissions to hospital (29% reduction [95% CI –10 to –4]; p=0·005); fewer days spent in hospital (29% reduction [8 to 45]; p=0·01); and fewer emergency department visits (24% reduction [3 to 40]; p=0·03) over an 18-month period compared with usual services.[61,62] In an earlier study, the permanent supportive housing group spent significantly fewer nights in hospital than did participants in the usual services group (mean difference –31 [95% CI –47·83 to –14·16]; p=0·001), however no between-group differences were identified for the number or duration of readmissions to psychiatric hospitals.[57] In a non-randomised study, no significant differences were identified between permanent supportive housing and waitlisted groups with regard to the number of days spent in hospital (p=0·54) or the number of emergency department visits (p=0·35).[74]

Few permanent supportive housing studies reported on earned income and employment outcomes. The AHCS study found no significant differences between participants with high or moderate support needs who received permanent supportive housing compared with those who received usual services in terms of number of days of consecutive employment, hourly wage, hours of work per week, or monthly earned income.[48]

The cost-effectiveness studies on permanent supportive housing reported inconsistent results regarding resource requirements. Seven studies showed increased costs to the payer,[13,56,88,89,91,92,100] and six showed that costs were partially offset by savings in medical and social services as a result of the intervention (table 3).[93,95,97,99,102,103] A cost utility analysis of permanent supportive housing suggested that permanent supportive housing was associated with increased costs and increased quality-adjusted life-years, with an incremental cost-effectiveness ratio of US$62 493 per quality-adjusted life years.[94] Another study concluded that, compared with usual care, permanent supportive housing was more costly to society (CAN$7868 [95% CI 4409–11 405), but increased the number of days spent stably housed (140 days [95% CI 128–153]).[96] The cost of 1 day of stable housing was CAN$56, which might be considered to be cost-effective.

Ten studies on income assistance interventions assessed housing stability;[12,24,75,77–80,82,83,87] however, heterogeneity in intervention design and outcome assessment precluded meta-analysis. Five studies investigated the impact of housing subsidies with[12,80,82,87] or without[79] case management. When compared with usual services, one study showed significant improvements in the proportion of participants living independently in stable housing (without family or friends) at 6 months (OR 6·20 [95% CI 4·18–9·20]; p<0·0001) and 18 months (4·60 [3·10–6·83]; p<0·0001).[87] When compared with case management alone, housing subsidies and case management resulted in long-term improvements in the number of days spent stably housed (mean difference at 3 years 8·58; p<0·004; low certainty evidence),[12] and the proportion of participants living in independent housing at 24 months (57·5% for people with housing subsidies and case management *vs* 30·4% for people with case management alone; OR 3·09 [95% CI 2·00–4·76]; p<0·0001).[80] Notably, women achieved consistent housing almost 6 months earlier than men.[80,81] A pilot study that offered assistance finding housing and rental supplements showed such marked improvements in attainment of independent housing at 6 months that the study was concluded and plans were made to routinely implement the intervention (100% of people given assistance *vs* 14·2% of people without assistance; p<0·001 Fisher's exact test).[78] The remaining four studies assessed the effectiveness of financial education,[75] compensated work therapy,[24] or individual placement and support.[76,77,83] Financial education had no additional benefit compared with existing employment-specific programming;[75] however, compensated work therapy significantly reduced episodes of homelessness compared with usual services (OR 0·1 [95% CI 0·1–0·3]; p=0·001; low certainty evidence).[24] Individual placement and support had an effect on housing stability when compared with usual services[83] or social enterprise interventions.[76]

Few studies investigated the effects of income assistance interventions on mental health, quality of life, substance use, and hospital admission outcomes: compared with usual care, housing subsidies with case management resulted in short-term improvements in depression symptoms and perceived stress levels, but had no significant effect on measures of mental health or emergency department visits.[87] Compared with case management alone, the addition of housing subsidies significantly improved quality of life in US (mean difference 0·39; p=0·009; low certainty evidence)[12] and Canadian studies (p=0·031).[82] Housing subsidies without case management had no effect on alcohol or drug use.[79] Financial education did not significantly affect depressive symptoms compared with existing employment-specific programming.[75] Compensated work therapy immediately decreased alcohol consumption (mean difference –45·4% [SD 9·4]; p=0·001) and drug consumption (mean difference –44·7% [12·8]; p=0·001) compared with usual services, however, differences between groups declined over time.[24]

Employment and earned income outcomes were reported in six studies.[12,75,77,79,82,83] Long-term housing subsidies alone had no effect on employment or family income, but significantly improved food security compared with usual services (p<0·01).[79] Housing subsidies with case management also resulted in improved food security when compared with usual services,[82] but had no effect on days employed or total earned income.[12] Financial education resulted in no significant changes in economic hardship, earnings, and employment, whereas the employment-specific programming (comparison) group had a significant increase in employment.[75] Provision of individual placement and support alongside permanent supportive housing in the AHCS study during periods of high intervention fidelity resulted in participants being more than twice as likely to secure employment than those assigned to usual services (OR 2·42 [95% CI 1·13–5·15]; p=0·02; low certainty evidence); however, during the entire study period, this difference was not significant (p=0·46).[83] Compared with social enterprise interventions, individual placement and support had no additional benefits on earned income or employment for young people (aged 16–24 years) who were homeless.[77]

Two studies assessed the cost-effectiveness of income assistance interventions.[12,90] Housing subsidies with case management led to higher client costs but fewer days spent homeless compared with standard care and case management only groups.[12] For each additional day housed, clients who received housing subsidies and case management cost Veterans Affairs US$58 (95% CI 4 to 111), cost the US health-care system $50 (–17 to 117), and cost government (ie, health-care services and non-health services) $45 (–19 to 108).[12] Temporary financial assistance was associated with costs of US$10 300 per one new homeless case averted. Furthermore, targeting low-income families would reduce the cost of averting one new case of homelessness to US$6800.[90] Additionally, the benefit gained from temporary financial assistance was found to outweigh the cost, with a net saving of US$20 548.[90] We did not identify any studies reporting on the cost-effectiveness of social assistance programmes and employment support.

Discussion

We found that permanent supportive housing significantly improved housing stability, with little to no negative effects on other social and health outcomes. Permanent supportive housing stability outcomes remained statistically significant at 6 years of follow-up. Similarly, income assistance interventions, particularly housing subsidies, improved housing stability and food security. Effects on other income and employment related outcomes were inconsistent.

Most studies on permanent supportive housing included individuals with severe mental illness who had previous experience of homelessness. Several studies showed that permanent supportive housing can end homelessness and assist this population to achieve housing stability, compared with usual services.[13,56,64,67,68] The effects of permanent supportive housing on housing stability are similar for individuals with high[13] or moderate[56] levels of need. A small amount of evidence suggests that recipients of permanent supportive housing report greater improvements in their subjective quality of life than those receiving standard care.[56] Additionally, to date, studies have shown no evidence that recipients of permanent supportive housing have improvements in other health and social outcomes (eg, mental health, substance use) compared with controls. Despite wide variation in the methodological quality of the included studies, economic evidence is consistent with findings from a previous review of cost and cost-effectiveness studies done between 2007 and 2015.[105] We found that permanent supportive housing results in cost offsets, but requires additional resources for implementation. The extent to which permanent supportive housing can be regarded as providing value for money is dependent on the willingness of governments to pay for the achieved housing outcomes.

Our systematic review provides the most up-to-date evidence on permanent supportive housing and income assistance as of February, 2020, and is the only existing review, to our knowledge, that includes a study of long-term housing stability outcomes over a 6-year period. The addition of this recent publication serves to address a limitation of the research to date—ie, the relatively short-term follow-up of previous studies. Previous reviews included temporary or abstinence-contingent housing interventions,[106–110] depended on a high percentage of observational studies,[107,108,111–113] or restricted the inclusion of studies on the basis of date or language.[106–109,112,114] For example, a 2018 review included only randomised controlled trials with a follow-up of at least 1 year and focused exclusively on housing stability outcomes.[110] The authors concluded that a range of housing programmes and case management interventions appear to reduce homelessness and improve housing stability compared with usual services.[110] Similar findings were reported by Baxter and colleagues, who assessed the outcomes of four randomised control trials published up to 2017, and considered housing stability as a secondary outcome.[114] The authors found that permanent supportive housing resulted in large improvements in housing stability, however, short-term effects on health and wellbeing outcomes were unclear.[114] We completed an independent replication of housing outcomes,[114] and confirmed the findings of previous reviews, while concurrently providing additional evidence on a variety of psychosocial and cost-effectiveness outcomes from a broader set of study designs. Replication of the findings of systematic reviews is crucial to ensure robustness or generalisability of systematic review results. Without replication of results, policies, guidelines, or practices could be implemented on

the basis of tenuous evidence.[115] Furthermore, our review enabled people with lived experience of homelessness to engage with topic prioritisation and review processes, which represents a valuable and unique approach to community engagement, health equity, and development of trust in review findings.[116] Homelessness is an international public health priority and, thus replication of systematic review findings has implications for public policy and programme implementation.

Furthermore, our review is the first to synthesise evidence on the effect of income assistance interventions on the social and health outcomes of homeless individuals. Income assistance interventions have not been as widely studied as housing interventions, in part due to the complexity of isolating the intervention in populations with complex social and economic needs. Furthermore, the effect of such interventions on subjective outcomes including quality of life might require longer follow-up and more intensive interventions to identify any differences, which pose challenges for study design. Furthermore, investigation of the effect of income assistance interventions on individual outcomes in the context of a challenging political–economic climate and ongoing systemic barriers remains difficult.[117] However, research on other populations,[22,118] such as low-income families and pregnant women accessing income supplements, has demonstrated positive outcomes, thus highlighting the importance of comprehensive services, longitudinal support, and patient advocacy as part of the intervention.[79,119] Existing economic evidence shows that the additional cost of providing income assistance is found to be minimal and outweighed by its economic benefit to society.

We used high-quality methods to synthesise our evidence, did meta-analyses on housing stability, and used GRADE methods to assess the certainty of the effects. Although our review offers a unique summary of evidence that is specific to individuals with lived experience of homelessness, it has some limitations. All included studies were done in the USA or Canada. Thus, we hypothesise that the effectiveness and cost-effectiveness of these interventions could differ globally. Caution should be taken in generalising these findings to other high-income countries with substantially different health or social systems. The GRADE certainty of evidence ranged from low to moderate, indicating that future research will probably affect our confidence in the effect estimates, and also likely change the estimates themselves. Another significant limitation is the heterogeneity between studies with regard to interventions and standard care models, which might vary markedly both within and between countries, and continues to restrict comparisons and interpretations of outcomes.[120] Such heterogeneity precluded meta-analysis for most outcomes and we therefore relied on narrative synthesis for the majority of this review. To reduce reporting bias, we used the SWiM reporting guidelines.[31] Future research on the development of fidelity standards for single-site programmes would be valuable to generate implementation data.

The review uncovered health equity findings: women were housed 6 months earlier than men and permanent supportive housing housed even the most vulnerable and people with severe mental illness, thus promoting health equity. Although research on social outcomes of housing and income interventions has been done, further work is needed to assess health outcomes.[121] Additionally, patient-important outcomes (ie, outcomes that patients consider most important) require longer follow-up period and realist evaluation[122,123] to better understand what works, for whom, and under what conditions.

The potentially devastating consequences of homelessness demand effective interventions and policy action to end homelessness. This systematic review studied interventions that were selected with the input of people with lived experience of homelessness, successfully replicated housing effects reported in other reviews, included new studies with outcomes up to 6 years of follow-up, and considers an expanded list of social and health outcomes and economic findings. As a result of research findings on the effectiveness of permanent supportive housing, countries in Europe, Canada, and the USA have prioritised the development of non-abstinence-contingent permanent supportive housing programmes to help people with serious mental illness who have extensive histories of chronic homelessness.[16,124] However, a need persists to educate policy makers and the public about the effectiveness of these interventions to enable further refinement, scale-up, and integration of these interventions within health and social care systems.

Contributors

GB, VS, PT, and KP conceived the study and secured funding for this project. All authors screened and selected relevant studies. AS, OM, TAb, QA, CM, and KT helped with the data extraction process. TAu, AS, OM, TAb, QA, CC, and KT critically appraised included studies. TAu, GB, VB, AS, OM, TAb, QA, KT, VS, and KP did the data analysis. AS and OM drafted the first version of the review and AS created the figures and drafted the appendices. TAu, GB, VB, VS, PT, and KP supervised the writing. All authors interpreted the findings and edited the manuscript. TAu, GB, VB, AS, OM, and KP finalised the manuscript, and all authors approved the final version of the manuscript.

Declaration of interests

TH has received honoraria from Bruyère Research Institute to provide consultations on this work. All other authors declare no competing interests.

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