



University  
of Glasgow

Baxter, Andrew (2017) *The effects of Housing First and other permanent, non-contingent housing provision interventions on the health and wellbeing of homeless adults: a systematic review and meta-analysis of Randomised Controlled Trials*. [MSc].

<http://endeavour.gla.ac.uk/296/>

Copyright and moral rights for this work are retained by the author(s)

A copy can be downloaded for personal non-commercial research or study, without prior permission or charge

This work cannot be reproduced or quoted extensively from without first obtaining permission in writing from the author(s)

The content must not be changed in any way or sold commercially in any format or medium without the formal permission of the author

When referring to this work, full bibliographic details including the author, title, institution and date must be given

## Abstract

**Background:** Homelessness is associated with poor health and high rates of health risk behaviour. Housing First is designed as an intervention to decrease rates of homelessness. The claimed effectiveness in improving housing stability is proposed as an approach to improve health and wellbeing.

**Objectives:** This review aimed to evaluate existing evidence for the effectiveness of Housing First in improving health and wellbeing, and housing stability as a causal factor. Two models of the intervention were examined.

**Data Sources:** Searches for publications in peer reviewed journals were conducted across several databases (EMBASE, MEDLINE, PubMed, PsycINFO, CENTRAL, Social Sciences Citation Index, Biosis).

**Study Eligibility:** *Population* – adults who are roofless, houseless, living in insecure housing or inadequate housing. *Intervention* – Housing First, defined as assistance in locating and entering housing or subsistence of rental costs to attain housing which was a) intended to be permanent, b) not contingent on adherence to treatment or abstinence from substance use and c) provided rapidly. *Comparators* – not receiving the above intervention. *Outcomes* – primary measures of health and wellbeing: substance use, mental health, non-routine use of healthcare services, self-reported health and quality of life, other; secondary outcome: housing stability. *Study type* – Randomised Controlled Trials recording quantitative data.

**Methods:** Risk of bias was assessed for all studies. Meta-analyses were carried out across five outcome domains. Results from a single study's subgroup analyses were examined.

**Results:** Four studies were found with useable data which was extracted and synthesised. Statistically significant improvements were seen in intervention groups over comparators in

Emergency Room (ER) visits (incidence rate ratio=0.80; 95%CI 0.72 to 0.88) and number of days spent hospitalised (standardised mean difference  $d$ =-0.18; 95%CI -0.33 to -0.03). Differences favouring intervention participants were seen in self rated mental health ( $d$ =0.08; 95%CI -0.61 to 0.21), mental health symptom severity ( $d$ =-0.04; 95%CI -0.19 to 0.11) and number of participants with  $\geq$ ER visit, but these results were not certain at the 95% confidence level. Differences favouring comparators were found in measures of problematic substance use (Odds Ratio=0.81; 95%CI 0.60 to 1.10), number of participants with  $\geq$ 1 hospitalisation (OR=1.05; 95%CI 0.83 to 1.32) and self-rated physical health ( $d$ =-0.05; 95%CI -0.18 to 0.08), also not certain at the 95% confidence level. Significant results were seen in measures of housing stability across all studies, with 66%-82% of intervention participants attaining stable housing at 18-24 months compared to 11% to 51% of comparator participants. The heterogeneity of effect size prevented calculation of pooled effect estimate. Subgroups showed variation in effect across age groups, severity of mental health problem and type of model used.

**Limitations:** The eligibility criteria limited the number of studies. High risk of bias arose in all studies. Differences in interventions, participants and controls may have produced high heterogeneity.

**Conclusions and Implications:** Housing stability was improved, as was potentially some aspects of health. Further research could analyse causes of this variation in outcome across groups and potentially develop more targeted models of Housing First. Implementation of the approach would likely reduce homelessness and non-routine health service use, but may not be sufficient to address all health concerns.

## Acknowledgements

Drs Hilary Thomson, S. Vittal Katikireddi and Emily Tweed of the MRC/CSO Social & Public Health Sciences Unit, University of Glasgow provided excellent, ongoing supervision and advice at all points throughout this research.

Lynn Irvine, College Librarian of the College of Social Sciences, University of Glasgow provided invaluable training and assistance in constructing and running the literature search.

Professor Deborah Padgett, Professor of Social Work and Global Public Health at the New York University, Silver School of Social Work, gave excellent encouragement and helpful input into the Pathways Housing First development and the published results when approached by email and face-to-face.

Dr. Cindy Gray gave excellent guidance to the Global Health Master's students in preparation for and completion of the dissertations. Her ongoing support of each of us through this course has been instrumental.

The shared support and encouragement between members of the Master's of Global Health class of 2017 has also been an appreciated and cheery drive to continue on to the completion of this project.

## Table of Contents

1	Introduction .....	1
1.1	Homelessness and Health .....	1
1.2	Current interventions to address homelessness .....	2
1.2.1	Linear Residential Treatment or Continuum of Care Services .....	2
1.2.2	Housing First .....	2
1.3	Evaluating Housing First .....	3
2	Critical Literature review .....	5
2.1	Development of Housing First .....	5
2.2	Defining Housing First .....	7
2.3	The strengths of Housing First .....	9
2.4	Critique and limitations of Housing First .....	12
2.5	Previous reviews of the evidence for Housing First .....	15
2.6	Evaluation of the health impacts of Housing First – the need for this review .....	16
3	Methods .....	18
3.1	Aim .....	18
3.2	Research Questions .....	18
3.3	Protocol .....	18
3.4	Ethical considerations .....	19
3.5	Search Strategy .....	19
3.6	PICOS inclusion criteria .....	20
3.6.1	Population .....	20
3.6.2	Intervention .....	20
3.6.3	Comparators .....	21
3.6.4	Primary Outcomes .....	21
3.6.5	Secondary Outcomes .....	22
3.6.6	Study type .....	22
3.7	Other exclusion criteria .....	22
3.8	Screening of studies .....	22
3.9	Data extraction .....	23
3.10	Risk of Bias assessment .....	23
3.11	Effect size calculations .....	24
3.12	Data synthesis .....	24
3.13	Subgroup analysis .....	26
4	Results .....	27

4.1	Search results and studies included.....	27
4.2	Description of studies .....	28
4.2.1	Pathways Housing First (the New York Housing Study).....	29
4.2.2	At Home/Chez Soi study .....	29
4.2.3	Housing Opportunities for Persons With AIDS study (HOPWA) .....	32
4.2.4	Chicago Housing for Health Partnership study (CHHP).....	32
4.3	Risk of Bias in included studies .....	34
4.3.1	Areas of low risk of bias .....	34
4.3.2	Areas of high risk of bias .....	35
4.4	Data synthesis .....	37
4.4.1	Substance Use .....	39
4.4.2	Mental Health .....	41
4.4.3	Health Service Use .....	43
4.4.4	Self-reported Health and Quality of Life .....	47
4.4.5	Other, unanticipated outcomes.....	49
4.4.6	Housing Stability .....	52
4.4.7	Subgroups reported .....	55
4.4.8	Sensitivity analyses .....	58
4.5	Summary of synthesised data .....	59
5	Discussion.....	61
5.1	Summary of findings .....	61
5.2	Appraising this review.....	63
5.2.1	Strengths of this review .....	63
5.2.2	Limitations of this review.....	64
5.3	Limitations of available evidence.....	66
5.4	Implications for scholarship .....	67
5.5	Implications for implementation of Housing First.....	69
6	Conclusion.....	71
7	References .....	72
Appendix A	PROSPERO protocol .....	83
Appendix B	Search Strategy .....	88
Appendix C	Data Extraction Form .....	91
Appendix D	Cochrane Risk of Bias form 2.0 (Higgins et al. 2016) .....	94
Appendix E	Included studies .....	99
Appendix F	Excluded studies at final screening stage .....	105
Appendix G	Measures reported in studies as used in meta-analyses.....	109

## Figures

Figure 1-1 The Housing First logic model, adapted from Stergiopoulos et al. (2014, fig.1) and Tsemberis (2010) .....	4
Figure 2-1 The 'Implementation Paradox', reproduced from Henwood, Shinn et al. (2013, fig.1) .....	11
Figure 4-1 PRISMA flow diagram showing literature search and screening process .....	27
Figure 4-2 The layout of the 'At Home/Chez Soi' study and the samples reported by each paper (constructed from analysis of retained articles) .....	31
Figure 4-3 Odds ratio of reduction in problematic substance use across 24 months in intervention compared to TAU .....	40
Figure 4-4 Standardised mean difference of improvement in mental health from baseline to 18-24 months between intervention and control .....	42
Figure 4-5 Standardised mean difference in decrease in mental health symptom severity from baseline to 18-24 months between intervention and control groups .....	42
Figure 4-6 Incidence Rate Ratio of Emergency Room visits across 18-24 months in intervention group over control .....	44
Figure 4-7 Standardised mean difference in number of hospitalisations across 18-24 months between intervention and control.....	44
Figure 4-8 Standardised mean difference in number of days spent hospitalised during 18-24 months between intervention and control .....	45
Figure 4-9 Odds ratio of hospitalisation in 18-24 months in intervention compared to TAU	45
Figure 4-10 Odds ratio of emergency room visit in 18-24 months in intervention compared to TAU .....	46
Figure 4-11 Standardised mean difference of improvement in self-rated physical health from baseline to 18-24 months between intervention and control .....	48
Figure 4-12 Odds ratio of achieving stable housing by 18-24 months in intervention compared to TAU .....	54
Figure 4-13 Standardised mean difference in proportion of days spent housed during 18-24 month trial period.....	54

## Tables

Table 4-1 Overview of studies identified for inclusion in this review .....	28
Table 4-2 Risk of Bias of the four included studies across the four primary outcome domains, assessed using the Cochrane Risk of Bias tool 2.0 (Higgins et al. 2016).....	34
Table 4-3 Summary of reported outcome measures used from each study, grouped by outcome domain and comparison.....	37
Table 4-4 Other health and wellbeing related outcomes extracted from studies.....	49
Table 4-5 Summary of all synthesised results, grouped by Outcome Domain and Comparison .....	59



# 1 Introduction

## 1.1 Homelessness and Health

Homelessness is a significant and widespread social problem. It can be seen in diverse contexts worldwide, and has prompted calls for action (FEANTSA 2017). Homelessness is defined in several ways to clarify the problem to be addressed. The European Typology of Homelessness and Housing Exclusion (ETHOS) includes: rooflessness, houselessness, living in insecure housing, and living in inadequate housing (FEANTSA 2006). The United Nations Conference of European Statisticians alternatively uses two categories of 'primary homeless' – living without shelter – and 'secondary homeless' – including temporary or insufficient housing (Conference of European Statisticians 2016).

Homelessness is thought to cause a range of severe health outcomes (Fazel et al. 2014). Simultaneously, it has been suggested that poor health may cause negative housing outcomes. Persons of high needs may be more strongly selected into homelessness through current structures of public and private housing systems (Smith 1990).

These observations prompt action on homelessness as a health intervention (BurrIDGE & Ormandy 1993; Byrne et al. 1986; Henwood, Cabassa, et al. 2013). While the evidence for the effectiveness of housing interventions on health is not yet conclusive, these negative effects of homelessness on health do suggest that a well-developed model of housing provision could bring positive results (Thomson et al. 2001; Hwang et al. 2009; Hwang 2001).

## 1.2 Current interventions to address homelessness

### 1.2.1 Linear Residential Treatment or Continuum of Care Services

Common approaches to addressing homelessness in particularly vulnerable persons have been categorised as 'linear residential treatment' (LRT), also described as 'Continuum of Care services', 'treatment first' or the 'staircase model' (Padgett et al. 2015; Tsemberis 2010, p.13). These aim to begin with temporary, emergency accommodation and services to address health needs. The participant then progresses through stages of temporary and transitional housing before achieving permanent housing. This is made conditional on adherence to treatment and programmes targeting mental health and substance use problems throughout, with the client being assessed for 'housing readiness' before being allocated permanent accommodation. This has been criticised as being ineffective, with a high rate of return to homelessness and subsequent loss of support services (O'Hara 2007).

### 1.2.2 Housing First

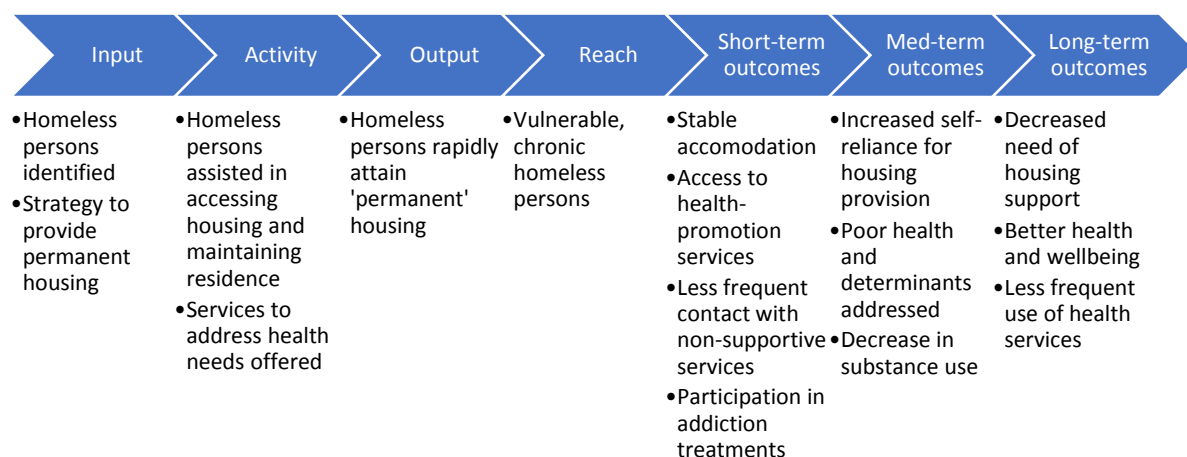
An alternative approach, labelled 'Housing First', was first developed by Pathways to Housing, aiming to give assistance in access to permanent housing as an initial step in addressing homelessness amongst vulnerable people. Based in New York, and working with homeless individuals with "mental health and addiction problems" (Tsemberis 2010, p.4), Pathways to Housing began in 1992 to test and adapt the Housing First model, which has since been implemented in several locations globally (Padgett et al. 2015). The Housing First programme differs from other models in its aim to provide rapid access to stable housing, not contingent on compliance with health treatment or substance abstinence. Additionally, it includes ongoing, flexible support through contact with a case worker with the aim of assisting in remaining in the residence and recovering health. For clients with moderate

needs, an “Intensive Care Management” (ICM) programme assigns this case worker. For more vulnerable persons, and alternative “recovery-oriented Assertive Community Treatment” (ACT) programme gives the case manager a role in actively pursuing ongoing contact with the person to address the health issues (Tsemberis 2010; Padgett et al. 2015). The developers of Housing First highlight differences with ‘treatment first’ models as providing rapid access to supported housing (initiated at first contact with homeless person), facilitating access and participants’ ‘choice’ in attaining housing with furnishing, and offering treatment and support services as entirely voluntary, with a ‘harm reduction’ approach to substance use (Tsemberis 2010, p.18).

### 1.3 Evaluating Housing First

There is increasing interest in developing the Housing First model for larger-scale implementation, pointing to a strong ‘evidence base’ (Gaetz et al. 2013; Pleace 2016). If homelessness causes poor health, less time spent homeless through the provision of stable housing could lead to positive effects on health. Housing First interventions promote and include access to health-promoting activities and services, and consequently stable housing in this context would logically lead to greater impact (see Figure 1-1). Stability of Housing is identified as an intended ‘primary outcome’ in Housing First trials (e.g. Goering et al. 2011, p.1), and so is likely to be a more commonly reported and more consistently measured outcome across the published studies.

Figure 1-1 The Housing First logic model, adapted from Stergiopoulos et al. (2014, fig.1) and Tsemberis (2010)



This review aims to appraise the available evidence evaluating interventions which provide homeless persons with rapid access to non-abstinence contingent, permanent housing.

These interventions will be compared with other treatment not involving this housing provision. Restoration of health and wellbeing are treated as a primary outcome.

Improvement in housing stability is also included as a secondary outcome, based on its role as a social determinant of health.

## 2 Critical Literature review

To examine the background of the development of the model, literature was found using both the search for 'Housing First' in the titles of books and articles and other grey literature online, and attending an event (Glasgow Homelessness Network 2017) and a presentation (Padgett 2017) addressing the Housing First model. Further publications associated with Pathways to Housing addressing the intervention were found through these references. Several books describing the history of Housing First were found, alongside protocols and research papers discussing research of the model and three systematic reviews.

### 2.1 Development of Housing First

Dr. Sam Tsemberis, credited with developing the model through foundation of Pathways to Housing in New York in 1992, published the Housing First 'manual' (Tsemberis 2010), outlining the structure of the model to be replicated by other homelessness service bodies. This aimed to house particularly vulnerable homeless persons with severe mental health problems and possible concurrent substance use problems. These clients are seen as "hard to house", resistant to the effectiveness of linear residential treatment (ibid. p.15).

Tsemberis proposes that this is a failing of the system of interventions, rather than the individuals themselves. The foundation of the Pathways Housing First model on the other hand is stated as "housing as a basic human right" (ibid. p.18), with a series of principles flowing from this (Box 2-1). Based on this, there is an implicit obligation on society to provide such housing and to support clients in maintaining it. Tsemberis (2010, p.16) also asserts that it is erroneous to assume that participants must be made 'housing ready' before they have the capability of sustaining tenancy, pointing to a high success rate amongst

observed Housing First participants (“85 percent”, *ibid.* p.19), with no identifiable predictors of success or failure to suggest that the model does not work for some participants.

*Box 2-1 The 'Principles of Housing First' as outlined by the founder of Pathways to Housing, Sam Tsemberis (Tsemberis 2010, p.18)*

- Housing as a basic human right
- Respect, warmth and compassion for all clients
- A commitment to working with clients for as long as they need
- Scattered-site housing: independent apartments
- Separation of housing and services
- Consumer choice and self-determination
- A recovery orientation
- Harm reduction

Padgett et al. (2015) describe the ongoing testing and implementation of the ‘Pathways Housing First’ model. The reported successes of Housing First in observational studies and pilot studies prompted the first Randomised Controlled trial of the model, with the intent of improving the strength of evidence evaluating the programme. In this trial of Housing First a range of measures were taken, each to test the hypothesised effects of the intervention on the health and wellbeing of participants with poor mental health (Tsemberis et al. 2004). Measures directly relevant to health, housing stability, use of substances, mental health and use of health services, were each reported (Padgett et al. 2015, Table 4.1). The summary of results reports significant improvements in housing stability, reductions in mental health service and substance use treatments, and no significant differences in mental health and substance use. These are summarised as “remarkable” findings (Padgett et al. 2015, p.56), and are presented as evidence to prompt universal uptake of the programme.

Padgett et al. (2015) trace out the implementation and trials of further Housing First interventions across Europe, including Amsterdam, Lisbon and Scandinavia. The Housing First Europe Hub website points to these and more European cities where the approach is being implemented (Housing First Europe Hub 2017), and further projects across the British isles were highlighted at the Housing First Scotland seminar (Glasgow Homelessness Network 2017; Homeless Link 2017; Depaul 2017). Of particular local interest to the author, a pilot project was conducted and evaluated in Glasgow to test the Housing First model in a particular context (Johnsen 2013). This evaluated 22 participants placed in public housing accommodation for several housing stability and health outcomes over the three years of the project. Recently allocated funding intends to 'scale up' this project by providing additional places in subsidised private rental accommodation, with placements and a 12-month evaluation due to begin in September, conducted by the Glasgow Homelessness Network in conjunction with other local partners (Crisis 2016).

## 2.2 Defining Housing First

The definition of Housing First to be used in this review was developed from the principles of Housing First as described by Padgett et al. (2015) and Tsemberis (2010) and found in Box 2-1. For clarity of inclusion and exclusion, easily defined and detectable markers of Housing First in comparison to other approaches were selected. This led to the description of the Housing First model to be used by this review as 'rapid provision of permanent, non-abstinence contingent housing'. Throughout this review these interventions will be described as 'Housing First' for brevity and clarity. Not all models were described in this way by developers and researchers. The fidelity to the Housing First principles will be discussed in the analysis.

A key principle of the initially developed intervention, as identified in Box 2-1 was the use of the 'Scattered Site' Housing First format (SHF). This aimed to give participants choice in finding housing, to promote community integration and to avoid concentrating people of high needs (Tsemberis 2010). Participants are assisted in securing housing in the private market and rent payments are subsidised. A proposed alternative Housing First model is the 'Congregate' Housing First format (CHF or CONG), often based on housing provision models developed independently from Housing First. This houses participants in a single building, in independent accommodation but with a range of communal facilities (Somers et al. 2017, p.3; Zabkiewicz et al. 2012). This proposal is not universally accepted, and is criticised as not giving participants the same level of 'consumer choice' in accommodation as people with other disabilities (Ridgway & Zippel 1990; Carling 1993). This review includes the congregate model as a 'Housing First' intervention and discusses this difference in design.

Other approaches were found which provided housing to homeless persons, but not under this definition. These were occasionally described as 'Housing First' and used by other reviewers to evaluate the Housing First intervention (Ly & Latimer 2015; Woodhall-Melnik & Dunn 2016; Kertesz et al. 2009). This included:

- Housing contingent on abstinence – The Housing and Urban Development-Veteran Affairs Supportive Housing (HUD-VASH) model (Rosenheck et al. 2003; Montgomery et al. 2013; O'Connell et al. 2009; O'Connell et al. 2012; J Westermeyer & Lee 2013) consists of provision of 'Section 8 vouchers', also termed 'Housing Choice Vouchers'. However, in the eligibility criteria of the guidelines, these vouchers can be denied to participants with a history of substance use if they cannot show commitment to or



completion of an abstinence-oriented recovery programme (U.S. Department of Housing and Urban Development 2001, p.37).

- Housing provision not ‘permanent’ – Accommodation which was intended to be time-limited was judged to be different from Housing First. The study reported in Milby et al. (2005) and Kertesz et al. (2007) conducted a comparison of randomly assigned abstinence-contingent and non-abstinence-contingent housing (alongside control). However the housing was defined as a “treatment intervention (maximum 6 months) and not a permanent housing program” (Kertesz et al. 2007, p.21). It was therefore deemed not compatible with Housing First.
- Housing provision not ‘rapid’ – Levitt (2013) provides an example of this alternative model, testing ‘Advantage subsidies’ for homeless families. Application for the subsidies was contingent on having spent the previous 60 days in shelter accommodation (Furman Centre for Real Estate and urban Policy 2017), constituting ‘transitional’ or ‘temporary’ accommodation.

### 2.3 The strengths of Housing First

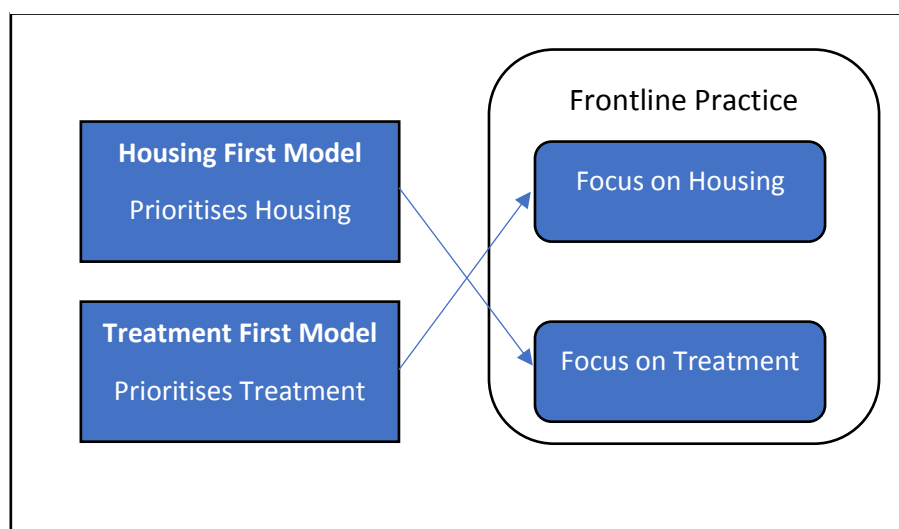
The Housing First approach can be seen to have several strengths in providing for health and wellbeing. As a starting point, the focal principle of ‘Housing as a right’ (Box 2-1) gives a clear goal. This also strengthens its legitimacy and case in the public sphere. The Housing First approach can be seen as congruent with the Capabilities approach to equality in society (Macleod 2014). In providing both the possibility of attaining housing and some measure of autonomy in choosing housing, Housing First fulfils these two markers of ‘functions’ and ‘freedoms’ central to the capabilities approach (Sen 1999). ‘Housing’ as a capability could be seen under Nussbaum’s (Nussbaum 2003, pp.78–80) list of ‘Central Human Capabilities’ as

giving both “Control over one’s environment” and providing the means of attaining “Bodily health”, “Bodily integrity” and others. This sees the homelessness problem as a product of unfair *structural maintenance* of homelessness amongst persons of particular needs, rather than as the fault or sickness of the person. In response this approach seeks to “recognise people’s needs, situations and goals and remove barriers that limit what people can do and can be” (ERP 2007, p.14). Housing First seeks to reshape society to give people choice and autonomy in housing, accounting for vulnerabilities and need. In this provision it can be seen to be built on the principles of ‘moral’ or ‘ethical’ individualism (Spicker 2013; Burchardt 2006), valuing the health and wellbeing of every person, regardless of socio-economic circumstance.

Frieden’s (2010) ‘health impact pyramid’ gives further weight to the proposed relative effectiveness of Housing First. As the scope of the health intervention increases from the individual level to the societal level there is increasing impact on the health and health inequalities of the population. Simultaneously there is less variation in result produced by differing individual responses to the intervention. At the most individual level of engaging and counselling participants, “successfully inducing behavioural change is the exception rather than the rule” (Frieden 2010, p.592). Housing First, in changing the social structures which maintain homelessness and associated determinants of health, could thus have a much greater impact than interventions that seek to make an individual ‘housing ready’ through substance use and mental health treatments. This addresses Fitzpatrick’s (2005) hypothesised ‘housing structures’ causal mechanism. Homelessness amongst these vulnerable persons can be seen as the fault of the structure of society in giving inadequate access to housing, rather than solely as a fault in the homeless individual.

A particularly health-focussed strength of the Housing First approach was raised by Padgett (2017) in response to programmes which aim to make a client 'housing ready' before assigning to housing. The 'Implementation Paradox' (Henwood, Shinn, et al. 2013) describes observations that in Housing First programmes, with stable housing already established the contact time with service providers is predominantly focussed on health and treatment (Figure 2-1). Conversely, in 'treatment first' settings the focus on treatment is ironically lost, as the goal of being housed is pursued by case managers. This provision of stable housing as a first step would then give a more coherent and focussed platform from which to seek health improvement in clients.

*Figure 2-1 The 'Implementation Paradox', reproduced from Henwood, Shinn et al. (2013, fig.1)*



A further strength identified by many proponents is its potential cost-savings to society. By targeting the chronically homeless population the expense on shelters and other emergency accommodation would be significantly reduced. Additionally, if emergency health services and hospital facilities were less needed as a result of stable housing and other health improvements, this would be a further saving (Latimer et al. 2017). There is some debate on the overall balance of costs of the Housing First programme against savings in other areas

(Kertesz et al. 2009; Padgett et al. 2015; Ly & Latimer 2015). This issue is not addressed in this review.

#### 2.4 Critique and limitations of Housing First

Criticisms levelled at Housing First are commonly framed as comparisons with the Linear Residential Treatment (LRT) approaches, which are argued to be more effective or appropriate in some areas. Padgett et al. (2015) highlight an ongoing discussion about the efficacy of Housing First in dealing with clients with both mental health and substance use problems with the intent of treating ill health and ending addiction. This critique is made in two ways. Firstly, in offering non-contingent housing with a 'harm reduction' approach, Housing First is accused of increasing or failing to address these problems where an alternative programme would provide positive results. Implementing Housing First brings an 'opportunity cost' in forgoing incentivised enrolment in effective treatment. Secondly, it is argued that if mental health and substance use are able to be addressed sufficiently before housing was provided, then "there will be a higher success rate" in stably housing the person (Parvini 2014; cited in Padgett et al. 2015, p.36). It is argued that the concern of housing readiness is valid, and that the causes of homelessness in the individual need to be treated first.

This discussion engages with a literature review of the evidence for Housing First compared to other programmes, conducted by Kertesz et al. (2009). The authors of this review focussed on studies which compared outcomes specifically for clients with substance abuse problems, looking at both housing stability and reductions in addiction problems. They argue that the Housing First model (grouped with similar housing interventions) is potentially not as effective as other programmes in lowering rates of substance use. The

studies evaluating Housing First are criticised as limited by poor handling of data for substance use. The low rate of substance use amongst sample populations is arguably not representative of the true population. They also potentially misrepresent the population by recruiting participants with comparatively low levels of substance use problem (Kertesz et al. 2009, p.519). The authors also highlight the failures of the researchers evaluating Housing First to define what interventions are included in the control populations. They argue that this undermines the claims of Housing First being the best model by failing to compare it with well managed and effective alternative programmes. They point to the recorded failings of addiction treatment programmes to keep faithfully to their proven models as a possible explanation of poor results amongst control participants (citing McLellan et al. 2003). In comparison, they present the 'Birmingham' model of abstinence-contingent (temporary) housing (ACH) as tested by the authors, alongside both 'treatment as usual' controls and non-abstinence-contingent (temporary) housing (NACH; Milby et al. 2005; Kertesz et al. 2007). They point first to these results as showing that abstinence-contingent housing is effective at reducing substance use by using housing as an incentive to promote change in learned behaviour. They also highlight the higher rate of housing retention amongst ACH participants and those maintaining abstinence as a *result* of this efficacy (Kertesz et al. 2009, pp.516–517).

In response to these criticisms of the Housing First approach, Padgett et al. (2015, Box 4.2) highlight that the developed model was not primarily designed as an intervention to address substance use, and so the observations of this not being reduced should not be taken as proof of the ineffectiveness of the model. Additionally the authors point to later qualitative research that did suggest a lower rate of substance use amongst Housing First participants than treatment as usual (Padgett et al. 2011). Attention is also drawn to the requirements of

fidelity to the housing first model to produce such improvements in both housing stability and substance use. This discussion then raises questions of what should be considered a 'true' Housing First model, and also what outcomes should be taken to evaluate its success.

A cultural limitation of Housing First may be its treatment of participants as atomised individuals. Alongside the strength of Housing First in its 'ethical' or 'moral' individualism, valuing the homeless person, a potential weakness may be identified as its embodiment of 'methodological' or 'substantive' individualism (Spicker 2013). Burchardt (2006) criticizes these latter points for failing to recognise both the 'belonging' of individuals to groups, alongside the failure to account for 'influence' from a variety of social interactions. Housing First's focus on Scattered-site format is advocated as attempting to account for both, by addressing negative social impacts and seeking integration and social inclusion by normalising "neighbourly behaviour" (Tsemberis 2010, p.22). However, critics have highlighted the risk of removing homeless individuals from their current communities and leaving them isolated (Noblet 2017). The critique of the capabilities approach could fall on Housing First here too, that "the priority is individual liberty, not social solidarity; the freedom to choose, not the need to belong" (Dean 2009, p.267). The modification of Congregate Housing First (see 2.1 above) could be an attempt to address this issue, while simultaneously violating the principle of providing equal capabilities of attaining 'normal' housing.

A further limitation of Housing First is that if implemented as a standard policy, it would functionally replace all other homelessness interventions. The criticism of its possible lack of effectiveness raised by Kertesz et al. (2009) is outlined above. Implementation of Housing First would make it impossible for many other approaches to exist simultaneously. The

example of abstinence-contingent housing to treat substance use would be potentially rendered unfeasible; the incentives of housing provision aiming to prompt enrolment would be nullified by superior provision of Housing First. If more effective interventions were available which were incompatible with Housing First provision in the same locality, then it could be argued that these should be preferred and Housing First not implemented. If improving health is the aim then it can be arguably acceptable and necessary to de-prioritise and restrict choice (Nuffield Council on Bioethics 2007).

## 2.5 Previous reviews of the evidence for Housing First

Alongside Kertesz et al (2009), two systematic reviews of the literature were found which were conducted on a number of published studies of various types. Ly and Latimer (2015) focussed primarily on an economic analysis of the cost-effectiveness of the programme. Health and wellbeing was measured here through the direct costs and benefits to society as a result of Housing First programmes, rather than quantifying indirect and intangible costs and benefits. Woodhall-Melnik and Dunn (2016) conducted a systematic review and examined a broad range of studies reporting outcomes for participants, including health and wellbeing outcomes. A narrative synthesis was produced with the aim of providing a stronger evidence-base for the appraisal of the Housing First intervention. While the authors noted that there is ongoing discussion of the importance of fidelity to the model, with variations in what core principles are applied, the use of 'housing first' to describe the programme appears to be the only inclusion criterion. They noted some inconsistencies in findings across several reviews, and gave some possible explanation of these differences in outcome, but no quantitative analysis was done to compare the contributions of each of these studies. They concluded that their findings are consistent with Kertesz et al. (2009),

showing limited usefulness of the model in addressing substance use, and therefore advocate caution in applying the model until further research is conducted.

## 2.6 Evaluation of the health impacts of Housing First – the need for this review

Although several prior reviews were found, as identified above, there remained inconsistencies and gaps, which this review was proposed to address. Firstly, this review included more recently published studies, not included in previous reviews. Secondly, this review was systematic and structured around clear inclusion criteria and search strategies. Thirdly, the focus on Randomised Controlled Trials and quantitative data addresses concerns of bias and allow meta-analysis. Fourthly, this review focused on the health impact while considering this from several angles.

The continual publishing of new data prompted an updated review. A study evaluating Housing First was known from the literature to have been conducted by the developers of the model, Pathways to Housing. This was included by all previous reviewers. A further trial of the 'Housing First' model has been conducted in five Canadian cities, with a number of relevant measures for this review (Goering et al. 2011). This study produced a number of published papers. Additionally, a large trial of Housing First was noted to have taken place in four cities in France in recent years, looking primarily at use of health services, while also recording housing stability and other health and wellbeing outcomes (Tinland et al. 2013). The study was anticipated to be completed and data collected by 2016 (Estecahandy 2013), however no published data reporting the results of this trial were available at the time of this systematic review.

A limitation of the Kertesz et al. (2009) review was the lack of clarity of what constituted a true Housing First intervention. This creates the possibility of both inclusion of non-relevant



interventions and the exclusion of relevant ones. Woodhall-Melnik and Dunn's systematic review (2016) likewise does not clearly identify the Housing First model to be evaluated, nor is it clear from the reporting of the search strategy across a limited number of databases whether the literature search would produce all relevant studies. To address Padgett et al.'s (2015) assertion that fidelity to the Housing First model was a precursor to success, while also appraising all suitable evidence, this review sought to define clear inclusion criteria as a starting point.

In analysis of the study results the authors are not consistent and systematic, allowing for the possibility of bias in the selective reporting of results. A further limitation is the unclear weighting of importance of the reported results. Some conclusions of the limited evidence of effectiveness of Housing First are based mainly on the outcomes related to substance use. Additionally, other health-unrelated outcomes are used. In order to holistically and exclusively consider health impacts, this review aimed to look at broader measures of health.

## 3 Methods

### 3.1 Aim

The aim of this systematic review is to assess the effectiveness of interventions rapidly providing permanent, non-abstinence contingent housing to homeless people in improving health and wellbeing, in comparison to other interventions addressing homelessness.

### 3.2 Research Questions

*RQ1:* Does rapid provision of permanent, non-abstinence contingent housing improve health and wellbeing in homeless people?

*RQ2:* Does rapid provision of permanent, non-abstinence contingent housing improve housing stability for homeless people?

*RQ3:* Are there differences in the health effects between scattered and congregate models of the intervention?

### 3.3 Protocol

Ahead of beginning the research, the protocol for this review was submitted to the PROSPERO International prospective register of systematic reviews and published 2<sup>nd</sup> June 2017 (Baxter et al. 2017). The protocol and the methodology was constructed using PRISMA guidelines (Moher et al. 2009; Moher et al. 2015) The research was conducted with minor amendments, which were noted and submitted to PROSPERO on 8<sup>th</sup> August 2017. The methods used are described here, drawing on the protocol and in the order reported there. The full protocol is included in Appendix A.

### 3.4 Ethical considerations

No formal ethical approval was needed, as the data collected was exclusively from published sources. Ethical consideration was given to the potential impacts of this review. The reporting of health and health-related behaviours may be considered a sensitive topic. In order not to contribute to stigma surrounding these issues, care was taken to use similar reporting language to the studies themselves.

### 3.5 Search Strategy

The multi-disciplinary nature of the intervention and targeted outcomes required a range of databases to be identified to be searched to ensure sensitivity. The search strategy was constructed from the PICOS inclusion criteria (below) and checked with the college librarian. The following databases were selected to be searched: EMBASE, MEDLINE, PubMed, PsycINFO, Cochrane Central Register of Controlled Trials (CENTRAL), Social Sciences Citation Index and Biosis. The full search strategy for each database is found in Appendix B.

Searches were restricted to studies published since 1992 (founding of Pathways to Housing and initiation of the intervention) in peer-reviewed journals. The search was carried out and all records were exported to bibliographic software programme EndNote Web™. Duplicate records were eliminated before studies were screened for inclusion or exclusion. The studies included in the three systematic reviews identified earlier were then obtained and screened for inclusion. These were collected separately after screening of literature search results to maintain clarity of sources.

### 3.6 PICOS inclusion criteria

The **P**opulation, **I**ntervention, **C**ontrol, **O**utcomes and **S**tudy type were defined as below, following the Cochrane Handbook guidance (Higgins & Green 2011), to identify which studies would be included in the systematic review.

#### 3.6.1 Population

The population included in this study were defined as adults (16 years and older) who meet at least one of the European Typology for Homelessness and Housing Exclusion (ETHOS) criteria: roofless, houseless, living in insecure housing, living in inadequate housing. Only adult participants were included, as the ability to enter a tenancy would be required to attain such independent housing.

#### 3.6.2 Intervention

The intervention was defined as providing the homeless person with access to housing through:

- Assistance in locating and entering housing; *or*
- Subsistence of rental costs to maintain permanent tenancy

The housing provided was defined as:

- Intended to be permanent – no intention by providers to end or transfer tenancy, counting sustained tenancy as the intended outcome; *and*
- Not contingent on adherence to treatment or substance abstinence; *and*
- Rapid, with the process of securing and entering housing initiated at first contact with the homeless person with the aim of beginning tenancy promptly

These components, identified from the literature, were selected as binary, testable markers to ensure clarity of inclusion and exclusion. Some aspects of the Housing First programme as identified in the 'Principles' (Box 2-1) were not as clearly able to be defined in the inclusion criteria and so were not addressed at this stage. The focus on the highlighted components was designed to allow the inclusion of possible models not branded as 'Housing First' but which meet this definition, while also leaving discussion of fidelity to the analysis phase. The label 'Housing First' was used for all interventions for brevity and clarity.

### 3.6.3 Comparators

It was not expected that homeless services outside the intervention would be similar across several contexts, and so the comparison groups were defined as not providing housing in the above manner. Treatment As Usual groups therefore included many, diverse other homeless services and interventions.

### 3.6.4 Primary Outcomes

The primary outcomes, chosen to reflect the aim and research questions, were quantitative measures of health and wellbeing. These were grouped into four domains:

- Substance use – including self-reported occasions of substance use and self-reported substance use problems
- Mental health – including self-reported mental health and clinical assessment of mental ill health
- Non-routine use of healthcare services – including episodes of hospitalisation and use of emergency services
- Self-reported health and quality of life – questionnaires and interviews recording perspectives

- Other, unanticipated measures of health and aspects of wellbeing associated with health and mental health.

### 3.6.5 Secondary Outcomes

A secondary outcome was identified to be included and defined as the domain of Housing Stability. This included any measure of housing which reflected the stated goals of the intervention of ending homelessness. The use of this domain in the review was based both on the hypothesised causative mechanism leading to changes in health and also its expected availability in almost all studies. Measures included:

- Proportion of individuals who achieve stable housing at the end of the study period
- Proportion of participant's time spent in housing during observation period

### 3.6.6 Study type

The target study design was Randomised Controlled Trials, and articles reporting quantitative data recording comparisons between a Housing First intervention and a control were sought. This was to produce meta-analyses of the available data.

## 3.7 Other exclusion criteria

Only studies which were published in English in peer-reviewed journals were included.

Studies which did not provide quantitative measures comparing the effects of the intervention against control were not included. Studies which only reported the secondary outcomes of Housing Stability were not included.

## 3.8 Screening of studies

After the search was conducted, all records were combined and duplicates eliminated, titles then abstracts were examined alongside the above PICOS criteria. In cases of uncertainty

over the relevance of a study at this stage the paper was retained for full text screening. Full texts of remaining studies were then obtained and analysed, using the criteria to retain only relevant studies.

### 3.9 Data extraction

Data from each included paper was extracted, recording study details, intervention and control details, outcome measures and data for Risk of Bias assessment. The data extraction form outlining each of these fields is included in Appendix C.

Where multiple papers were identified as originating from the same study these were assessed for duplicate reporting of data from the same sample and time point. To avoid double counting of data, where sampling overlap was stated or suspected for any single outcome, data were selected to prioritise larger combined samples or similarities compared to other studies.

### 3.10 Risk of Bias assessment

The Cochrane Risk of Bias Tool 2.0 (Higgins et al. 2016) was used to assess potential bias for each outcome. The Primary Outcomes as defined by this review were analysed across each study and recorded for the following domains, defined in the RoB tool:

- bias arising from the randomisation process
- bias due to deviations from the intended interventions (analysing the *effect of assignment to intervention*)
- bias due to missing outcome data
- bias in measurement of the outcome
- bias in selection of reported results.

The overall assessment of bias for each outcome was taken as the highest RoB rating in any domain as relating to any outcome.

### 3.11 Effect size calculations

Standardised Mean Differences were calculated to compare continuous variables between intervention and control groups. Odds Ratios were calculated for binary outcomes and an Incidence Rate Ratio for one other outcome. Where possible, equations to calculate these variables from reported measures were used from Cooper, Hedges and Valentine (2009), Campbell and Swinscow (2009) or Field (2009) and processed manually in Microsoft Excel™. These calculations were then repeated using the tools in IBM® SPSS Statistics®, Review Manager 5.3 (The Nordic Cochrane Centre 2014) or the Campbell Collaboration effect size calculator (Wilson n.d.) to check the accuracy of results. Where effect sizes were reported only by subgroups and not for the whole trial population, these measures were combined, either through grouping raw data if reported or pooling effect sizes. Effect sizes were pooled by entering the data into Review Manager 5.3 and combined using a random effects model (assuming unequal effect size and variation across groups. This occurred only in the At Home/Chez Soi study, where Chung et al. (2017) reported outcomes for two subgroups classed by age (combined to give 'At Home – all' measurements recorded in meta-analyses below) and Stergiopoulos, Hwang et al. (2015) reported outcomes of Moderate Needs participants by city (combined to give 'At Home – MN' below).

### 3.12 Data synthesis

Outcome measures from studies were grouped by the domains outlined in 3.6.4 and 3.6.5. These were then analysed across studies for similarities which would allow comparison.



Where possible, standardised effect estimates were calculated to allow this comparison between studies.

After calculation of standardised effect estimates for comparable measures in each domain, these were then used to construct forest plots using the Review Manager 5.3 (The Nordic Cochrane Centre 2014) tool, calculating effect sizes using the Generic Inverse Variance method and graphing 95% confidence intervals. A Random Effects model was used with the assumption that effect sizes and variation would vary across studies. Pooled standardised mean differences were categorised for effect size using Cohen's (1988) guidelines of small,  $d = 0.2$ ; medium,  $d = 0.5$ ; and large,  $d = 0.8$ . Heterogeneity was calculated using Review Manager 5.3 and recorded as an  $I^2$  value and categorised using the Cochrane Handbook guide:

- 0% to 40%: might not be important;
- 30% to 60%: may represent moderate heterogeneity;
- 50% to 90%: may represent substantial heterogeneity;
- 75% to 100%: considerable heterogeneity. (Higgins & Green 2011, sec.9.5.2)

In cases of 'substantial' or 'considerable' heterogeneity the pooled effect size was not used in the final analysis of the results.

In several cases meta-analysis was not possible due to a measurement only being reported in one study. These were included in the narrative synthesis alongside other measures analysed in the same domain.

### 3.13 Subgroup analysis

Subgroup analysis was planned for comparisons of effect estimates across age and health markers at baseline if these were present in multiple studies and able to be combined.

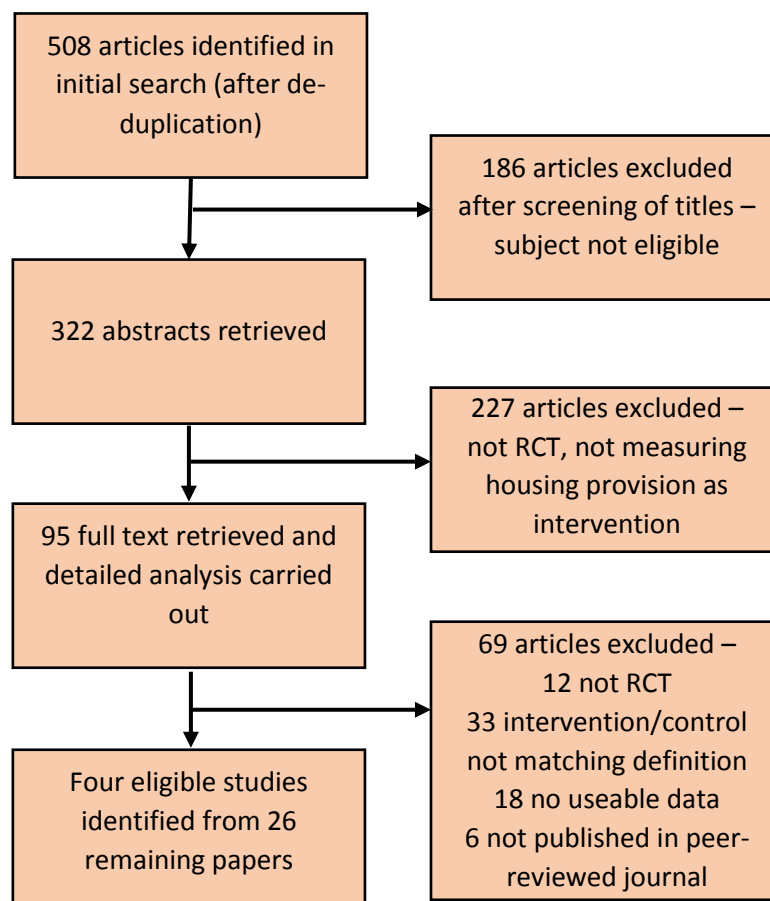
Alongside this, dividing the data across studies by scattered-site and congregate models to address research question 3 was planned. The presence of these subtypes in only one study prevented this from being synthesised. Results were recorded and presented.

## 4 Results

### 4.1 Search results and studies included

Through the online database searches 508 articles were found to be screened (illustrated in Figure 4-1). Screening of references of the three systematic reviews (Woodhall-Melnik & Dunn 2016; Ly & Latimer 2015; Kertesz et al. 2009) identified no further eligible studies. From the 26 articles retained from screening, four studies were identified that reported useable data. Full details of studies included can be found in Appendix E and studies excluded can be found in Appendix F.

*Figure 4-1 PRISMA flow diagram showing literature search and screening process*



## 4.2 Description of studies

The four studies included in this review are outlined in Table 4-1. All four studies examined the intervention of rapid provision of non-abstinence contingent, permanent housing to homeless persons against control as the normal expected treatment in the context. The context and treatment as usual provision varied across the cities and nations represented in these studies, but were not always clearly and fully reported. Beyond the inclusion criteria, there was some variation in the inclusion of the other principles of Housing First (Box 2-1). All studies reported a measure of Housing Stability alongside primary outcome measures.

*Table 4-1 Overview of studies identified for inclusion in this review*

<b>Study</b>	<b>Location</b>	<b>Data collection</b>	<b>Sample size</b>	<b>Participant characteristics</b>	<b>Interventions assessed</b>
Pathways Housing First	New York City, NY (USA)	1997 to 2003	225	Homeless, mental health disorder, individual	Housing First with ACT
At Home/Chez soi	Moncton, Montreal, Toronto, Vancouver, Winnipeg (Canada)	2009 to 2013	2148	Homeless, mental health disorder, substance use disorder, individual	Housing First with ACT; Housing First with ICM; Congregate Housing First
Housing Opportunities for Persons with AIDS	Baltimore, MD; Chicago, IL; Los Angeles, CA (USA)	2004 to 2007	630	Homeless, HIV-positive, individual	Non-contingent housing, scattered site format, time-unlimited rent subsidy
Chicago Housing for Health Partnership	Chicago, IL (USA)	2003 to 2007	407	Homeless, chronic illness, individual	Non-contingent housing, scattered site or congregate, time-unlimited rent subsidy

#### 4.2.1 Pathways Housing First (the New York Housing Study)<sup>1</sup>

The New York Housing Study was begun as a four-year randomised controlled trial reporting on several outcomes of interest (Padgett et al. 2015, p.51), aiming to address the particular needs of “people with mental health and addiction problems” (Tsemberis 2010, p4).

The study recruited 225 participants with the following eligibility criteria: “(1) spent 15 of the last 30 days on the street or in other public places; (2) had a history of homelessness during the past 6 months; and (3) had a psychiatric diagnosis of severe mental illness” (Padgett et al. 2015, p.51). Intervention participants received immediate access to subsidised accommodation, alongside ongoing support from an assertive community treatment (ACT) team.

#### 4.2.2 At Home/Chez Soi study

Begun in five Canadian cities in 2009, this study sought to evaluate the Housing First model in several, diverse settings and to expand the range of outcomes measured (Goering et al. 2011). Eligibility for this study was determined as: (1) legal adult status; (2) absolutely homeless or precariously housed (definitions Goering et al. 2011, appendix 3); and (3) the presence of a mental disorder. In each city (excluding Moncton), participants were recruited and stratified into two groups, classified as either ‘High Needs’ (HN) if exhibiting severe mental disorders (Aubry et al. 2016) or otherwise ‘Moderate Needs’ (MN). HN participants

---

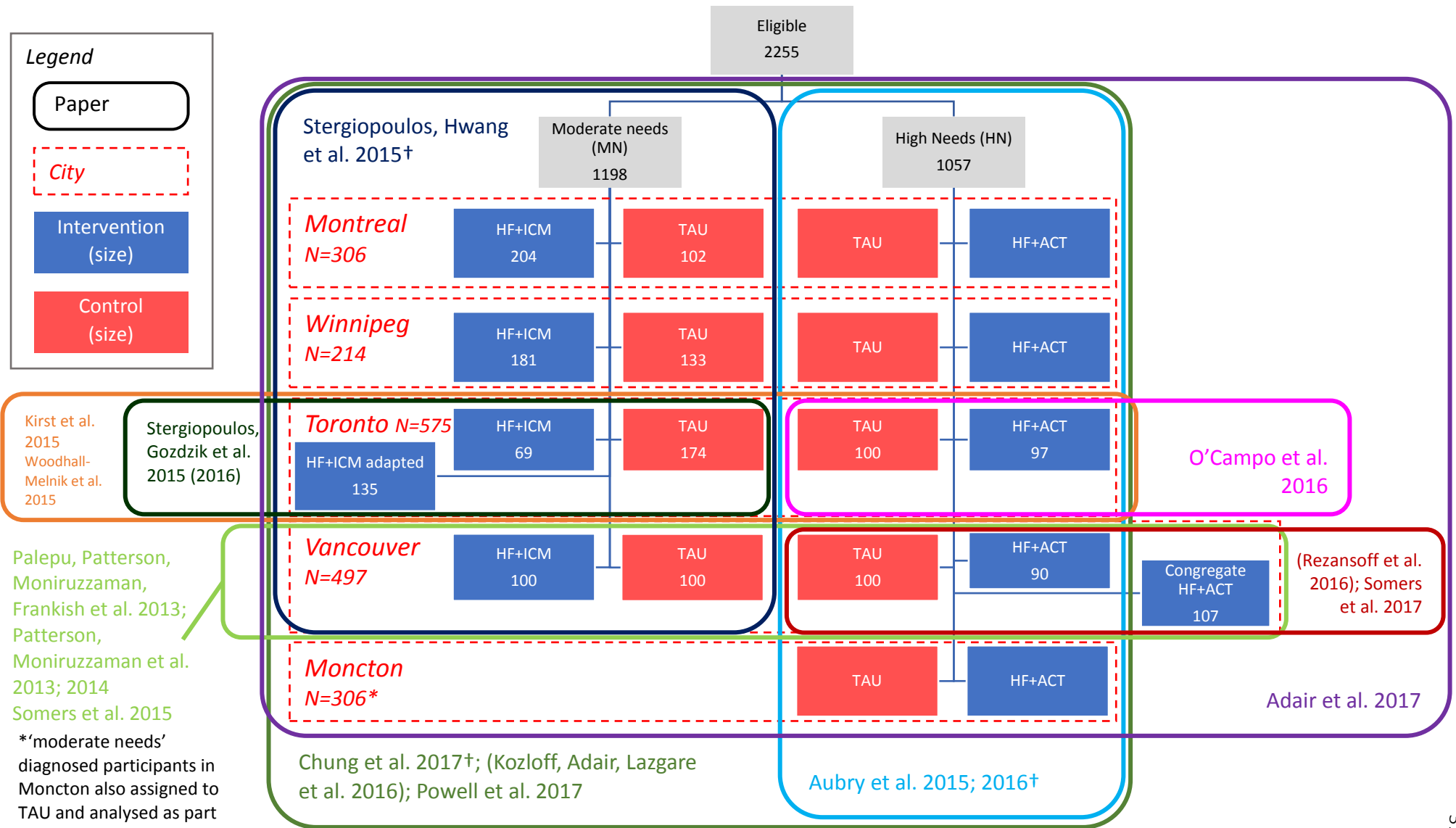
<sup>1</sup> This study is identified in Padgett et al. (2015, p.50) as the ‘New York Housing Study’, however the label ‘Pathways Housing First’ is used throughout this review for clarity in line with the reporting in Tsemberis (2004) and Gulcur (2003).

were then randomised to Treatment As Usual (TAU) or to Housing First with Assertive Community Treatment (HF+ACT; see Figure 4-2) and MN participants to TAU or Housing First with Intensive Case Management (HF+ICM).

In addition to the 2148 participants included in meta-analyses, a further HN subgroup in Vancouver was assigned to an alternative Congregate Housing First (CHF or CONG) format, incorporating and evaluating pre-existing housing provision alongside the 'Scattered-site' Housing First (SHF; Goering et al. 2011; Zabkiewicz et al. 2012).

A large number of papers reporting on this trial were retrieved and analysed, reporting on several sub-divisions of the overall At Home/Chez Soi population. The overlapping samples of these papers, alongside the layout of the study by city and stratification, are illustrated in Figure 4-2. Data from Chung et al. (2017) were used for most of the meta-analyses (labelled 'At Home – all' in figures below) with Stergiopoulos, Hwang et al. (2015) providing measures of health service use for the Moderate Needs ('At Home – MN') subgroup and Aubry et al. (2016) reporting health service use and proportion attaining stable housing of the High Needs ('At Home – HN') subgroup.

Figure 4-2 The layout of the 'At Home/Chez Soi' study and the samples reported by each paper (constructed from analysis of retained articles). Bracketed items denote a smaller subset within this group



\*'moderate needs' diagnosed participants in Moncton also assigned to TAU and analysed as part of 'high needs' group  
 †Papers used in meta-analyses

#### 4.2.3 Housing Opportunities for Persons With AIDS study (HOPWA)

The design of this study was principally aiming to address questions of the causative relationships between homelessness and the sexual risk behaviours associated with HIV transmission, and to evaluate the potential of a housing intervention to address HIV as a public health issue (Kidder et al. 2007). Eligible participants were: 1) homeless or at severe risk of homelessness, 2) HIV-positive and 3) of low income (Kidder et al. 2007; Wolitski et al. 2010).

Intervention participants were assigned to 'Housing Referral Specialists' for assistance in locating housing and activating the rent subsistence. Control participants received advice in planning housing alone. All participants were then referred to other support services if needed (Kidder et al. 2007). No further or ongoing health services or case management is described as part of the intervention.

#### 4.2.4 Chicago Housing for Health Partnership study (CHHP)

This study focussed on health and homelessness through the targeting of hospitalised patients at two primary facilities through the recruitment process. Patients at a public teaching hospital and a private, non-profit hospital in Chicago who were known to not have stable housing were referred by hospital staff who assessed eligibility. A series of chronic illness conditions were selected as inclusion criteria, each judged as increasing the mortality risk of homeless individuals (Sadowski et al. 2009, p.1772). Participants randomised to intervention received case-manager assistance in locating housing through 10 community agencies. Follow-up health and care input was provided by 'respite and housing' case managers, contacting the participant at least twice per week and coordinating referrals to



substance abuse and mental health treatment as needed. Control participants had able to access similar services through usual procedures.

The authors identified the intervention as being “based on the Housing First model” (Sadowski et al. 2009, p.1773), which they explain to mean seeking rapid, stable housing. Housing was provided in a variety of congregate and scattered formats, including housing which depended on “sobriety” alongside “participants’ geographic preferences” (p.1773). It was therefore assumed that the housing provision itself was not contingent, however this would likely differ from the Pathways Housing First model above which emphasises “consumer choice” as a key principle (Tsemberis 2010, p.18), over and above other conditions put upon participants.

### 4.3 Risk of Bias in included studies

Risk of Bias was assessed for each of the four studies across all measurements of the four primary outcome domains of this review. Assessed biases for each study are summarised in Table 4-2 and discussed by domain of bias below. These findings were relatively consistent across all studies and concerns about possibilities of bias were raised for similar reasons.

*Table 4-2 Risk of Bias of the four included studies across the four primary outcome domains, assessed using the Cochrane Risk of Bias tool 2.0 (Higgins et al. 2016)*

<i>Study</i>	<i>Outcomes assessed</i>	<i>Bias arising from the randomisation process</i>	<i>Bias due to deviations from the intended interventions</i>	<i>Bias due to missing outcome data</i>	<i>Bias in measurement of the outcome</i>	<i>Bias in the selection of the reported result</i>	<i>Overall RoB judgement</i>
Pathways Housing First	Substance Use	Low	High	Low	High	Low	High
	Mental Health	Low	High	Low	High	Low	High
	Health Service Use	Low	High	Low	High	Low	High
At Home/Chez Soi	Substance Use	Low	High	High	High	Low	High
	Mental Health	Low	High	High	High	Low	High
	Quality of Life	Low	High	High	High	Low	High
	Health Service Use	Low	High	High	High	Low	High
HOPWA	Mental Health	Low	High	Low	High	Low	High
	Quality of Life	Low	High	Low	High	Low	High
	Health Service Use	Low	High	Low	High	Low	High
CHHP	Mental Health	Low	High	High	High	Low	High
	Quality of Life	Low	High	High	High	Low	High
	Health Service Use	Low	High	High	High	Low	High

#### 4.3.1 Areas of low risk of bias

Bias arising from the randomisation process was low for all studies. Each study reported reliable randomisation procedures and concealment of allocation until completion of

recruitment, and in all reports the baseline data were considered relatively balanced.<sup>2</sup> Alongside this, bias in the selection of reported result was considered low. All studies made a limited number of measurements for each outcome (including with reference to protocols), and most measurements were reported. Occasionally, several analyses were done on collected data, however this review aimed to use primary data where available or consistent analytical outcomes to reduce bias due to multiple analyses of the same data. It was judged that bias due to selective reporting of multiple measures or multiple analyses was reasonably low for all studies.

Two of the studies, Pathways Housing First and HOPWA, reported that analysis of baseline data was conducted to assess bias due to loss to follow-up and that no concerns were raised (Padgett et al. 2006; Wolitski et al. 2010). These were marked as 'low' bias due to missing outcome data.

#### 4.3.2 Areas of high risk of bias

Across all studies the lack of blinding gave 'High' risk of bias judgements in the domains of deviations from the intended interventions and measurement of the outcome. All participants were fully aware of their assignments to groups, as were the majority of trial

---

<sup>2</sup> One outcome, number of hospitalisations at 'primary study sites' in the 12 months prior to enrolment, was reported to be significantly different between groups by Sadowski et al. (2009, p.1774) at  $p=0.05$ . However, as one of more than 20 measures recorded this would feasibly be explained as random variation, and so was not judged to be indicative of problems in the randomisation process.

personnel in most studies. This was judged as highly likely to produce bias in deviation from the intended interventions, although no assessments were made and reported in this regard. It was deemed impossible to accurately predict the direction of such bias, for example, the participant assigned to control may be prompted by this enrolment to more actively look for ways out of homelessness, producing a greater effect amongst control participants that would be experienced in usual practice. Alternatively, the participants or personnel involved in evaluating the intervention may be more strongly motivated to see it 'succeed' than in usual practice, giving exaggerated positive results for the intervention.

As almost all measures were taken as self-reported outcomes from participants, bias in measurements was also anticipated as highly likely. The authors note this as an expected issue in most cases. This 'high' risk of bias also remains uncertain as to likely direction.

Tsemberis et al. (2004) for example suggest that underreporting of drug use may have occurred in control patients, who were more likely to be resident in abstinence-contingent accommodation and to therefore fear eviction. In the CHHP study the measures of health-service use used in the meta-analyses were first elicited as recollected events in interviews and then confirmed by reference to medical records (Sadowski et al. 2009). Not all medical records were available, and no analysis is provided for the likelihood of bias, so this domain is marked as 'high' for this study.

A concern in the At Home and CHHP studies was significant losses to follow-up, giving bias due to missing outcome data. All authors noted a greater loss from control groups than intervention groups and judged that this was to be expected due to the nature of the study – control group participants without stable housing provision were more difficult to locate and contact for data-collection interviews. Sadowski et al. (2009) took account of bias in

reporting each domain in the CHHP study and drew their conclusions accordingly. However, the main data presented which were useable in meta-analysis were reported before this adjustment, therefore the study was rated as ‘high’ risk of bias. Additionally, Aubry et al. (2016) and Chung et al. (2017) judged bias due to missing data to be ‘unlikely’ due to relatively low losses. However, evidence for this was not provided and so the At Home/Chez Soi study was rated as ‘high’ risk of bias in this domain.

#### 4.4 Data synthesis

Reported outcome measures extracted from each study are summarised in Table 4-3, grouped by outcome domain and by outcome comparison as combined in each meta-analysis. Full details of measures and reported results can be found in Appendix G.

Standardised measures and meta analyses are displayed by study in the forest plots in Figure 4-3 to Figure 4-13. Meta analyses were conducted on comparable variables between trials within each domain. Sections 4.4.1 to 4.4.6 below report analysis of results as grouped by domain.

*Table 4-3 Summary of reported outcome measures used from each study, grouped by outcome domain and comparison*

<b>Domain</b>	<b>Meta-analysis comparison</b>	<b>Study</b>	<b>Tools for measurement*</b>	<b>Papers reporting result used</b>
Substance Use	Problematic substance use	At Home/Chez Soi	GAIN-SS SPS	(Chung et al. 2017)
Substance Use	Problematic substance use	Pathways Housing First	DAFBC	(Tsemberis et al. 2004)
Mental Health	Self-rated mental health	At Home/Chez Soi	SF-12 MCS	(Chung et al. 2017)
Mental Health	Self-rated mental health	CHHP	ACTG-21	(Sadowski et al. 2009)
Mental Health	Self-rated mental health	HOPWA	SF-36 MCS	(Wolitski et al. 2010)
Mental	Mental health	At	CSI	(Chung et al. 2017)

Health	symptom severity	Home/Chez Soi		
Mental Health	Mental health symptom severity	HOPWA	CES-D10	(Wolitski et al. 2010)
Mental Health	Mental health symptom severity	Pathways Housing First	CSI	(Tsemberis et al. 2004)
Health Service Use	Emergency room visits	At Home/Chez Soi	HSJUI	(Aubry et al. 2016)
Health Service Use	Emergency room visits	CHHP	Self-report/records	(Sadowski et al. 2009)
Health Service Use	Number of hospitalisations	CHHP	Self-report/records	(Sadowski et al. 2009)
Health Service Use	Number of hospitalisations	HOPWA	Self-report	(Wolitski et al. 2010)
Health Service Use	Number of days spend hospitalised	At Home/Chez Soi	RTLFBFI	(Stergiopoulos, Hwang, et al. 2015)
Health Service Use	Number of days spend hospitalised	CHHP	Self-report/records	(Sadowski et al. 2009)
Health Service Use	Number of days spend hospitalised	Pathways Housing First	RTLFBFI	(Gulcur et al. 2003)
Health Service Use	Participants with $\geq 1$ hospitalisation	At Home/Chez Soi	RTLFBFI	(Stergiopoulos, Hwang, et al. 2015)
Health Service Use	Participants with $\geq 1$ hospitalisation	CHHP	Self-report/records	(Sadowski et al. 2009)
Health Service Use	Participants with $\geq 1$ ER visit	CHHP	Self-report/records	(Sadowski et al. 2009)
Health Service Use	Participants with $\geq 1$ ER visit	HOPWA	Self-report	(Wolitski et al. 2010)
Quality of Life	Self-rated physical health	At Home/Chez Soi	SF-12 PCS	(Chung et al. 2017)
Quality of Life	Self-rated physical health	CHHP	ACTG-21	(Sadowski et al. 2009)
Quality of Life	Self-rated physical health	HOPWA	SF-36 PCS	(Wolitski et al. 2010)
Quality of Life	Generic quality of life	At Home/Chez Soi	EQ-5D	(Chung et al. 2017)
Quality of Life	Condition-specific quality of life	At Home/Chez Soi	QOLI-20	(Chung et al. 2017)
Housing Stability	Achieving stable housing	At Home/Chez Soi	RTLFBFI	(Aubry et al. 2016)

		Soi		
Housing Stability	Achieving stable housing	CHHP	Self-report	(Sadowski et al. 2009)
Housing Stability	Achieving stable housing	HOPWA	Self-report	(Wolitski et al. 2010)
Housing Stability	Time in stable housing	At Home/Chez Soi	RTLFI	(Chung et al. 2017)
Housing Stability	Time in stable housing	Pathways Housing First	RTLFI	(Tsemberis et al. 2004)

\*GAIN-SS SPS: Global Appraisal of Individual Needs – Short Screener, Substance Problem Scale; DAFBC: Drug and Alcohol Follow Back Calendar; SF-12/36 MCS/PCS: Short Form 12/36-item, Mental Component Summary/Physical Component Summary; ACTG-21: AIDS Clinical Trial Group 21-item short form; CSI: Colorado Symptoms Index; CES-D10: Centre for Epidemiological Studies Depression scale – 10-item; HSJUI: Health, Social and Justice service Use Inventory; EQ-5D: EuroQol 5-Dimensional tool; QOLI-20: Quality of Life Index – 20-item; RTLFI: Residential Timeline Follow-Back Inventory

#### 4.4.1 Substance Use

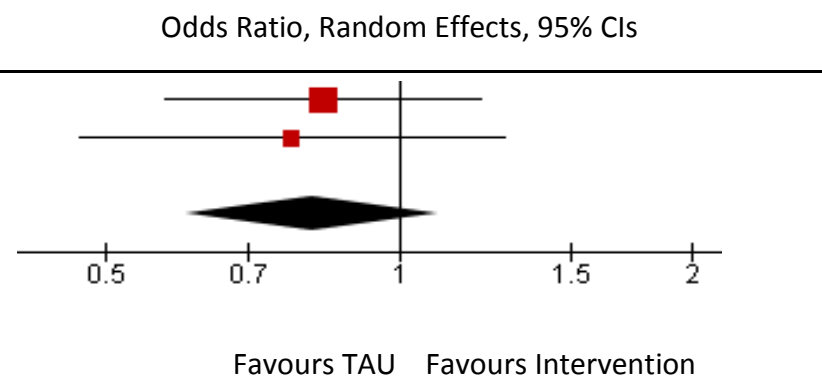
The data for counted measures of illicit substance use in the Pathways Housing First study was combined with the records of substance use problems in the At Home/Chez Soi study to calculate the intervention impact on substance use. Figure 4-3 shows that the results across studies are highly homogeneous ( $I^2=0\%$ ). A small difference was seen between intervention and Treatment As Usual (TAU) groups, with TAU participants seeing a greater overall reduction in substance use problems (OR=0.81). The results weren't statistically significant at the 95% confidence level, (95%CI 0.60 to 1.10; P=0.18), and so there is some uncertainty in whether this is an observed difference in effect between groups. The authors, Tsemberis et al. (2004) and Padgett et al. (2011), highlight particularly high risk of bias in this result. Both groups are judged as highly likely to underreport substance use, but control participants are under further pressure to underreport as their accommodation is likely to be contingent on abstinence. This would bias the result in favour of TAU.

Figure 4-3 Odds ratio of reduction in problematic substance use across 24 months in intervention compared to TAU

Study	Int. n	TAU n	Weight	Odds Ratio [95%CI]
At Home (HN)	369	337	64.7%	0.84 [0.58, 1.21]
PHF	87	119	35.3%	0.78 [0.47, 1.28]
Total	456	456	100%	0.81 [0.60, 1.10]

Heterogeneity:  $\tau^2 = 0.00$ ;  $\chi^2 = 0.05$ ,  $df = 1$  ( $P = 0.82$ );  $I^2 = 0\%$

Test for overall effect:  $Z = 1.35$  ( $P = 0.18$ )





#### 4.4.2 Mental Health

All four studies reported measures of mental health. These were grouped into two broad categories – self-rated mental health and severity of mental health symptoms. A small increase in self-rated mental health was seen in intervention groups compared to TAU ( $d=0.08$ ). This small result was not statistically significant at the 95% level so there is uncertainty around this finding (95%CI -0.06 to 0.21;  $P=0.27$ ). Results were highly homogeneous across studies ( $I^2=0\%$ ). Differences in decreases of mental health symptom severity (with negative scores showing improvement) were also found to be small across each study (Figure 4-5), and when combined produced a non-significant small difference of -0.04, favouring intervention with slight heterogeneity ( $I^2=23\%$ ). This result was also uncertain, likely due in part to the observed heterogeneity and variation in results (95%CI -0.19 to 0.11;  $P=0.62$ ).

Figure 4-4 Standardised mean difference of improvement in mental health from baseline to 18-24 months between intervention and control

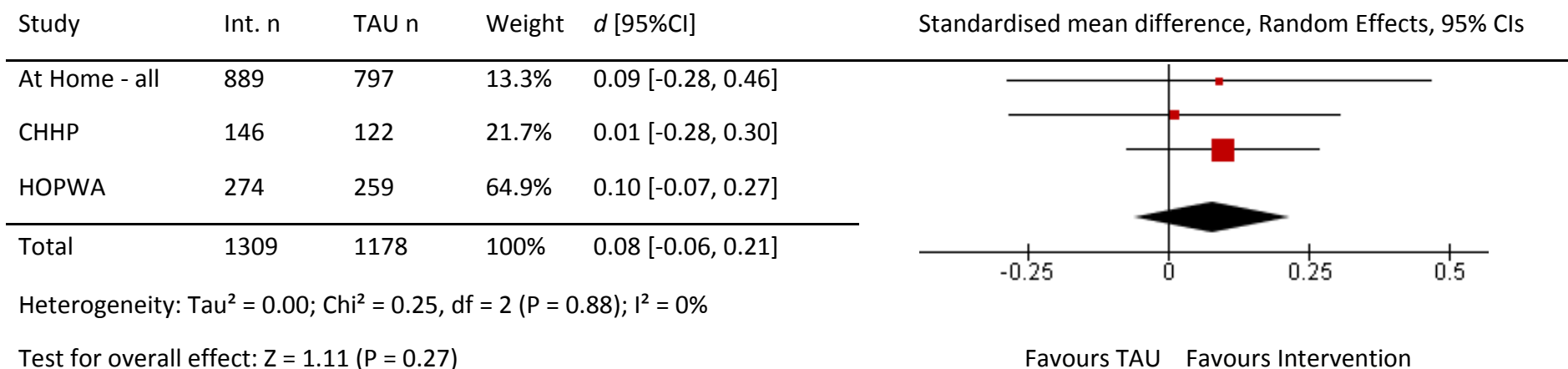
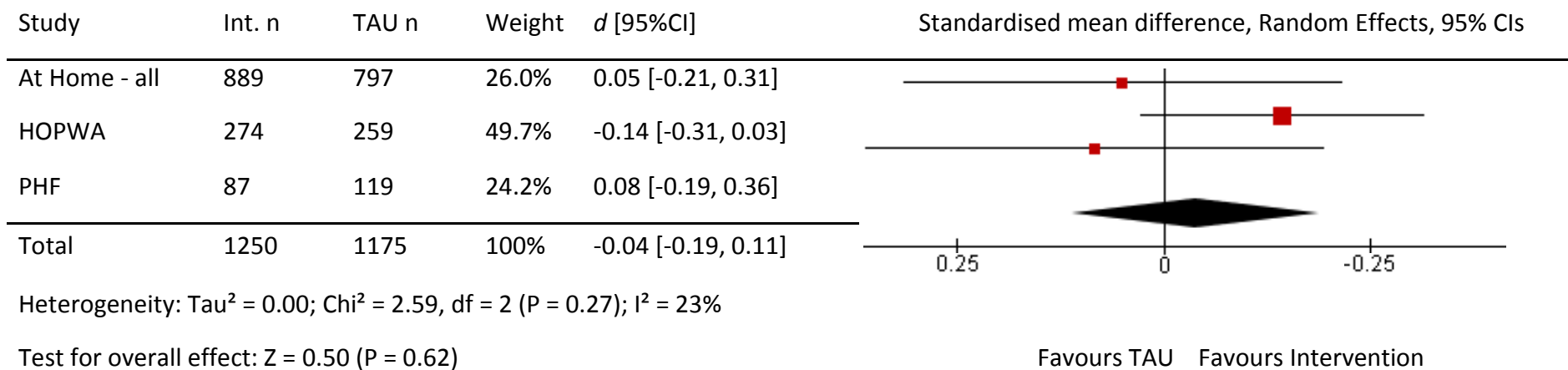


Figure 4-5 Standardised mean difference in decrease in mental health symptom severity from baseline to 18-24 months between intervention and control groups



#### 4.4.3 Health Service Use

All studies reported a measure of Health Service Use. Five meta-analyses of Health Service Use were conducted between comparable variables across two or more of the studies. A greater reduction was seen in intervention groups over control groups in number of Emergency Room visits (Figure 4-6; combined Incidence Rate Ratio=0.8) across the At Home High Needs group and the CHHP studies. This result was highly homogeneous between studies ( $I^2=0\%$ ), as well as giving strong confidence in its validity (95%CI 0.72 to 0.88,  $P<0.00001$ ). A small improvement in hospitalisations was also seen across the CHHP and HOPWA studies (Figure 4-7;  $d=0.18$ ), although with less certainty and not meeting the 95% confidence threshold (95%CI -0.09 to 0.44;  $P=0.2$ ). These data were also substantially heterogeneous ( $I^2=79\%$ ), meaning that this result should not be taken as a true indicator of intervention effect. The similarly sized difference in number of days hospitalised across the At Home Moderate Needs group, CHHP and Pathways Housing First studies did show greater than 95% confidence in this difference between groups, also favouring intervention (Figure 4-8;  $d=0.18$ ; 95%CI 0.03 to 0.33;  $P=0.02$ ). This measure did additionally show moderate statistical heterogeneity ( $I^2=45\%$ ), but less so than the number of hospitalisations. Figure 4-9 displays the odds ratio of hospitalisation within the study period and Figure 4-10 shows the odds ratio of Emergency Room visit within the period amongst intervention groups against control. The pooled odds ratio of hospitalisations across studies was highly homogeneous ( $I^2=0\%$ ) with a small effect size favouring TAU, but results were not statistically significant (OR=1.05; 95%CI 0.83 to 1.32;  $P=0.70$ ). Odds of ER visit were moderately heterogeneous between trials ( $I^2=33\%$ ), with a small effect size favouring intervention (OR=0.91), but results were also not statistically significant (95%CI 0.64 to 1.30;  $P=0.62$ ).

Figure 4-6 Incidence Rate Ratio of Emergency Room visits across 18-24 months in intervention group over control

Study	Int. n	TAU n	Weight	IRR [95%CI]
At Home - HN	369	337	20.2%	0.80 [0.64, 0.99]
CHHP	201	204	79.8%	0.80 [0.71, 0.89]
Total	570	541	100%	0.80 [0.72, 0.88]

Heterogeneity:  $\tau^2 = 0.00$ ;  $\chi^2 = 0.00$ ,  $df = 1$  ( $P = 0.97$ );  $I^2 = 0\%$

Test for overall effect:  $Z = 4.59$  ( $P < 0.00001$ )

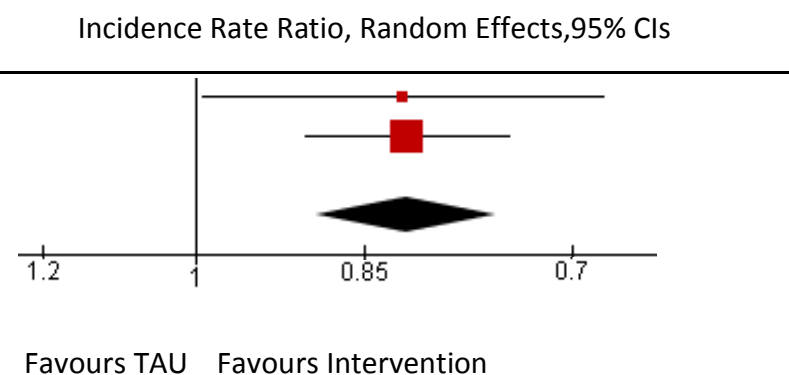


Figure 4-7 Standardised mean difference in number of hospitalisations across 18-24 months between intervention and control

Study	Int. n	TAU n	Weight	d [95%CI]
CHHP	201	204	48.3%	-0.32 [-0.51, -0.12]
HOPWA	274	259	51.7%	-0.04 [-0.21, 0.13]
Total	475	463	100%	-0.18 [-0.44, 0.09]

Heterogeneity:  $\tau^2 = 0.03$ ;  $\chi^2 = 4.19$ ,  $df = 1$  ( $P = 0.04$ );  $I^2 = 76\%$

Test for overall effect:  $Z = 1.29$  ( $P = 0.20$ )

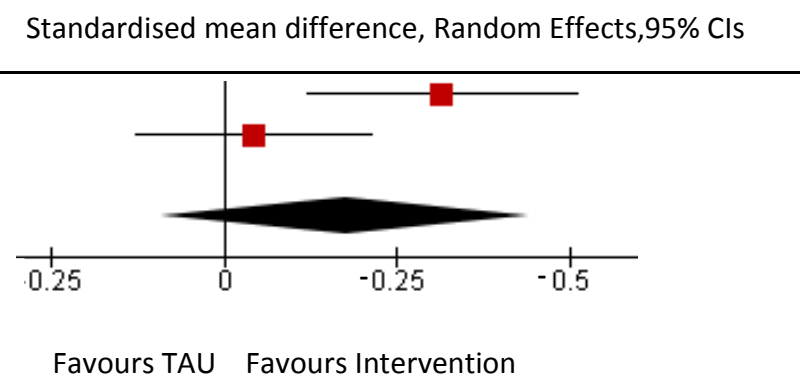


Figure 4-8 Standardised mean difference in number of days spent hospitalised during 18-24 months between intervention and control

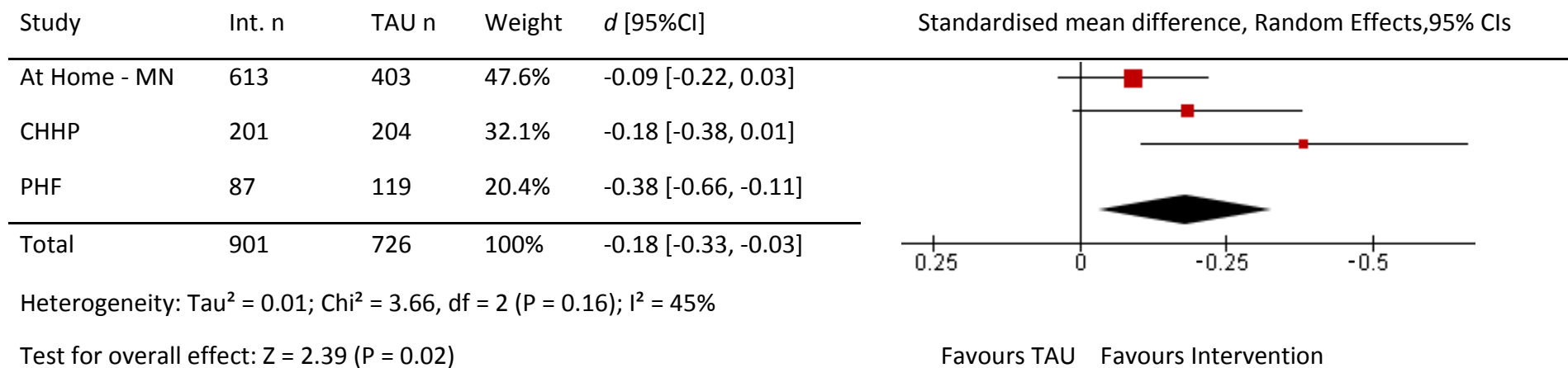


Figure 4-9 Odds ratio of hospitalisation in 18-24 months in intervention compared to TAU

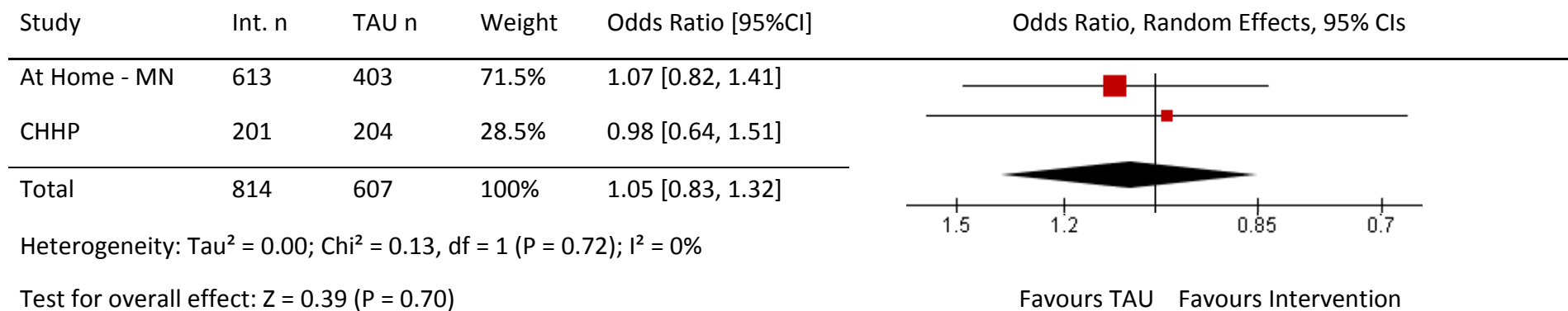
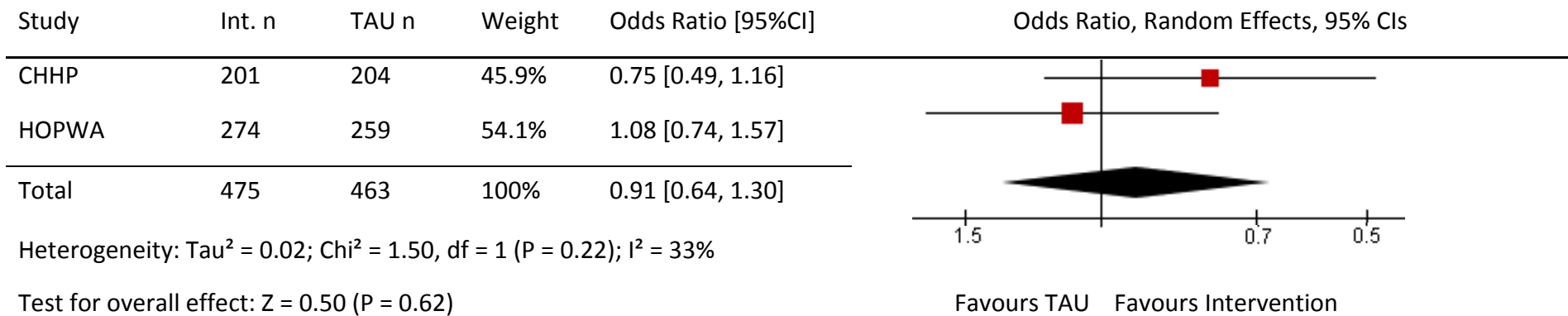


Figure 4-10 Odds ratio of emergency room visit in 18-24 months in intervention compared to TAU

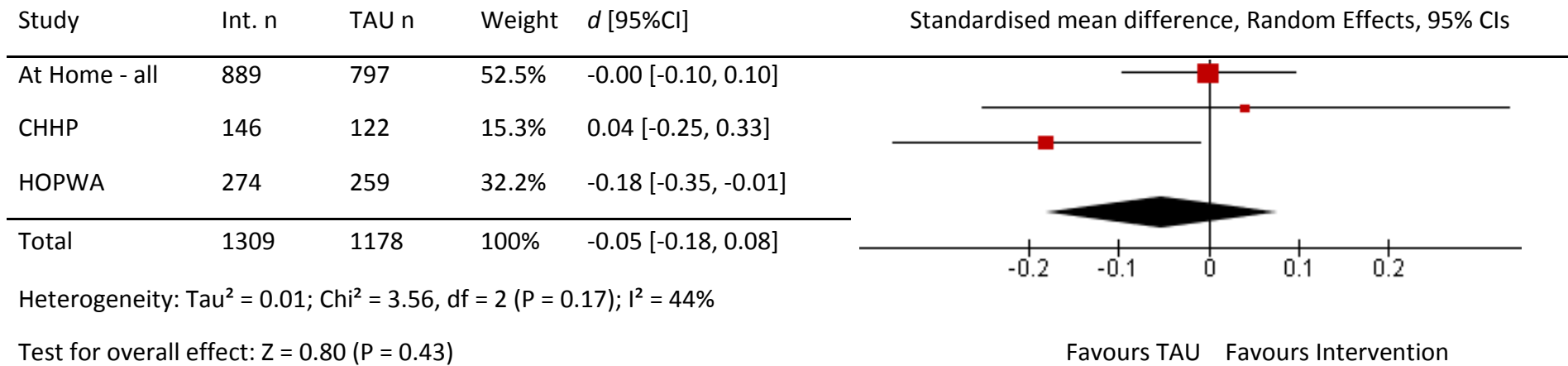


#### 4.4.4 Self-reported Health and Quality of Life

Self-rated physical health, as counted under this outcome domain, was recorded across three studies. When combined the studies were shown to be moderately heterogenous ( $I^2=44\%$ ) and showed a small difference favouring TAU ( $d=-0.05$ ), but this was not significant at the 95% confidence level (95%CI -0.18 to 0.08;  $P=0.43$ ).

Two measures of Quality of Life were found in the At Home/Chez Soi study, but not repeated elsewhere. The results of the two age group subgroups of Chung et al. (2017) were pooled for both scores, but no meta-analysis was done as there were no other studies to compare with. A small difference was found in differences in mean changes of generic quality of life between treatment and control groups from baseline ( $d=-0.03$ ), with the control group showing slightly better improvements. However, there is some uncertainty of this result (95%CI -0.13 to 0.6;  $P=0.51$ ). A small difference in condition-specific quality of life was found, favouring intervention ( $d=0.18$ ), but again with some uncertainty, not meeting the 95% confidence level (95%CI -0.09 to 0.45).

Figure 4-11 Standardised mean difference of improvement in self-rated physical health from baseline to 18-24 months between intervention and control





#### 4.4.5 Other, unanticipated outcomes

Several further outcomes that were related to health were recorded. These are listed in Table 4-4. Only two comparable measures were available across more than one study (CD4 count/intact immunity; detectable/undetectable viral load), with direction of variance not indicated in Wolitski et al. (2010). Due to time and space constraints in this review alongside this unknown direction, these data were not synthesised.

*Table 4-4 Other health and wellbeing related outcomes extracted from studies*

<b>Paper</b>	<b>Study</b>	<b>Outcome</b>	<b>Measure reported</b>	<b>Result as reported (95%CI or P)</b>
(Aubry et al. 2016)	At Home (HN subgroup)	Community Functioning (MCAS*)	Difference in mean changes from baseline	$d=0.12$ (-0.04 to 0.30)
(Aubry et al. 2016)	At Home (HN subgroup)	Physical Integration (CIS*)	Difference in mean changes from baseline	No statistically significant changes from baseline in both groups
(Aubry et al. 2016)	At Home (HN subgroup)	Psychological Integration (CIS)	Difference in mean changes from baseline	Both groups reporting significant improvements – not statistically significant between groups
(Chung et al. 2017)	At Home ( $\geq 50$ subgroup)	Community Functioning (MCAS)	Difference in mean changes from baseline	$D=0.70$ (-1.19 to 2.59) favouring Int
(Chung et al. 2017)	At Home (18-49 subgroup)	Community Functioning (MCAS)	Difference in mean changes from baseline	$D=0.40$ (-0.60 to 1.40) favouring Int
(Chung et al. 2017)	At Home ( $\geq 50$ subgroup)	Psychological Community Integration (CIS)	Difference in mean changes from baseline	$D=0.16$ (-0.73 to 1.05) favouring Int
(Chung et al.	At Home (18-49	Psychological	Difference in	$D=0.24$ (-0.23 to 0.72)

2017)	subgroup)	Community Integration (CIS)	mean changes from baseline	favouring Int
(Chung et al. 2017)	At Home ( $\geq 50$ subgroup)	Recovery (RAS*)	Difference in mean changes from baseline	D=2.21 (-0.74 to 5.16) favouring Int
(Chung et al. 2017)	At Home (18-49 subgroup)	Recovery (RAS)	Difference in mean changes from baseline	D=-0.57 (-2.11 to 0.97), favouring TAU
(Parpouchi et al. 2016)	At Home	Unprotected sex	Rates	adjusted OR=1.00 (0.71 to 1.43)
(Rezanoff et al. 2016)	At Home (CHF subgroup, diagnosed schizophrenia)	Medication adherence for psychosis	Difference in ratio of adherence to anti-psychotic medication	D=0.06 (-0.10 to 0.21), favouring Int
(Rezanoff et al. 2016)	At Home (SHF subgroup, diagnosed schizophrenia)	Medication adherence for psychosis	Difference in ratio of adherence to anti-psychotic medication	D=0.24 (0.10 to 0.37), favouring Int
(Somers et al. 2017)	At Home (CHF subgroup)	Community Functioning (MCAS)	Difference in mean changes from baseline	D=5.81 (2.69 to 8.93), favouring Int
(Somers et al. 2017)	At Home (SHF subgroup)	Community Functioning (MCAS)	Difference in mean changes from baseline	D=1.66 (-1.59 to 4.92), favouring Int
(Somers et al. 2017)	At Home (CHF subgroup)	Physical Community Integration (CIS)	Difference in mean changes from baseline	D=0.47 (-0.14 to 1.09), favouring Int
(Somers et al. 2017)	At Home (SHF subgroup)	Physical Community Integration (CIS)	Difference in mean changes from	D=-0.53 (-1.16 to 0.11), favouring TAU

			baseline	
(Somers et al. 2017)	At Home (CHF subgroup)	Psychological Community Integration (CIS)	Difference in mean changes from baseline	D=2.53 (1.05 to 4.01), favouring Int
(Somers et al. 2017)	At Home (SHF subgroup)	Psychological Community Integration (CIS)	Difference in mean changes from baseline	D=-0.34 (-1.88 to 1.20), favouring TAU
(Somers et al. 2017)	At Home (CHF subgroup)	Recovery (RAS)	Difference in mean changes from baseline	D=5.58 (1.65 to 9.50), favouring Int
(Somers et al. 2017)	At Home (SHF subgroup)	Recovery (RAS)	Difference in mean changes from baseline	Difference in change of score=0.05 (-3.63 to 3.74), favouring Int
(Stergiopoulos, Hwang, et al. 2015)	At Home (MN subgroup)	Community Functioning (MCAS)	Difference in mean changes from baseline	D=1.06 (0 to 2.13), favouring Int
(Stergiopoulos, Hwang, et al. 2015)	At Home (MN subgroup)	Physical Community Integration (CIS)	Ratio of Rate Ratios	RRR=1.02 (0.92 to 1.14), favouring Int
(Stergiopoulos, Hwang, et al. 2015)	At Home (MN subgroup)	Psychological Community Integration (CIS)	Difference in mean changes from baseline	D=0.31 (-0.25 to 0.86), favouring Int
(Stergiopoulos, Hwang, et al. 2015)	At Home (MN subgroup)	Recovery (RAS)	Difference in mean changes from baseline	D=0.09 (-1.53 to 1.71), favouring Int
(Woodhall-Melnik et al. 2015)	At Home (Toronto subgroup)	BMI	Variations in changes from baseline	MN group B=0.00063 (P=0.99) HN group B=0.91 (P=0.34)
(Woodhall-Melnik et al. 2015)	At Home (Toronto subgroup)	Waist circumference	Variations in changes from baseline	MN group $\beta$ =1.01 (P=0.52) HN group $\beta$ =2.10 (P=0.64)

(Buchanan et al. 2009)	CHHP (HIV+ subgroup)	Survival with intact immunity	Relative Risk	Relative Risk=1.63 (1.01 to 2.61), favouring Int
(Buchanan et al. 2009)	CHHP (HIV+ subgroup)	Undetectable viral load	Relative Risk	Relative Risk=1.93 (0.97 to 3.84), favouring Int
(Wolitski et al. 2010)	HOPWA	CD4 below 200	Variations in changes from baseline	F=0.11 (P=0.9522)
(Wolitski et al. 2010)	HOPWA	Detectable viral load	Variations in changes from baseline	F=1.03 (P=0.3770)
(Wolitski et al. 2010)	HOPWA	Health risk behaviour (past three months)	Variations in changes from baseline	F=2.26 (P=0.0801)

\*MCAS: Multnomah Community Ability Scale; CIS: Community Integration Scale; RAS: Recovery Assessment Scale;

#### 4.4.6 Housing Stability

In all four studies, the intervention group was found to have significant improvements in Housing Stability. Figure 4-12 and Figure 4-13 present forest plots of the two different measures – odds ratio of attaining ‘stable housing’ by the end of the trial period and difference in proportion of days ‘stably housed’ – and in both cases there were large differences between groups favouring the housing intervention. These two measures were used in separate comparisons as they were not able to be combined. As Padgett et al. (2015; Box 4.3) note, the count of ‘number of days housed’ obscures “housed where” and “how many times rehoused”, whereas by comparison the status of ‘stably housed’ aims to predict the ongoing maintenance of the attained housing. Adair et al. (2017) further illustrate the differences in potential “pathways” of housing experienced during the trial period by participants in both groups; a large or small number of days in housing does not necessarily predict the future status of stably housed.

The combined effects estimate indicated that participants receiving non-contingent housing are 6.54 times more likely to be stably housed after 18-24 months (95%CI 2.17 to 13.48;  $P < 0.00001$ ). Results were considerably heterogeneous across studies ( $I^2 = 89\%$ ). The calculated pooled standardised mean difference between proportions of days housed during the observed trial period was 1.11 (95%CI 0.41 to 1.82;  $P = 0.002$ ), representing a very large difference between the groups overall (Cohen 1988). Results were also considerably heterogeneous ( $I^2 = 95\%$ ).

The considerable statistical heterogeneity here limits the usefulness of these meta-analysis results. To address this heterogeneity, the result of the meta-analysis itself should not be accepted (Higgins & Green 2011, sec.9.5.3), and effectively considered as 'not done'. The forest plots and data in Table 4-5 are reported here for completion. The results across all studies still show statistically significant improvements in intervention participants over TAU and so are interpreted with some confidence to be an intervention-favouring outcome.

Figure 4-12 Odds ratio of achieving stable housing by 18-24 months in intervention compared to TAU

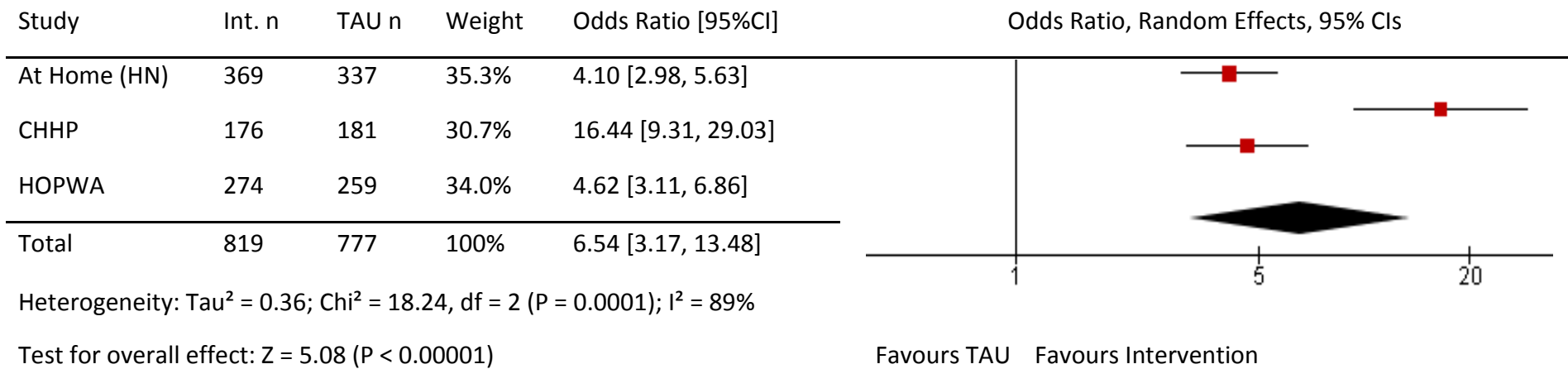
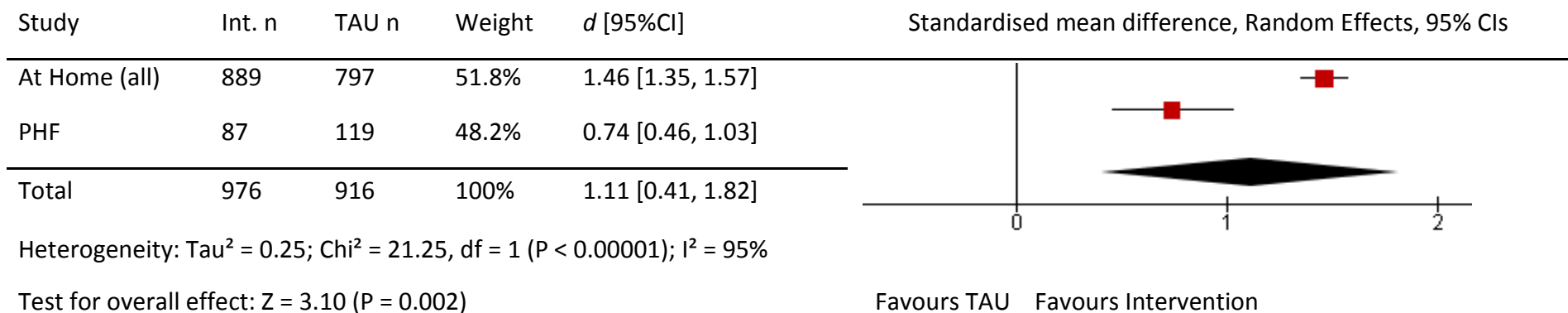


Figure 4-13 Standardised mean difference in proportion of days spent housed during 18-24 month trial period



#### 4.4.7 Subgroups reported

No subgroup comparisons were able to be synthesised across studies. Observations in subgroup differences as extracted are reported here with comments, however no new data were generated.

##### *Categorisation by age*

The At Home/Chez Soi population is divided into two age groups in Chung et al. (2017), consisting of participants of 18-49 years of age and  $\geq 50$  years. Kozloff, Adair, Lazgare et al. (2016) report an additional subgroup analysis of 18-24 year-olds. In most cases reported, the older adults in Chung et al. (2017) experience greater benefits than the 18-49 age group. The largest differences were seen in the domains of Mental Health and Quality of life.

Participants aged 50 and older showed gains in scores in both self-rated mental health (difference  $D=2.18$ ; 95%CI -0.79 to 5.15) and mental health symptom severity ( $D=-1.32$ ; 95%CI -3.85 to 1.20), both favouring intervention. The 18-49 age group showed differences favouring TAU in both measures (self-rated  $D=-1.64$ ; 95%CI -3.22 to -0.07; symptom severity  $D=2.07$ ; 95%CI 0.74 to 3.39). The researchers recorded more than 95% confidence in the validity of both differences (Chung et al. 2017 Table 3). The younger subset of 18-24 year olds showed smaller differences between intervention and TAU in both measures than seen in the two larger age categories, with difference in self-rated mental health  $D=-0.78$  (95%CI -6.74 to 5.18), favouring TAU and difference in mental health symptom severity  $D=-0.05$  (95%CI -5.10 to 5.00), favouring intervention.

In the domain of quality of life, the  $\geq 50$  years age group again saw greater gains than the 18-49 group in generic quality of life (older group  $D=0.37$ ; 95%CI -4.62 to 5.35; favouring int.; younger group  $D=-1.13$ , 95%CI -3.75 to 1.48; favouring TAU), condition-specific quality of life

(older group  $D=8.35$ ; 95%CI 3.37 to 13.33; favouring int.; younger group  $D=1.36$ ; 95%CI -1.21 to 3.92; favouring int.) and self-rated physical health (older group  $D=0.37$ ; 95%CI -2.01 to 2.76; favouring int.; younger group  $D=-0.11$ ; 95%CI -1.37 to 1.15; favouring TAU). The youngest subsection of 18-24 years age group again saw intermediate gains in condition-specific quality of life ( $D=7.29$ ; 95%CI -1.61 to 16.18; favouring int.) and self-rated physical health ( $D=1.46$ ; 95%CI -2.83 to 5.74; favouring int.), but the greatest improvements in generic quality of life amongst the three subgroups ( $D=2.81$ ; 95%CI -6.36 to 11.97, favouring int.).

In additional outcome domains, differences between age groups were smaller but followed similar patterns. This suggests that there is a difference in effectiveness of Housing First for different age groups, with older adults experiencing greater gains from the intervention than the younger groups, and in all measures showing variably-sized gains over TAU. In both measures of mental health, researchers recorded greater than 95% confidence that the TAU participants experienced better results than intervention participants in the 18-49 years category. The youngest age-group by comparison showed moderate gains over TAU in a number of areas. The 18-49 age group, including the youngest adults, showed least gains through the intervention, suggesting that the greatest contributions to this measured effect was found amongst 25-49 year-olds.

#### *Categorisation by 'High' and 'Moderate' needs*

High Needs participants of the At Home study are reported in Aubry et al. (2015) at 12 months and Aubry et al. (2016) at 24 months, and the Moderate Needs participants in Stergiopoulos, Hwang et al. (2015) for the full 24 months. These two groups were drawn from the same recruited population and stratified by the presence or absence of severe



instances of mental health problems (except in the Moncton site, where all were classed as 'High Need'). Several outcomes are available to be compared between these two groups.

Aubry et al. (2016) in analysis of the High Needs subgroup show reductions in mental health symptom severity in both intervention and treatment-as-usual groups, with a small, statistically significant difference favouring TAU (adjusted  $d=0.17$ ; 95%CI 0.05 to 3.0;  $P=0.01$ ). Stergiopoulos, Hwang et al. (2015) report a similar direction of effect, but with a smaller and not statistically significant effect size ( $d=0.05$ ; 95%CI -0.08 to 0.18). Both groups report small, not statistically significant results favouring the intervention groups at 6 and 12 months (Aubry et al. 2015; Stergiopoulos, Hwang, et al. 2015), suggesting that rates of improvement are initially greater for intervention participants, with control participants showing greater gains over the full 24-month period.

Both intervention subgroups report significantly greater improvements than control in condition-specific quality of life at 12 months (MN  $d=0.19$ ; 95%CI 0.07 to 0.32; favouring int.; HN  $d=0.15$ ; 95%CI 0.04 to 0.24; favouring int.). Between MN groups this small difference remained similar ( $d=0.20$ ; 95%CI 0.07 to 0.32), but HN control participants showed a greater improvement by 24 months ( $d=0.05$ ; 95%CI -0.08 to 0.18; favouring int.).

Similar results were seen across the subgroups in Health Service Use, and community functioning (grouped in 'Other' domain in this review). The two measures of Housing Stability ('days housed' and 'proportion attaining stable housing') were not directly comparable (see 4.4.6 above).

#### *Categorisation by 'Scattered' and 'Congregate' models*

Somers et al. (2017) and Rezansoff et al. (2016) report on the 'Vancouver at Home' arm of the At Home/Chez Soi study, comparing Congregate Housing First (CHF) and Scattered-site

Housing First (SHF) with TAU. Both intervention groups report similarly large and statistically significant improvements in Housing Stability. Similar, small differences from TAU were seen in Substance Use, with both groups favouring TAU and Quality of Life, with both favouring intervention. In the largest differences between the groups, CHF saw statistically significant improvements in reduction of severity of disability (or 'community functioning', MCAS score;  $D=5.81$ ; 95%CI 2.69 to 8.93; favouring int.), and improvements in psychological community integration ( $D=2.53$ ; 95%CI 1.05 to 4.01; favouring int.) and recovery ( $D=5.58$ ; 95%CI 1.65 to 5.83), where SHF did not (see Table 4-4). In measures of mental health symptom severity, CHF saw better outcomes than SHF (CHF  $D=1.68$ ; 95%CI -2.44 to 5.80; favouring TAU; SHF  $D=3.82$ ; 95%CI -0.49 to 8.12; favouring TAU), although with neither comparisons with control or between treatments giving 95% confidence of this difference. Conversely, Rezansoff et al (2016) report better outcomes in possession of antipsychotic medication amongst SHF participants than CHF (CHFD=0.06; 95%CI -0.10 to 0.21; favouring int.; SHF  $D=0.24$ ; 95%CI 0.10 to 0.37; favouring int.).

#### 4.4.8 Sensitivity analyses

Sensitivity analysis was sought to be carried out to analyse studies of lower risk of bias. This was only feasible in one instance as exclusion of studies in other meta-analyses left only a single study. In the analysis of decrease in mental health symptom severity the 'At Home' population was able to be excluded on the grounds of lack of evidence for accounting for loss to follow up. This produced similar, not statistically significant results ( $d= -0.06$ ; 95%CI -0.27 to 0.16;  $P=0.60$ ), but with higher heterogeneity of reported data ( $I^2=46\%$ ).

#### 4.5 Summary of synthesised data

Table 4-5 summarises the findings from the meta-analyses for all primary and secondary domains. Excluding considerably heterogeneous results, five meta-analyses show greater outcomes amongst intervention participants and three favour Treatment As Usual. Only two of these comparison, number of emergency room visits and number of days spent hospitalised, give more than 95% confidence in the results, both favouring the intervention groups. Outcomes were found under every domain outlined in the protocol (Baxter et al. 2017), but not all quantitative data was able to be meta-analysed.

*Table 4-5 Summary of all synthesised results, grouped by Outcome Domain and Comparison*

<b>Domain</b>	<b>Meta-analysis comparison</b>	<b>Number of studies</b>	<b>Total participants</b>	<b>I<sup>2</sup></b>	<b>Metric</b>	<b>Effect estimate (95%CI)</b>	<b>Direction</b>
Substance Use	Problematic substance use	2	912	0%	OR*	0.81 (0.60 to 1.10)	Favours TAU
Mental Health	Self-rated mental health	3	2487	0%	SMD*	0.08 (-0.61 to 0.21)	Favours Int
Mental Health	Mental health symptom severity	3	2425	23%	SMD	-0.04 (-0.19 to 0.11)	Favours Int
Health Service Use	Emergency room visits	2	1111	0%	IRR*	0.80 (0.72 to 0.88)	Favours Int
Health Service Use	Number of hospitalisations	2	948	76%	SMD	-0.18 (-0.44 to 0.09)	Favours Int
Health Service Use	Number of days spent hospitalised	3	1627	45%	SMD	-0.18 (-0.33 to -0.03)	Favours Int
Health Service Use	Participants with ≥1 hospitalisation	2	1421	0%	OR	1.05 (0.83 to 1.32)	Favours TAU
Health Service Use	Participants with ≥1 ER visit	2	948	33%	OR	0.91 (0.64 to 1.30)	Favours Int
Quality of	Self-rated	3	2487	44%	SMD	-0.05	Favours

Life	physical health					(-0.18 to 0.08)	TAU
Quality of Life	Generic Quality of Life	1	2148	N/A	SMD	-0.03 (-0.13 to 0.06)	Favours TAU
Quality of Life	Condition-specific Quality of Life	1	2148	N/A	SMD	0.18 (-0.09 to 0.45)	Favours Int
Housing Stability	Achieving stable housing	3	1596	89%	OR	6.54 (3.17 to 13.48)	Favours Int
Housing Stability	Time in stable housing	2	1892	95%	SMD	1.11 (0.41 to 1.82)	Favours Int

\*OR: Odds Ratio, OR=1 – no difference between groups; SMD: Standardised Mean Difference, SMD=0 – no difference between groups; IRR: Incidence Rate Ratio, IRR=1 – no difference between groups

## 5 Discussion

### 5.1 Summary of findings

Research Question 1 addressing whether Housing First can improve health and wellbeing in homeless people is not able to be fully answered in this review. The primary outcomes examining health and wellbeing outcomes produced varied results, with few giving certainties of a positive effect of the intervention at the 95% confidence level. In many of the results reported, there were seen improvements in measurements in both intervention and control groups. Housing First, in replacing the treatment as usual (TAU) practices, was found to have no additional effect in several of these areas.

The lower use of Health Services as one measure of health is one indicator of this potential for improvement over current practice. Caution should be taken in interpreting this result positively, as greater use of health services may be a measure of either better health or merely greater access to services as a result of stable housing. The two measures showing most clear differences – emergency room incidence rates and number of days hospitalised – are also the most comprehensive measures and may be the most likely to be indicative of improved health.

In several instances, varying results were reported in the subgroup analyses of the At Home/Chez Soi study. Over the whole study period, older adults and persons with less severe mental health problems experienced better quality of life (Chung et al. 2017; Stergiopoulos, Hwang, et al. 2015). Conversely, younger adults and persons with severe mental health problems in usual care experienced a greater improvement in mental health over this period than those in Housing First (Chung et al. 2017; Aubry et al. 2016). There is a possibility for some people to experience significantly better health benefits and others to

experience poorer health through Housing First than current treatment, as shown by this subgroup analyses.

Research Question 2, looking at whether the intervention improved housing stability, can be shown to be affirmed in this review. All studies reported statistically significant and large increases in housing stability amongst intervention participants than control participants.

Meta-analysis was not able to give a reliable measure of effect estimate, as the large variation in effect size between studies produced considerable heterogeneity.

Improvements in housing stability in intervention over control were also seen in all subgroups, suggesting that neither age, mental health need nor scattered/congregate format differences mitigate this effectiveness.

Research Question 3 addressing the differences between Congregate Housing First (CHF) and Scattered-site Housing First (SHF) was not fully answered, with only one study addressing this. The congregate format was seen to produce greater reduction in severity of disability, improvements in psychological community integration and improvements in recovery. The 'community' aspect of the congregate setup, bringing clients into close contact with peers with similar experiences, may contribute to this observed difference.

Simultaneously there is uncertainty over the effectiveness of this setup for participants with severe mental health problems, with both greater adherence to medication and a small increase in severity of problems seen in scattered-site format participants. These results are difficult to generalise as they are only observed in one context.

Across all studies there was high ratings of risk of bias in several areas. This was predominantly unavoidable due to the lack of possibility of blinding. Direction of bias was not clear. This weakens the certainty of the results reported in this systematic review. Some

outcomes may have been less affected by risk of bias, such as Housing Stability eliciting clear responses of number of days housed, rather than interviews recording personal assessments.

The ambiguity of the above health outcomes may be in part explained by the practice of 'methodological individualism' (Burchardt 2006) in Housing First (see section 2.4).

Potentially, persons more 'normalised' to isolation as chronically homeless, older adults may experience less dissatisfaction with placement in a scattered-site apartment away from established community. Persons with less severe mental health problems may also be more enabled to actively seek community and integration in their new locations. These may produce better reported Quality of Life.

## 5.2 Appraising this review

### 5.2.1 Strengths of this review

This review was able to complete meta-analyses of several key health outcomes in evaluation of Housing First. The scope of this review question gave clarity and focus to the review process. Additionally, the broad definitions of health and wellbeing allowed for a holistic consideration of the impacts of the intervention on the lives of the participants. The intervention was clearly defined, constructed and published in an online protocol before initiation of the search. This allowed for a potentially broad range of similar interventions to be included. Simultaneously, the key markers of the intervention's difference from TAU were clearly used to select the studies which most clearly evaluated their effectiveness.

The search strategy was developed extensively and adapted appropriately to ensure broad results from each database. The low expected number of relevant studies allowed this to be constructed to maximise sensitivity, ensuring greater confidence in the inclusion of all

useable studies. Additionally, the large range of databases across multiple subject areas gave more opportunity to ensure that all studies were found.

The screening and selection of studies was carried out with close attention to the protocol, and so the included studies were ensured to be the most relevant to the research question. Care was taken to look into unclear aspects of the study design and context, aiming to retrieve protocols or research unfamiliar terms.

The Risk of Bias tool was used effectively to critically appraise all studies and interpret results accordingly. Care was taken to ensure that this was applied objectively.

The dual nature of the synthesis process provided a good overview of the evidence. This novel example of meta-analyses of Housing First data was systematic and handled the data responsibly to appraise heterogeneity and give standardised effect estimates. The examination of differences at the subgroup levels showed some of the variation in effect sizes in differing contexts which were potentially obscured by the across-studies comparisons.

Finally, this review was careful in the reporting of outcomes. The ambiguity in the effects of the intervention on health and wellbeing was highlighted and used to prompt caution in the interpreting of results. Where only a single study was found to be reporting an outcome, this result was not generalised. Care was also taken in not assuming generalisability of other outcomes with few studies or participants.

### 5.2.2 Limitations of this review

The scope of this review was primarily limited by the focus on exclusively quantitative data from Randomised Controlled Trials. This limited the availability of evidence, as other study



designs, such as cross-sectional, quasi-experimental or qualitative studies were excluded. Further, the restriction to only English-language publications may have excluded useable results. The inclusion of only four studies limits the generalisability of findings to other contexts. The high risk of bias in all measures across all studies limits the clarity and certainty of effect estimates. A process evaluation of the successes or failures of the intervention to give improved outcomes was not possible in the limited scope of the data addressed.

A limitation in the methodology of this review was the necessity of a single reviewer carrying out this research. As outlined in the protocol (Baxter et al. 2017), further work with other researchers would be necessary before publication is pursued to ensure correct handling of data and drawing of conclusions.

The inclusion criteria used could also be questioned as to their legitimacy for truly evaluating 'Housing First'. The three elements of rapid provision, non-abstinence contingency and goal of permanent residence were selected to balance fidelity to the original model with the use of clearly defined markers in the search process. The omission of 'consumer choice', 'attached services' and 'scattered site format' (Tsemberis 2010) generated a sample of fairly heterogeneous interventions to be combined as one experimental grouping. Conversely, the inclusion criteria may have been too strict. The interpretation of non-abstinence-contingence led to the exclusion of the HUD-VASH studies which were included in all other reviews as a 'Housing First' intervention (Woodhall-Melnik & Dunn 2016; Kertesz et al. 2009; Ly & Latimer 2015).

### 5.3 Limitations of available evidence

The availability of evidence for this review was very restricted. Few studies were identified for inclusion. The expected publication of the study conducted in France will be one potential addition to the number of published RCTs evaluating Housing First (Tinland et al. 2013). Alongside being a 'gold standard' of evidence testing an intervention, RCTs are also notoriously difficult to perform in this area of research. Recruitment of large sample sizes to give precise effect estimates limits the feasibility in certain settings. Alongside this, the expense incurred by the provision of the intervention as well as research costs make it difficult to run.

A limitation discovered in the available evidence was the consistent focus on a relatively short follow-up period of 24 months (with the exception of Padgett et al. 2011, recording outcomes across 48 months, which wasn't able to be used in this analysis). A weakness of this is that it was therefore unable to look at more long-term impacts on health. Several possible benefits and harms of either intervention or control treatments may take much longer to become detectable. Premature death amongst homeless persons due to ill health could feasibly have been effected by this intervention for example. A much more extensive follow-up would be necessary to detect differences here.

The considerable heterogeneity found in several outcomes also prevented accurate calculation of some effect estimates. Several differences across the studies may have contributed to this. Firstly, the characteristics of the participants are very different by the design of each study. The selection according to high/moderate mental health needs, chronic physical health problems or HIV/AIDS to produce separate study populations limited the generalisability of the results. Secondly, variations in intervention models may account

for some of this difference. The particularities of the different ranking of 'consumer choice' between studies (see section 4.2.4 – CHHP lowered priority), the difference in availability of housing in each location or the provisions of health service support throughout the study may contribute to observed heterogeneity. Thirdly, variations in Treatment As Usual may produce some of the range in comparative results reported here. Across two nations and nine cities the expected 'normal' practice in addressing homelessness would vary considerably. In addition, the relative size of the sample population to the total homeless population of the city could produce knock-on effects if TAU homelessness services saw a significant reduction in clients as they are recruited to intervention groups.

A further limitation across the available studies was the 'high' risk of bias encountered in each. In many cases this was entirely unavoidable; participants and treatment staff were unable to be blinded to group assignment for example. Further steps could potentially have been taken to address risk of bias in measurement of outcomes. Almost all data used in this review was recorded as self-reported measure at interview with the participants. If alternative measurements were used and handled by blinded staff members, this would have reduced the risk of bias in this area. Better methods of accounting for missing outcome data could have also been incorporated into studies.

#### 5.4 Implications for scholarship

Further questions are prompted by this review which could be addressed by ongoing evaluation of the Housing First model. As discussed throughout, clarity of definition of the Housing First intervention should be a starting point in ongoing research. Evaluation of the importance of the 'principles' of Housing First in its effectiveness would be an important next step. The three further principles of scattered site format, consumer choice and

ongoing care were not used to define inclusion. However, the resulting studies showed examples of both adherence and non-adherence to these aspects. Further testing of the importance of these would require additional, comparable studies to be examined.

Alongside this, if adaptations to the three inclusion principles (rapid provision, non-abstinence contingency and permanence of residence) were proposed and further tested how would these be balanced with the aim of fidelity? If more positive effects were discovered in slightly varying models, at what points should health outcomes take greater priority?

In particular, further research on the comparative effectiveness of Congregate Housing First (CHF) could address some of the questions highlighted in this review. The differences of effect seen in the At Home/Chez Soi study appear to point to different strengths of each approach. If these were both found to be valid in further studies, then questions of priority would then need addressed. Additionally, further questions of whether clients eligible for Housing First support would more frequently choose one or the other model would be worth asking. The 'consumer choice' element of Housing First may still be applicable if both models are offered simultaneously. However, a further question would be whether this self-selection into one or the other corresponded with experiencing greater outcomes.

The subgroup analyses of the At Home/Chez Soi study showed several differences in effects for different age groups and health needs. An initial question for ongoing research is whether these differences are seen in further study populations, and whether they point to generalisable measures of greater effectiveness of the intervention for particular groups of homeless persons. In addition, the direct comparison of Housing First with best-practice examples of the treatments broadly grouped under TAU in this review would be able to

discern more clearly whether a better solution to health problems exists for certain groups. Lastly, a process evaluation of both these Housing First interventions as well as potentially more effective programmes may be able to show whether a combination of approaches is able to provide the best health and wellbeing outcomes, while still retaining the improved housing stability which Housing First prizes.

### 5.5 Implications for implementation of Housing First

This review adds strength to the calls to adopt Housing First as an ‘evidence-based’ housing model (Glasgow Homelessness Network 2017), having shown consistent improvements in the housing stability of vulnerable homeless persons. Alongside this, Housing First can be shown to reduce use of non-routine health services, which is potentially both a cost-saving outcome as well as a proposed indicator of reduced health needs.

Across all studies, no significant improvements over usual treatment were seen in problematic substance use, mental health or quality of life. However, in many of these measures, this recorded similar improvements in both groups. In this regard, Housing First could be used as a ‘health intervention’, performing as effectively as current practices. In these cases, Housing First could be implemented to address both the housing need and the health need simultaneously.

In several areas Housing First may not be as effective as other approaches to homelessness. Amongst several subgroup participants (see section 3.13) better outcomes may be achievable through other methods. As Kertesz et al. (2009) contend, the well-resourced and correctly conducted application of a better model may provide better results than the TAU or intervention groups reported here. In light of the high attainment of stable housing however, this does pose a poignant ethical question. If a person is evidently able to be

stably housed by such a structural intervention as Housing First, then the decision not to implement this becomes a decision to *structurally maintain* homelessness. Is this structural maintenance of homelessness amongst a vulnerable subset of a population justifiable as an effective health intervention? This review would argue that it is not. The resulting opportunity cost of functionally 'replacing' these proposed effective models may then more adequately be addressed in other ways, through alternative health services freely chosen or adaptations to the Housing First model.

The choice of which model to implement is yet to be made clear by the scholarship, as highlighted above. If the methodological individualism is responsible for creating feelings of isolation and poor quality of life, the alternative model of CHF may be one possibility to counter this. However, this does raise the question of whether 'consumer choice' is a principle which should take priority over this outcome. Pursuit of equality of capability – to have control over one's environment (Nussbaum 2000) – is arguably more valid than equality of utility – a person's satisfaction with life. Freedom and choice are relegated to a secondary concern (Sen 1992). The choice of a congregate setup offered to the homeless person, in the midst of choices of society's 'normal', scattered-site housing, may be one provision worth considering.

In response to this evidence, Housing First could be implemented at a policy level as a standard model to address homelessness. As a new 'Treatment As Usual' it would then allow for testing of improved models. As a social health and wellbeing intervention, it would also ensure the further equality of capability of housing across vulnerable members of society.

## 6 Conclusion

This dissertation looked at the best available evidence for the Housing First model and its proposed effects on the health and wellbeing of homeless persons. The conducting of a systematic review aimed to include all the relevant studies and handle them in a balanced way. This review has then contributed to the evidence-based appraisal of the Housing First model in key ways. The robustness and coherence of the compared results presents each of the potential health outcomes of the intervention from the best experimental tests. This brings together a rounded picture of the health and wellbeing effects measured in several locations. It therefore fills gaps left by previous research and reviews.

Housing First is shown to be a highly effective in reducing homelessness amongst vulnerable participants. Additionally, it can be seen to reduce non-routine use of healthcare services, which may be an indicator of better health outcomes. In other measurements of health outcomes, there is much less clarity of effectiveness of the Housing First model in comparison with other approaches existing alongside it in the study locations. Housing First may be more effective than treatment as usual for older persons and those with less severe mental health problems. It may be less effective than current approaches for younger persons and those with more severe mental health problems. Different models may be able to address some of these problems and provide a better fit for certain clients.

Further research could answer these questions of how a better Housing First model could be developed. More long-term observations of study participants would provide clearer measures of the ongoing health effects of this intervention. In the immediate term, Housing First could be implemented with confidence in its success as a housing intervention, but with caution in relying on this model for certainty in improved health outcomes.

## 7 References

- ACTG Outcome Committee, 1999. ACTG QOL 601-602 (QOL 601-2) Health Survey Manual. *AIDS Clinical Trial Group website*. Available at: <https://www.frontierscience.org/apps/cfmx/apps/common/QOLAdherenceForms/resources/actg/manualql601-2799.pdf> [Accessed July 17, 2017].
- Adair, C.E. et al., 2016. Housing Quality in a Randomized Controlled Trial of Housing First for Homeless Individuals with Mental Illness: Correlates and Associations with Outcomes. *J Urban Health*, 93(4), pp.682–697.
- Adair, C.E. et al., 2017. Outcome trajectories among homeless individuals with mental disorders in a multisite randomised controlled trial of housing first. *The Canadian Journal of Psychiatry / La Revue canadienne de psychiatrie*, 62(1), pp.30–39.
- Andresen, E.M. et al., 1994. Screening for depression in well older adults: evaluation of a short form of the CES-D (Center for Epidemiologic Studies Depression Scale). *American journal of preventive medicine*, 10(2), pp.77–84.
- Aubry, T. et al., 2016. A multiple-city RCT of housing first with assertive community treatment for homeless Canadians with serious mental illness. *Psychiatric Services*, 67(3), pp.275–281.
- Aubry, T. et al., 2015. One-Year Outcomes of a Randomized Controlled Trial of Housing First With ACT in Five Canadian Cities. *Psychiatric Services*, 66(5), pp.463–469.
- Baxter, A. et al., 2017. *The effects of Housing First and other permanent, non-contingent housing provision interventions on the health and wellbeing of homeless adults: protocol for a systematic review of randomised controlled trials*, PROSPERO. Available at: [https://www.crd.york.ac.uk/PROSPERO/display\\_record.asp?ID=CRD42017064457](https://www.crd.york.ac.uk/PROSPERO/display_record.asp?ID=CRD42017064457).
- Boothroyd, R.A. & Chen, H.J., 2008. The Psychometric Properties of the Colorado Symptom Index. *Administration and Policy in Mental Health and Mental Health Services Research*, 35(5), pp.370–378.
- Buchanan, D. et al., 2009. The health impact of supportive housing for HIV-positive homeless patients: a randomized controlled trial. *American Journal of Public Health*, 99 Suppl 3, pp.S675-80.
- Burchardt, T., 2006. *Foundations for measuring equality: A discussion paper for the Equalities Review*, CASE paper 111, London.
- Burnam, M.A. et al., 1995. An experimental evaluation of residential and nonresidential treatment for dually diagnosed homeless adults. *Journal of Addictive Diseases*, 14(4), pp.111–134.
- Burrige, R. & Ormandy, D., 1993. *Unhealthy housing: research, remedies, and reform*, London : E. & F.N. Spon.
- Byrne, D.S. et al., 1986. *Housing and health: the relationship between housing conditions and the health of council tenants*, Aldershot: Gower.
- Campbell, M.J. & Swinscow, T.D. V., 2009. *Statistics at square one* 11th ed., Chichester: Wiley-Blackwell/BMJ Books.
- Caplan, B. et al., 2006. Change in neurocognition by housing type and substance abuse among formerly homeless seriously mentally ill persons. *Schizophrenia Research*, 83, pp.77–86.



- Carling, P.J., 1993. Housing and Supports for Persons With Mental Illness: Emerging Approaches to Research and Practice. *Psychiatric Services*, 44(5), pp.439–449.
- Cheng, A.L. et al., 2007. Impact of Supported Housing on Clinical Outcomes: Analysis of a Randomized Trial Using Multiple Imputation Technique. *Journal of Nervous and Mental Disease*, 195(1), pp.83–88.
- Cheung, A. et al., 2015. Emergency department use and hospitalizations among homeless adults with substance dependence and mental disorders. *Addiction Science & Clinical Practice*, 10(17), pp.1–12.
- Chung, T.E. et al., 2017. Housing first for older homeless adults with mental illness: A subgroup analysis of the at home/chez soi randomized controlled trial. *International Journal of Geriatric Psychiatry*.
- Ciarlo, J. et al., 1986. *Colorado Symptom Index*, Washington DC: National Institute of Mental Health.
- Cohen, J., 1988. *Statistical power analysis for the behavioral sciences*, London : L. Erlbaum Associates.
- Conference of European Statisticians, 2016. Recommendations for the 2020 Censuses of Population and Housing. Available at: [https://www.unecce.org/fileadmin/DAM/stats/publications/2015/ECECES41\\_EN.pdf](https://www.unecce.org/fileadmin/DAM/stats/publications/2015/ECECES41_EN.pdf) [Accessed July 26, 2017].
- Conrad, K.J. et al., 1998. Case managed residential care for homeless addicted veterans. Results of a true experiment. *Medical Care*, 36(1), pp.40–53.
- Conrad, K.J. et al., 2001. Reliability and Validity of a Modified Colorado Symptom Index in a National Homeless Sample. *Mental Health Services Research*, 3(3), pp.141–153.
- Cooper, H.M., Hedges, L. V. & Valentine, J.C., 2009. *The handbook of research synthesis and meta-analysis* 2nd ed., Russell Sage Foundation.
- Crisis, 2016. Housing projects to benefit from £150k fund. Available at: <https://www.crisis.org.uk/about-us/latest-news/housing-projects-to-benefit-from-150k-fund/> [Accessed August 11, 2017].
- Dean, H., 2009. Critiquing capabilities: The distractions of a beguiling concept. *Critical Social Policy*, 29, pp.261–278.
- Dennis, M.L., Chan, Y.-F. & Funk, R.R., 2006. Development and Validation of the GAIN Short Screener (GSS) for Internalizing, Externalizing and Substance Use Disorders and Crime/Violence Problems Among Adolescents and Adults. *American Journal on Addictions*, 15(s1), pp.80–91.
- Depaul, 2017. Our Services. Available at: <https://ie.depaulcharity.org/our-work/our-services> [Accessed August 11, 2017].
- Dickey, B. et al., 1997. Housing costs for adults who are mentally ill and formerly homeless. *Journal of Mental Health Administration*, 24(3), pp.291–305.
- Dickey, B. et al., 1996. Use of mental health services by formerly homeless adults residing in group and independent housing. *Psychiatric Services*, 47(2), pp.152–158.
- Erdem, G., 2015. *Can a house become more than a home? Effects of housing assistance and supportive services on promoting capabilities among homeless mothers [thesis]*. The Ohio State University.

- ERP, 2007. *Fairness and Freedom: The Final Report of the Equalities Review*, London: Equalities Review Panel.
- Estecahandy, P., 2013. A "Housing First" Trial in France. In *Housing First International Conference*. Lisbon: Associação para o Estudo e Integração Psicossocial. Available at: <http://hf.aeips.pt/wp-content/uploads/2013/10/Pascale.pdf> [Accessed August 1, 2017].
- Fazel, S., Geddes, J.R. & Kushel, M., 2014. The health of homeless people in high-income countries: descriptive epidemiology, health consequences, and clinical and policy recommendations. *The Lancet*, 384(9953), pp.1529–1540.
- FEANTSA, 2017. About Us - FAQ. Available at: <http://www.feantsa.org/en/about-us/faq> [Accessed August 29, 2017].
- FEANTSA, 2006. *ETHOS - Taking stock*, Brussels: European Federation of National Associations Working with the Homeless.
- Field, A., 2009. *Discovering Statistics Using SPSS* 3rd ed., London: Sage Publications.
- Fitzpatrick, S., 2005. Explaining Homelessness: a Critical Realist Perspective. *Housing, Theory and Society*, 22(1), pp.1–17.
- Fletcher, T.D. et al., 2008. Evaluation of treatment programs for dual disorder individuals: Modeling longitudinal and mediation effects. *Administration and Policy in Mental Health and Mental Health Services Research*, 35(4), pp.319–336.
- Forchuk, C. et al., 2008. Developing and testing an intervention to prevent homelessness among individuals discharged from psychiatric wards to shelters and "no fixed address." *Journal of Psychiatric and Mental Health Nursing*, 15(7), pp.569–575.
- Fowler, P.J. & Chavira, D., 2014. Family Unification Program: Housing Services for Homeless Child Welfare-Involved Families. *Housing Policy Debate*, 24(4), pp.802–814.
- Fowler, P.J. & Schoeny, M., 2015. The Family Unification Program: A Randomized-Controlled Trial of Housing Stability. *Child Welfare*, 94(1), pp.167–187.
- Frieden, T.R., 2010. A framework for public health action: the health impact pyramid. *American journal of public health*, 100(4), pp.590–595.
- Furman Centre for Real Estate and urban Policy, 2017. Advantage – Directory of New York City Affordable Housing Programs – NYU Furman Center. Available at: <http://furmancenter.org/institute/directory/entry/advantage> [Accessed July 20, 2017].
- Gaetz, S., Scott, F. & Gulliver, T., 2013. *Housing First in Canada: Supporting Communities to End Homelessness*, Toronto: Canadian Homelessness Research Network Press.
- Geller, L., 2014. Putting housing first. *Canadian Nurse*, 110(5), pp.22–27.
- Gewirtz, A.H. et al., 2015. Two-year outcomes of the Early Risers prevention trial with formerly homeless families residing in supportive housing. *Journal of Family Psychology*, 29(2), pp.242–252.
- Glasgow Homelessness Network, 2017. *Housing First Scotland Seminar Report 2017*, Stirling. Available at: <http://www.ghn.org.uk/shien/wp-content/uploads/sites/5/2017/05/Housing-First-Report-1.pdf>.
- Goering, P.N. et al., 2016. Further Validation of the Pathways Housing First Fidelity Scale. *Psychiatric Services*, 67(1), pp.111–114.

- Goering, P.N. et al., 2011. The At Home/Chez Soi trial protocol: a pragmatic, multi-site, randomised controlled trial of a Housing First intervention for homeless individuals with mental illness in five Canadian cities. *BMJ open*, 1(2), p.e000323.
- Goldfinger, S.M. et al., 1999. Housing placement and subsequent days homeless among formerly homeless adults with mental illness. *Psychiatric Services*, 50(5), pp.674–679.
- Greenwood, R.M. et al., 2005. Decreasing Psychiatric Symptoms by Increasing Choice in Services for Adults with Histories of Homelessness. *American Journal of Community Psychology*, 36(3–4), pp.223–238.
- Gulcur, L. et al., 2007. Community Integration of Adults with Psychiatric Disabilities and Histories of Homelessness. *Community Mental Health Journal*, 43(3), pp.211–228.
- Gulcur, L. et al., 2003. Housing, hospitalization and cost outcomes for homeless individuals with psychiatric disabilities participating in continuum of care and housing first programmes. *Journal of Community & Applied Social Psychology*, 13(2), pp.171–186.
- Guo, X., Slesnick, N. & Feng, X., 2016. Housing and support services with homeless mothers: Benefits to the mother and her children. *Community Mental Health Journal*, 52(1), pp.73–83.
- Harpaz-Rotem, I., Rosenheck, R.A. & Desai, R., 2011. Residential treatment for homeless female veterans with psychiatric and substance use disorders: Effect on 1-year clinical outcomes. *Journal of Rehabilitation Research and Development*, 48(8), pp.891–899.
- Henwood, B.F., Shinn, M., et al., 2013. Examining Provider Perspectives within Housing First and Traditional Programs. *American journal of psychiatric rehabilitation*, 16(4), pp.262–274.
- Henwood, B.F., Cabassa, L.J., et al., 2013. Permanent supportive housing: Addressing homelessness and health disparities? *American Journal of Public Health*, 103(s2), pp.188–193.
- Higgins, J.P.T. et al., 2016. Revised Cochrane risk of bias tool for randomized trials (RoB 2.0). In J. Chandler et al., eds. *Cochrane Methods*. Cochrane Database of Systematic Reviews.
- Higgins, J.P.T. & Green, S., 2011. *Cochrane Handbook for Systematic Reviews of Interventions Version 5.1.0*, Available at: [www.handbook.cochrane.org](http://www.handbook.cochrane.org) [Accessed August 10, 2017].
- HIV/AIDS Treatment Adherence, H.O. and C.S.G., 2004. The HIV/AIDS Treatment Adherence, Health Outcomes and Cost Study: conceptual foundations and overview. *AIDS care*, 16 Suppl 1, pp.S6–21.
- Homeless Link, 2017. Housing First England. Available at: <http://www.homeless.org.uk/our-work/national-projects/housing-first-england> [Accessed August 11, 2017].
- Housing First Europe Hub, 2017. Housing First Europe Hub. Available at: <http://housingfirsteurope.eu/> [Accessed August 11, 2017].
- Hurlburt, M.S., Hough, R.L. & Wood, P.A., 1996. Effects of substance abuse on housing stability of homeless mentally ill persons in supported housing. *Psychiatric Services*, 47(7), pp.731–736.
- Hwang, S.W. et al., 2012. Ending homelessness among people with mental illness: the At Home/Chez Soi randomized trial of a Housing First intervention in Toronto. *BMC Public Health*, 12:787.
- Hwang, S.W., 2001. Homelessness and health. *CMAJ : Canadian Medical Association journal*, 164(2), pp.229–233.
- Hwang, S.W. et al., 2009. Mortality among residents of shelters, rooming houses, and hotels in Canada: 11 year follow-up study. *BMJ*, 339.

- Hwang, S.W. & Burns, T., 2014. Health interventions for people who are homeless. *The Lancet*, 384, pp.1541–1547.
- Johnsen, S., 2013. *Turning Point Scotland's Housing First Project Evaluation: Final Report*, Edinburgh.
- Jones, K. et al., 2003. Cost-Effectiveness of Critical Time Intervention to Reduce Homelessness Among Persons With Mental Illness. *Psychiatric Services*, 54(6), pp.884–890.
- Katz, M.H., 2015. Housing as a remedy for chronic homelessness. *JAMA: Journal of the American Medical Association*, 313(9), pp.901–902.
- Kertesz, S.G. et al., 2009. Housing First for Homeless Persons with Active Addiction: Are We Overreaching? *Milbank Quarterly*, 87(2), pp.495–534.
- Kertesz, S.G. et al., 2007. Long-term housing and work outcomes among treated cocaine-dependent homeless persons. *The Journal of Behavioral Health Services & Research*, 34(1), pp.17–33.
- Kidder, D.P. et al., 2007. Access to housing as a structural intervention for homeless and unstably housed people living with HIV: Rationale, methods, and implementation of the Housing and Health Study. *AIDS and Behavior*, 11(Suppl2), pp.S149–S161.
- Kirst, M. et al., 2015. The impact of a Housing First randomized controlled trial on substance use problems among homeless individuals with mental illness. *Drug and Alcohol Dependence*, 146, pp.24–29.
- Korr, W.S. & Joseph, A., 1995. Housing the homeless mentally ill: Findings from Chicago. *Journal of Social Service Research*, 21(1), pp.53–68.
- Kozloff, N., Adair, C.E., et al., 2016. "Housing First" for Homeless Youth With Mental Illness. *Pediatrics*, 138(4), p.e20161514.
- Kozloff, N., Stergiopoulos, V., Cheung, A., et al., 2016. Housing first for homeless youth with mental illness: Analysis from a randomized controlled trial. *Journal of the American Academy of Child and Adolescent Psychiatry*, 55(Suppl. 10), p.S149.
- Kozloff, N., 2016. Housing first "junior": Testing a complex psychosocial intervention designed for homeless adults with mental illness in homeless youth. *Journal of the American Academy of Child and Adolescent Psychiatry*, 55(Suppl. 10), p.S74.
- Kozloff, N., Stergiopoulos, V., Adair, C.E., et al., 2016. The unique needs of homeless youths with mental illness: Baseline findings from a housing first trial. *Psychiatric Services*, 67(10), pp.1083–1090.
- Krabbenborg, M.A.M. et al., 2015. Fidelity of a strengths-based intervention used by Dutch shelters for homeless young adults. *Psychiatric Services*, 66(5), pp.470–476.
- Lapham, S.C. et al., 1993. Albuquerque's community-based housing and support services demonstration program for homeless alcohol abusers. *Alcoholism Treatment Quarterly*, 10(3–4), pp.139–154.
- Lapham, S.C., Hall, M. & Skipper, B.J., 1995. Homelessness and substance use among alcohol abusers following participation in project H&ART. *Journal of Addictive Diseases*, 14(4), pp.41–55.
- Latimer, E.A. et al., 2017. Costs of services for homeless people with mental illness in 5 Canadian cities: a large prospective follow-up study. *CMAJ Open*, 5(3), pp.E576–E585.
- Latimer, E. & Rabouin, D., 2011. The at Home/Chez Soi Canadian Study of Housing First for people who are homeless and mentally ill: Study design and baseline data for the Montreal site.

*Psychiatrische Praxis. Conference: 9th International Conference of the European Network for Mental Health Service Evaluation, ENMESH, 38.*

- Lehman, A.F., 1996. Measures of quality of life among persons with severe and persistent mental disorders. *Social Psychiatry and Psychiatric Epidemiology*, 31(2), pp.78–88.
- Levitt, A.J. et al., 2013. Randomized Trial of Intensive Housing Placement and Community Transition Services for Episodic and Recidivist Homeless Families. *American Journal of Public Health*, 103(Suppl. 2), pp.S348–S354.
- Ly, A. & Latimer, E., 2015. Housing First Impact on Costs and Associated Cost Offsets: A Review of the Literature. *Canadian journal of psychiatry. Revue canadienne de psychiatrie*, 60(11), pp.475–87.
- Macleod, T., 2014. The Capabilities Approach, Transformative Measurement, and Housing First. *Global Journal of Community Psychology Practice Global Journal of Community Psychology Practice Global Journal of Community Psychology Practice*, 5(1), pp.1–10.
- Malte, C.A., Cox, K. & Saxon, A.J., 2017. Providing intensive addiction/housing case management to homeless veterans enrolled in addictions treatment: A randomized controlled trial. *Psychology of Addictive Behaviors*, 31(3), pp.231–241.
- Mares, A.S. & Rosenheck, R.A., 2011. A Comparison of Treatment Outcomes Among Chronically Homelessness Adults Receiving Comprehensive Housing and Health Care Services Versus Usual Local Care. *Administration and Policy in Mental Health and Mental Health Services Research*, 38(6), pp.459–475.
- McHugo, G.J. et al., 2004. A Randomized controlled trial of integrated versus parallel housing services for homeless adults with severe mental illness. *Schizophrenia Bulletin*, 30(4), pp.969–982.
- McLellan, A.T., Carise, D. & Kleber, H.D., 2003. Can the national addiction treatment infrastructure support the public's demand for quality care? *Journal of Substance Abuse Treatment*, 25(2), pp.117–121.
- Milby, J.B. et al., 2005. To house or not to house: The effects of providing housing to homeless substance abusers in treatment. *American Journal of Public Health*, 95(7), pp.1259–1265.
- Moher, D. et al., 2015. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement. *Systematic Reviews*, 4(1).
- Moher, D. et al., 2009. Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. *PLoS Medicine*, 6(7), p.e1000097.
- Montgomery, A.E. et al., 2013. Housing chronically homeless veterans: Evaluating the efficacy of a housing first approach to HUD-VASH. *Journal of Community Psychology*, 41(4), pp.505–514.
- Morrissey, J.P. et al., 2002. Integration of service systems for homeless persons with serious mental illness through the ACCESS program. Access to Community Care and Effective Services and Supports. *Psychiatric Services*, 53(8), pp.949–957.
- Morse, G.A. et al., 1994. Helping homeless mentally ill people: what variables mediate and moderate program effects? *American Journal of Community Psychology*, 22(5), pp.661–683.
- Morse, G.A. et al., 2008. Integrated treatment for homeless clients with dual disorders: A quasi-experimental evaluation. *Journal of Dual Diagnosis*, 4(3), pp.219–237.
- Morse, G.A. et al., 2006. Treating Homeless Clients with Severe Mental Illness and Substance Use Disorders: Costs and Outcomes. *Community Mental Health Journal*, 42(4), pp.377–404.

- Nelson, G. et al., 2014. Early implementation evaluation of a multi-site housing first intervention for homeless people with mental illness: A mixed methods approach. *Evaluation and Program Planning*, 43, pp.16–26.
- Nelson, G. et al., 2015. Life changes among homeless persons with mental illness: a longitudinal study of Housing First and usual treatment. *Psychiatric Services*, 66(6), pp.592–597.
- New Hampshire Dartmouth Psychiatric Research Centre, 1995a. *Drug and Alcohol Follow-Back Calendar*, Lebanon, NH: Dartmouth Medical School.
- New Hampshire Dartmouth Psychiatric Research Centre, 1995b. *Residential Follow-Back Calendar*, Lebanon, NH: Dartmouth Medical School.
- Noblet, P., 2017. “Housing first” could entrench youth homelessness [news article]. *The Guardian*. Available at: [https://www.theguardian.com/housing-network/2017/jul/19/housing-first-youth-homelessness-sunderland-council?CMP=share\\_btn\\_tw](https://www.theguardian.com/housing-network/2017/jul/19/housing-first-youth-homelessness-sunderland-council?CMP=share_btn_tw) [Accessed August 11, 2017].
- Nuffield Council on Bioethics, 2007. *Public health: ethical issues*, London. Available at: <https://nuffieldbioethics.org/wp-content/uploads/2014/07/Public-health-ethical-issues.pdf> [Accessed April 14, 2017].
- Nussbaum, M., 2003. Capabilities As Fundamental Entitlements: Sen and Social Justice. *Feminist Economics*, 9(2–3), pp.33–59.
- Nussbaum, M.C., 2000. *Women and human development: the capabilities approach*, Cambridge: Cambridge University Press.
- O’Campo, P. et al., 2016. How did a Housing First intervention improve health and social outcomes among homeless adults with mental illness in Toronto? Two-year outcomes from a randomised trial. *BMJ Open*, 6, p.e010581.
- O’Connell, M.J., Kaspro, W. & Rosenheck, R., 2009. Direct placement versus multistage models of supported housing in a population of veterans who are homeless. *Psychological Services*, 6(3), pp.190–201.
- O’Connell, M.J., Kaspro, W. & Rosenheck, R.A., 2008. Rates and risk factors for homelessness after successful housing in a sample of formerly homeless veterans. *Psychiatric Services*, 59(3), pp.268–275.
- O’Connell, M.J., Kaspro, W.J. & Rosenheck, R.A., 2012. Differential impact of supported housing on selected subgroups of homeless veterans with substance abuse histories. *Psychiatric Services*, 63(12), pp.1195–1205.
- O’Connell, M.J., Kaspro, W.J. & Rosenheck, R.A., 2017. Impact of supported housing on social relationships among homeless veterans. *Psychiatric Services*, 68(2), pp.203–206.
- O’Hara, A., 2007. Housing for People With Mental Illness: Update of a Report to the President’s New Freedom Commission. *Psychiatric Services*, 58(7), pp.907–913.
- O’Toole, T.P. et al., 2013. New to Care: Demands on a Health System When Homeless Veterans Are Enrolled in a Medical Home Model. *American Journal of Public Health*, 103, pp.S374–S379.
- Padgett, D., Henwood, B.F. & Tsemberis, S.J., 2015. *Housing first: ending homelessness, transforming systems, and changing lives*, New York: Oxford University Press.
- Padgett, D.K. et al., 2011. Substance Use Outcomes Among Homeless Clients with Serious Mental Illness: Comparing Housing First with Treatment First Programs. *Community Mental Health Journal*, 47(2), pp.227–232.

- Padgett, D.K., 2017. The Era of Housing First: Challenges of Implementation in Diverse Settings [Presentation]. In Glasgow: University of Strathclyde.
- Padgett, D.K., Gulcur, L. & Tsemberis, S., 2006. Housing first services for people who are homeless with co-occurring serious mental illness and substance abuse. *Research on Social Work Practice*, 16(1), pp.74–83.
- Palepu, A., Patterson, M.L., Moniruzzaman, A. & Somers, J.M., 2013. Housing first among homeless persons with concurrent disorders among participants of the Vancouver at home study. *Journal of General Internal Medicine*, 28, p.S91.
- Palepu, A., Patterson, M.L., Moniruzzaman, A., Frankish, C.J., et al., 2013. Housing First Improves Residential Stability in Homeless Adults With Concurrent Substance Dependence and Mental Disorders. *American Journal of Public Health*, 103(Suppl. 2), pp.E30–E36.
- Parashar, S. et al., 2011. Sticking to It: The Effect of Maximally Assisted Therapy on Antiretroviral Treatment Adherence Among Individuals Living with HIV Who are Unstably Housed. *Aids and Behavior*, 15(8), pp.1612–1622.
- Parpouchi, M. et al., 2016. Housing First and Unprotected Sex: A Structural Intervention. *J Health Care Poor Underserved*, 27(3), pp.1278–1302.
- Parvini, S., 2014. In Helping L.A.'s Homeless Population, Advocates Must Strike a "Delicate Balance" [news article]. Available at: <https://www.kcet.org/agenda/in-helping-las-homeless-population-advocates-must-strike-a-delicate-balance> [Accessed August 10, 2017].
- Patterson, M.L., Moniruzzaman, A., et al., 2013. Housing First improves subjective quality of life among homeless adults with mental illness: 12-month findings from a randomized controlled trial in Vancouver, British Columbia. *Social Psychiatry & Psychiatric Epidemiology*, 48, pp.1245–1259.
- Patterson, M.L., Rezanoff, S.N., et al., 2013. Trajectories of recovery among homeless adults with mental illness who participated in a randomised controlled trial of Housing First: A longitudinal, narrative analysis. *BMJ Open*, 3, p.e003442.
- Patterson, M.L., Moniruzzaman, A. & Somers, J.M., 2014. Community participation and belonging among formerly homeless adults with mental illness after 12 months of Housing First in Vancouver, British Columbia: A randomized controlled trial. *Community Mental Health Journal*, 50, pp.604–611.
- Piehler, T.F. et al., 2014. Executive functioning as a mediator of conduct problems prevention in children of homeless families residing in temporary supportive housing: A parallel process latent growth modeling approach. *Journal of Abnormal Child Psychology*, 42, pp.681–692.
- Pleace, N., 2016. *Housing First Guide Europe: Chapter 1. What is Housing First?*, Available at: <https://www.housingfirstguide.eu/website/wp-content/uploads/2016/HFG/Chapter1.pdf> [Accessed August 1, 2017].
- Poremski, D. et al., 2016. Effects of Housing First on employment and income of homeless individuals: Results of a randomized trial. *Psychiatric Services*, 67(6), pp.603–609.
- Powell, G.A. et al., 2017. Changes in quality of life from a homelessness intervention: True change, response shift, or random variation. *Quality of Life Research*, 26(7), pp.1853–1864.
- Rezanoff, S.N. et al., 2016. Housing First Improves Adherence to Antipsychotic Medication Among Formerly Homeless Adults With Schizophrenia: Results of a Randomized Controlled Trial. *Schizophr Bulletin*, 136.

- Ridgway, P. & Zipple, A.M., 1990. The paradigm shift in residential services: From the linear continuum to supported housing approaches. *Psychosocial Rehabilitation Journal*, 13(4), pp.11–31.
- Rosenheck, R. et al., 2003. Cost-effectiveness of supported housing for homeless persons with mental illness. *Archives of General Psychiatry*, 60(9), pp.940–951.
- Sadowski, L.S. et al., 2009. Effect of a housing and case management program on emergency department visits and hospitalizations among chronically ill homeless adults: A randomized trial. *JAMA: Journal of the American Medical Association*, 301(17), pp.1771–1778.
- Sen, A., 1999. *Development as Freedom*, Oxford: Oxford University Press.
- Sen, A., 1992. *Inequality Reexamined*, Oxford: Oxford University Press.
- Shinn, M. et al., 2015. Longitudinal impact of a Family Critical Time Intervention on children in high-risk families experiencing homelessness: A randomized trial. *American Journal of Community Psychology*, 56, pp.205–216.
- Shinn, M., Brown, S.R. & Gubits, D., 2016. Can housing and service interventions reduce family separations for families who experience homelessness? *American Journal of Community Psychology*.
- Simmons, M.M. et al., 2017. A Hybrid III stepped wedge cluster randomized trial testing an implementation strategy to facilitate the use of an evidence-based practice in VA Homeless Primary Care Treatment Programs. *Implement Science*, 12(1), p.46.
- Smith, S.J., 1990. Health status and the housing system. *Social Science & Medicine*, 31(7), pp.753–762.
- Somers, J.M. et al., 2017. A Randomized Trial Examining Housing First in Congregate and Scattered Site Formats. *PLoS One*, 12(1), p.e0168745.
- Somers, J.M., Rezansoff, S.N., et al., 2013. Housing First Reduces Re-offending among Formerly Homeless Adults with Mental Disorders: Results of a Randomized Controlled Trial M. Botbol, ed. *PLoS One*, 8(9), p.e72946.
- Somers, J.M., Patterson, M.L., et al., 2013. Vancouver At Home: pragmatic randomized trials investigating Housing First for homeless and mentally ill adults. *Trials [Electronic Resource]*, 14, p.365.
- Somers, J.M., Moniruzzaman, A. & Palepu, A., 2015. Changes in daily substance use among people experiencing homelessness and mental illness: 24-month outcomes following randomization to Housing First or usual care. *Addiction*, 110(10), pp.1605–1614.
- Sosin, M.R., Bruni, M. & Reidy, M., 1995. Paths and impacts in the progressive independence model: a homelessness and substance abuse intervention in Chicago. *Journal of Addictive Diseases*, 14(4), pp.1–20.
- Spicker, P., 2013. *Reclaiming individualism : perspectives on public policy*, Bristol: The Policy Press.
- Stahler, G.J. et al., 1993. Retention issues in treating homeless polydrug users: Philadelphia. *Alcoholism Treatment Quarterly*, 10(3–4), pp.201–215.
- Stefancic, A. & Tsemberis, S., 2007. Housing first for long-term shelter dwellers with psychiatric disabilities in a suburban county: A four-year study of housing access and retention. *The Journal of Primary Prevention*, 28, pp.265–279.



- Stergiopoulos, V., Hwang, S.W., et al., 2015. Effect of scattered-site housing using rent supplements and intensive case management on housing stability among homeless adults with mental illness: A randomized trial. *JAMA: Journal of the American Medical Association*, 313(9), pp.905–915.
- Stergiopoulos, V., Gozdzik, A., et al., 2015. Effectiveness of Housing First with Intensive Case Management in an Ethnically Diverse Sample of Homeless Adults with Mental Illness: A Randomized Controlled Trial. *PLoS One*, 10(7), p.e0130281.
- Stergiopoulos, V. et al., 2014. Housing First: exploring participants' early support needs. *BMC Health Services Research*, 14(1), p.167.
- Stergiopoulos, V. et al., 2012. Moving from rhetoric to reality: adapting Housing First for homeless individuals with mental illness from ethno-racial groups. *BMC Health Services Research*, 12, p.345.
- Stergiopoulos, V. et al., 2016. The effectiveness of a Housing First adaptation for ethnic minority groups: findings of a pragmatic randomized controlled trial. *BMC Public Health*, 16, p.1110.
- The EuroQol Group, 1990. EuroQol - a new facility for the measurement of health-related quality of life. *Health Policy*, 16(3), pp.199–208.
- The Nordic Cochrane Centre, 2014. *Review Manager (RevMan) [Computer program] Version 5.3*, Copenhagen: The Cochrane Collaboration.
- Thomson, H., Petticrew, M. & Morrison, D., 2001. Health effects of housing improvement: systematic review of intervention studies. *BMJ*, 323, pp.187–190.
- Tinland, A. et al., 2013. Evaluation of the Housing First program in patients with severe mental disorders in France: study protocol for a randomized controlled trial. *Trials*, 14, p.309.
- Tsai, J., Mares, A.S. & Rosenheck, R.A., 2010. A multisite comparison of supported housing for chronically homeless adults: "housing first" versus "residential treatment first". *Psychological Services*, 7(4), pp.219–232.
- Tsemberis, S., 2010. *Housing First: The Pathways Model to End Homelessness for People with Mental Illness and Addiction*, Minnesota: Hazelden.
- Tsemberis, S. et al., 2007. Measuring homelessness and residential stability: The residential time-line follow-back inventory. *Journal of Community Psychology*, 35(1), pp.29–42.
- Tsemberis, S., Gulcur, L. & Nakae, M., 2004. Housing First, Consumer Choice, and Harm Reduction for Homeless Individuals With a Dual Diagnosis. *American Journal of Public Health*, 94(4), pp.651–656.
- U.S. Department of Housing and Urban Development, 2001. Chapter 5: Eligibility and Denial of Assistance. In *Housing Choice Voucher Program Guidebook*. Available at: [https://portal.hud.gov/hudportal/documents/huddoc?id=DOC\\_35615.pdf](https://portal.hud.gov/hudportal/documents/huddoc?id=DOC_35615.pdf) [Accessed May 30, 2017].
- Uttaro, T. & Lehman, A., 1999. Graded response modeling of the Quality of Life Interview. *Evaluation and Program Planning*, 22(1), pp.41–52.
- Veldhuizen, S. et al., 2015. Patterns and predictors of attrition in a trial of a housing intervention for homeless people with mental illness. *Social Psychiatry and Psychiatric Epidemiology*, 50(2), pp.195–202.
- Ware, J.E., Kosinski, M. & Dewey, J.E., 2001. *How to score version 2 of the SF-36 health survey*,

Lincoln, RI: QualityMetric Inc.

Ware, J.E., Kosinski, M. & Keller, S.D., 1996. A 12-Item Short-Form Health Survey: Construction of Scales and Preliminary Tests of Reliability and Validity. *Medical Care*, 34(3), pp.220–233.

Westermeyer, J. & Lee, K., 2013. Residential Placement for Veterans With Addiction. *The Journal of Nervous and Mental Disease*, 201(7), pp.567–571.

Westermeyer, J. & Lee, K., 2013. Residential Placement for Veterans With Addiction American Society of Addiction Medicine Criteria vs. a Veterans Homeless Program. *Journal of Nervous and Mental Disease*, 201(7), pp.567–571.

Wilson, D.B., Practical Meta-Analysis Effect Size Calculator [Online Calculator]. Available at: <https://www.campbellcollaboration.org/this-is-a-web-based-effect-size-calculator/explore/this-is-a-web-based-effect-size-calculator> [Accessed August 2, 2017].

Wolitski, R.J. et al., 2010. Randomized Trial of the Effects of Housing Assistance on the Health and Risk Behaviors of Homeless and Unstably Housed People Living with HIV. *AIDS and Behavior*, 14(3), pp.493–503.

Wood, P.A. et al., 1998. Longitudinal assessment of family support among homeless mentally ill participants in a supported housing program. *Journal of Community Psychology*, 26(4), pp.327–344.

Woodhall-Melnik, J. et al., 2015. The Impact of a 24 Month Housing First Intervention on Participants' Body Mass Index and Waist Circumference: Results from the At Home/Chez Soi Toronto Site Randomized Controlled Trial. *PLoS One*, 10(9), p.e0137069.

Woodhall-Melnik, J.R. & Dunn, J.R., 2016. A systematic review of outcomes associated with participation in Housing First programs. *Housing Studies*, 31(3), pp.287–304.

Zabkiewicz, D.M. et al., 2012. The Vancouver At Home Study: Overview and Methods of a Housing First Trial Among Individuals Who are Homeless and Living with Mental Illness. *J Clin Trials*, 2(4).

## Appendix A *PROSPERO protocol*

### PROSPERO International prospective register of systematic reviews

#### Review title and timescale

##### 1 Review title

Give the working title of the review. This must be in English. Ideally it should state succinctly the interventions or exposures being reviewed and the associated health or social problem being addressed in the review.

The effects of Housing First and other permanent, non-contingent housing provision interventions on the health and wellbeing of homeless adults: protocol for a systematic review of randomised controlled trials

##### 2 Original language title

For reviews in languages other than English, this field should be used to enter the title in the language of the review. This will be displayed together with the English language title.

##### 3 Anticipated or actual start date

Give the date when the systematic review commenced, or is expected to commence.

24/04/2017

##### 4 Anticipated completion date

Give the date by which the review is expected to be completed.

04/09/2017

##### 5 Stage of review at time of this submission

Indicate the stage of progress of the review by ticking the relevant boxes. Reviews that have progressed beyond the point of completing data extraction at the time of initial registration are not eligible for inclusion in PROSPERO. This field should be updated when any amendments are made to a published record.

The review has not yet started

Review stage	Started	Completed
Preliminary searches	Yes	Yes
Piloting of the study selection process	Yes	Yes
Formal screening of search results against eligibility criteria	Yes	No
Data extraction	No	No
Risk of bias (quality) assessment	No	No
Data analysis	No	No

Provide any other relevant information about the stage of the review here.

#### Review team details

##### 6 Named contact

The named contact acts as the guarantor for the accuracy of the information presented in the register record.

Mr Baxter

##### 7 Named contact email

Enter the electronic mail address of the named contact.

andrewbaxter439@gmail.com

##### 8 Named contact address

Enter the full postal address for the named contact.

##### 9 Named contact phone number

Enter the telephone number for the named contact, including international dialing code.

##### 10 Organisational affiliation of the review

Full title of the organisational affiliations for this review, and website address if available. This field may be completed as 'None' if the review is not affiliated to any organisation.

MRC/CSO Social & Public Health Sciences Unit, University of Glasgow

Website address:

<http://www.gla.ac.uk/researchinstitutes/healthwellbeing/research/mrccsocialandpublichealthsciencesunit/>

##### 11 Review team members and their organisational affiliations

Give the title, first name and last name of all members of the team working directly on the review. Give the organisational affiliations of each member of the review team.

Title	First name	Last name	Affiliation
-------	------------	-----------	-------------

Mr	Andrew	Baxter	University of Glasgow, Institute of Health and Wellbeing
Dr	S. Vittal	Katikireddi	MRC/CSO Social & Public Health Sciences Unit, University of Glasgow
Dr	Hilary	Thomson	MRC/CSO Social & Public Health Sciences Unit, University of Glasgow
Dr	Emily	Tweed	MRC/CSO Social & Public Health Sciences Unit, University of Glasgow, Public Health Directorate, NHS Greater Glasgow and Clyde

## 12 Funding sources/sponsors

Give details of the individuals, organizations, groups or other legal entities who take responsibility for initiating, managing, sponsoring and/or financing the review. Any unique identification numbers assigned to the review by the individuals or bodies listed should be included.

Medical Research Council (MC\_UU\_12017/13 and MC\_UU\_12017/15) Chief Scientist's Office (SPHSU13 and SPHSU 15) In addition, SVK is funded by a NRS Senior Clinical Fellowship (SCAF/15/02)

## 13 Conflicts of interest

List any conditions that could lead to actual or perceived undue influence on judgements concerning the main topic investigated in the review.

Are there any actual or potential conflicts of interest?

None known

## 14 Collaborators

Give the name, affiliation and role of any individuals or organisations who are working on the review but who are not listed as review team members.

Title	First name	Last name	Organisation details
-------	------------	-----------	----------------------

## Review methods

### 15 Review question(s)

State the question(s) to be addressed / review objectives. Please complete a separate box for each question.

The aim of this systematic review is to assess the effectiveness of interventions providing permanent, non-contingent housing to homeless people in improving health and wellbeing, in comparison to other interventions addressing homelessness. RQ1: Does provision of permanent, non-contingent housing improve health and health-related quality of life in homeless people?

RQ2: Does provision of permanent, non-contingent housing improve Housing Stability for homeless people?

RQ3: Are there differences in the health effects between scattered and congregate models of the intervention?

### 16 Searches

Give details of the sources to be searched, and any restrictions (e.g. language or publication period). The full search strategy is not required, but may be supplied as a link or attachment.

Databases to search: EMBASE, MEDLINE, PubMed, PsycINFO, Cochrane Central Register of Controlled Trials (CENTRAL), Social Sciences Citation Index, Biosis. Searches will be restricted to studies published since 1992 (founding of Pathways to Housing and initiation of the intervention) in peer-reviewed journals. Forward and backward reference searching will be conducted on all included studies. The search will be carried out and all records exported to bibliographic software programme Endnote©. Duplicate records will be eliminated before studies are screened for inclusion or exclusion.

### 17 URL to search strategy

If you have one, give the link to your search strategy here. Alternatively you can e-mail this to PROSPERO and we will store and link to it.

[https://www.crd.york.ac.uk/PROSPEROFILES/64457\\_STRATEGY\\_20170431.pdf](https://www.crd.york.ac.uk/PROSPEROFILES/64457_STRATEGY_20170431.pdf)

I give permission for this file to be made publicly available

Yes

### 18 Condition or domain being studied

Give a short description of the disease, condition or healthcare domain being studied. This could include health and wellbeing outcomes.

The provision of permanent, non-contingent housing with the aim of ending the homeless status and improving the health of homeless persons.

### 19 Participants/population

Give summary criteria for the participants or populations being studied by the review. The preferred format includes details of both inclusion and exclusion criteria.

Studies that include adults (16 years and older) who meet at least one of the European Typology for Homelessness and Housing Exclusion (ETHOS) criteria: roofless, houseless, living in insecure housing, living in inadequate housing.

## 20 Intervention(s), exposure(s)

Give full and clear descriptions of the nature of the interventions or the exposures to be reviewed

The intervention will be defined as providing the homeless person with access to permanent housing through: • Assistance in locating and entering housing; or • Subsistence of rental costs. The housing provision will be defined as: • Intended to be permanent – no intention by providers to end or transfer tenancy, counting sustained tenancy as the intended outcome; and • Not contingent on adherence to treatment or substance abstinence; and • Initiated at first contact with the homeless person with the aim of beginning tenancy promptly. Interventions may be described as 'Housing First', or described differently. This description will be noted but studies recording all interventions under the above criteria will be included.

## 21 Comparator(s)/control

Where relevant, give details of the alternatives against which the main subject/topic of the review will be compared (e.g. another intervention or a non-exposed control group).

Controls will be defined as Treatment As Usual – receiving services aimed at addressing homelessness but not providing access to housing in the manner defined in the intervention.

## 22 Types of study to be included

Give details of the study designs to be included in the review. If there are no restrictions on the types of study design eligible for inclusion, this should be stated.

Randomised Controlled Trials, Cluster Randomised Controlled Trials

## 23 Context

Give summary details of the setting and other relevant characteristics which help define the inclusion or exclusion criteria.

All settings and all countries.

## 24 Primary outcome(s)

Give the most important outcomes.

Primary outcomes to be considered will be quantitative measures of health and wellbeing. Measurements of comparison with baseline at entry into the programme will be used, recording time delays. These will be grouped into five domains: • Substance use – including self-reported substance use, relapse rates, length of time abstaining, • Mental health – including self-reported mental health, clinical assessment, recorded episodes of ill health, • Non-routine use of healthcare services – including episodes of hospitalisation, emergency services, • Self-reported health and quality of life – questionnaires and interviews recording perspectives, • Other, unanticipated measures of health and wellbeing.

Give information on timing and effect measures, as appropriate.

## 25 Secondary outcomes

List any additional outcomes that will be addressed. If there are no secondary outcomes enter None.

The secondary outcome to be included will be stability of housing, the likelihood of return to homelessness after initiation of the program. Measures will include: • Proportion of individuals who return to homelessness, • Rate of return to homelessness amongst sample, • Proportion of participant's time spent in housing during observation period, • Other, unanticipated measures.

Give information on timing and effect measures, as appropriate.

## 26 Data extraction (selection and coding)

Give the procedure for selecting studies for the review and extracting data, including the number of researchers involved and how discrepancies will be resolved. List the data to be extracted.

Search and collection of records: One researcher will conduct the search, group all studies and eliminate duplicates. Title and Abstract screening: Two researchers will separately examine titles and abstracts alongside the above PICOS criteria and studies that are clearly not relevant will be excluded. If there is uncertainty over the relevance of a study it will be retained for full text screening. Full Text screening: Full texts of remaining studies will be obtained and analysed separately by two researchers, using the criteria to retain only relevant studies. Data extraction: Data from each study will be extracted. This will be carried out by one researcher and reviewed by a second: • Study details: Authors, year of publication, citation details, country of study, type of study, • Inclusion/exclusion criteria for participants, • Start/end of study and duration of participation, • Baseline characteristics of population, - Average age, - Male/female ratio, - Measures of duration of homelessness, - Measures of prevalence of mental health problems, - Measures of prevalence of substance use problems, • Process of randomisation, • Stated imbalances in baseline measures, • Sample size of intervention and control groups, • Losses to follow-up from each group, • Details of the intervention, including: - Recruitment and eligibility assessment of participants, - Stated application of 'Housing First' or other model, - Scattered-site or congregate format, - ACT/ICM or any other health service provision, - Process of acquiring housing, - Support provided to remain in housing, - Any other requirements of participants, • Details of 'Treatment As Usual' for control/comparison group, • For

each relevant outcome: - Outcome name given in paper, - Time points measured and reported, - Methods used to measure, including person conducting observation, - Statistical methods used, - Measures of means and variance reported for each group (as adjusted; according to Intention To Treat) If multiple papers are identified as originating from the same study these will be assessed for duplicate reporting of data from the same sample and time point. To avoid double counting of data, if sampling overlap is stated or suspected for any single outcome, then data will be selected to prioritise larger combined samples or similarities compared to other studies.

## 27 Risk of bias (quality) assessment

State whether and how risk of bias will be assessed, how the quality of individual studies will be assessed, and whether and how this will influence the planned synthesis.

The Cochrane Risk of Bias Tool 2.0 will be used to assess potential bias in each study. Each outcome extracted will be analysed for: • bias arising from the randomisation process, • bias due to deviations from the intended interventions (analysing the effect of assignment to intervention), • bias due to missing outcome data, • bias in measurement of the outcome, • bias in selection of reported results. Results of assessment of bias will be presented in a table and combined with final outcomes using the GRADE approach to weight strength of recommendation. A funnel plot will be constructed to test for publication bias for each outcome reported in 10 or more studies.

## 28 Strategy for data synthesis

Give the planned general approach to be used, for example whether the data to be used will be aggregate or at the level of individual participants, and whether a quantitative or narrative (descriptive) synthesis is planned. Where appropriate a brief outline of analytic approach should be given.

Standardised effect estimates will be calculated for each outcome and grouped by outcome domain. If two or more outcomes with comparable effect sizes are identified in the same domain then a meta-analysis will be conducted for each using a random effects model. A narrative synthesis will be carried out on all included data for each outcome domain. In the synthesis we will note areas of consistency or inconsistency of findings, differences in application of the intervention and any identified adverse effects or deterioration of the primary outcomes. Results will be used to generate a GRADE rating and a summary of findings table.

## 29 Analysis of subgroups or subsets

Give any planned exploration of subgroups or subsets within the review. 'None planned' is a valid response if no subgroup analyses are planned.

Further analysis will be conducted by dividing scattered-site and congregate versions of the interventions into subgroups if sufficient data are available. Other subgroup analysis will be conducted where possible comparing effect estimates on individuals across gender, age, and combinations of mental health and substance use problems (at baseline).

## Review general information

### 30 Type and method of review

Select the type of review and the review method from the drop down list.

Systematic review

### 31 Language

Select the language(s) in which the review is being written and will be made available, from the drop down list. Use the control key to select more than one language.

English

Will a summary/abstract be made available in English?

Yes

### 32 Country

Select the country in which the review is being carried out from the drop down list. For multi-national collaborations select all the countries involved. Use the control key to select more than one country.

Scotland

### 33 Other registration details

Give the name of any organisation where the systematic review title or protocol is registered together with any unique identification number assigned. If extracted data will be stored and made available through a repository such as the Systematic Review Data Repository (SRDR), details and a link should be included here.

### 34 Reference and/or URL for published protocol

Give the citation for the published protocol, if there is one.

Give the link to the published protocol, if there is one. This may be to an external site or to a protocol deposited with CRD in pdf format.

I give permission for this file to be made publicly available

Yes

### 35 Dissemination plans

Give brief details of plans for communicating essential messages from the review to the appropriate audiences.

The results will be written and submitted as a paper for publication by a relevant journal.

Do you intend to publish the review on completion?

Yes

**36 Keywords**

Give words or phrases that best describe the review. (One word per box, create a new box for each term)

Homeless Persons

Housing

**37 Details of any existing review of the same topic by the same authors**

Give details of earlier versions of the systematic review if an update of an existing review is being registered, including full bibliographic reference if possible.

**38 Current review status**

Review status should be updated when the review is completed and when it is published.

Ongoing

**39 Any additional information**

Provide any further information the review team consider relevant to the registration of the review.

**40 Details of final report/publication(s)**

This field should be left empty until details of the completed review are available.

Give the full citation for the final report or publication of the systematic review.

Give the URL where available.

Protocol available at:

[https://www.crd.york.ac.uk/PROSPERO/display\\_record.asp?ID=CRD42017064457](https://www.crd.york.ac.uk/PROSPERO/display_record.asp?ID=CRD42017064457) (Baxter et

al. 2017)

## Appendix B *Search Strategy*

- Population
  - MeSH – Homeless Persons (exploded)
  - Keywords – homeless\*, insecure\* hous\*, unstabl\* hous\*, inadequate\* hous\*, precarious\* hous\*, houseless, roofless
- Intervention
  - MeSH – Housing, Public Housing (exploded)
  - Keywords – housing, ‘housing first’
- Control – N/A
- Outcome – N/A – looking at multiple outcomes
- Study design – Randomised controlled trials (Cochrane/SIGN filters)

Search from 1992

Database	Search terms	Studies found in pilot
Medline (Ovid)	<ol style="list-style-type: none"> <li>1. exp Homeless Persons/</li> <li>2. homeless*.mp.</li> <li>3. (inadequate* adj2 hous*).mp.</li> <li>4. (insecure* adj2 hous*).mp.</li> <li>5. (precarious* adj2 hous*).mp.</li> <li>6. (unstabl* adj2 hous*).mp.</li> <li>7. houseless*.mp.</li> <li>8. roofless*.mp.</li> <li>9. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8</li> <li>10. exp Housing/</li> <li>11. exp Public Housing/</li> <li>12. housing.mp.</li> <li>13. “housing first”.mp.</li> <li>14. 10 or 11 or 12 or 13</li> <li>15. ‘randomized controlled trial’.pt.</li> <li>16. randomized.ab.</li> <li>17. randomly.ab.</li> <li>18. trial.ab.</li> <li>19. Randomized Controlled Trials as Topic/</li> <li>20. randomized controlled trial/</li> <li>21. random allocation/</li> <li>22. randomly allocated.tw.</li> <li>23. (allocated adj2 random\$).tw.</li> <li>24. 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23</li> <li>25. 9 and 14 and 24</li> </ol>	221
Embase (Ovid)	<ol style="list-style-type: none"> <li>1. exp Homeless Persons/</li> <li>2. homeless*.mp.</li> <li>3. (inadequate* adj2 hous*).mp.</li> <li>4. (insecure* adj2 hous*).mp.</li> <li>5. (precarious* adj2 hous*).mp.</li> <li>6. (unstabl* adj2 hous*).mp.</li> </ol>	143



	<p>7. houseless*.mp.  8. roofless*.mp.  9. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8  10. exp Housing/  11. exp Public Housing/  12. housing.mp.  13. "housing first".mp.  14. 10 or 11 or 12 or 13  15. Randomized controlled trial/  16. exp Randomization/  17. 'randomi?ed controlled trial\$'.tw.  18. rct.tw.  19. (random\$ adj2 allocat\$).tw.  20. 15 or 16 or 17 or 18 or 19  21. 9 and 14 and 20</p>	
PubMed	<p>((homeless persons[MeSH Terms]) OR  homeless* OR ((inadequate* OR insecure*  OR precarious* OR unstabl*) AND (housed  OR housing)) OR houseless* OR roofless*)  AND  (housing[MeSH Terms] OR public  housing[MeSH Terms] OR housing[tiab] OR  ("housing first"))  AND  ((randomized controlled trial[pt]) OR  randomized[tiab] OR randomly[tiab] OR  trial[tiab])</p>	261
Social Sciences Citation Index (Web of Science) Biosis Citation Index (Web of Science)	<p>TS=(homeless* or 'inadequate* hous*'  'insecure* hous*' or 'precarious* hous*' or  'unstabl* hous*' or houseless* or roofless*)  and  TS=(housing or 'housing first')  and  TS=('randomized controlled trial\$' or  ('randomized controlled' NEAR trial*) or  (random* NEXT/2 allocat*))</p>	248  57
PsychINFO	<p>S1. TX homeless*  S2. TX 'inadequate* hous*'  S3. TX 'insecure* hous*'  S4. TX 'precarious* hous*'  S5. TX 'unstabl* hous*'  S6. TX houseless*  S7. TX roofless*  S8. S1 OR S2 OR S3 OR S4 OR S5 OR S6 OR  S7  S9. MA Housing OR DE "Housing" OR DE  "Assisted Living" OR DE "Dormitories"  OR DE "Group Homes" OR DE "Shelters"  S10. TX housing*</p>	209

	<p>S11. TX 'housing first'  S12. S9 OR S10 OR S11  S13. TX randomi* control* trial*  S14. TX random*  S15. S13 OR S14  S16. S8 AND S12 AND S15</p>	
<p>Cochrane  Central Register  of Controlled  Trials</p>	<p>#1 MeSH descriptor: [Homeless  Persons] explode all trees  #2 homeless*  #3 inadequate* hous*  #4 insecure* hous*  #5 precarious* hous*  #6 unstabl* hous*  #7 housless*  #8 roofless*  #9 #1 or #2 or #3 or #4 or #5 or #6 or #7  or #8  #10 MeSH descriptor: [Housing] explode  all trees  #11 MeSH descriptor: [Public Housing]  explode all trees  #11 housing*  #12 "housing first"  #14 #10 or #11 or #12 or #13  #15 randomised controlled trial  #16 MeSH descriptor: [Randomized  Controlled Trial] explode all trees  #17 #15 or #16  #18 #9 and #14 and #17</p>	<p>10 (including only 'trials' in  CENTRAL)</p>

## Appendix C Data Extraction Form

Study ID	<i>Author/Year</i>	
Title		
Other reports of this study		
Intervention title	<i>'Housing First' or other model</i>	
Location of study		
Inclusion Criteria		
Characteristics of participant	<i>Homeless status/mental health issues/substance use/other</i>	
Study Design	<i>RCT or cluster?</i>	
Start/End dates		
Duration or participation		
Scattered-site or congregate format		
Overall Bias Assessment	<i>Low/High/Some Concerns</i>	
Domains of concern of bias		
Total Participants		
Subgroups reported		
Intervention groups (n)	<i>Number in each group</i>	
Control groups (n)	<i>Number in each group</i>	
Outcomes (grouped by domain)	<i>Housing Stability, Substance Use, Mental Health, Health service use, Quality of Life, other</i>	

Baseline characteristics of population:

Age	<i>Mean</i>	
Sex	<i>% Male</i>	
Prior duration of homelessness	<i>[measure used]</i>	
Prevalence of mental health problems	<i>[measure used]</i>	
Prevalence of substance use problems	<i>[measure used]</i>	
Stated imbalances in baseline		
Loss to follow up	<i>Per group assignment/subgroup stratifications</i>	

Methods:

Recruitment methods	<i>Including eligibility assessment</i>	
Process of randomisation		

Process of acquiring housing		
Support provided to retain housing		
Health service provision	<i>ACT/ICM or other</i>	
Requirements of participants		
Time points measured and reported		
Definition of intervention	<i>Including each intervention group</i>	
Details of TAU/control groups		

Intervention/control groups:

Group Name			Group Name	
Participants			Participants	
Description			Description	

Outcomes –

*New sets of tables for each measure/intervention group/subgroup*

Outcome name given in paper				Unit of measurement		
Time points reported				Scale		
How measured	<i>Instruments and assessors</i>			Statistical methods used		

Intervention group						
Subgroup/all?						
Results (after adjustments)	Intervention			Comparison		
	Mean	SD	N	Mean	SD	N
Difference (mean, SE)						
Loss to follow up						

Intervention group						
Subgroup/all?						
Results (after adjustments)	Intervention			Comparison		
	Mean	SD	N	Mean	SD	N
Difference (mean, SE)						
Loss to follow up						

## Appendix D *Cochrane Risk of Bias form 2.0* (Higgins et al. 2016)

<b>Assessor name/initials</b>	
<b>Study ID and/or reference(s)</b>	

### Study design

<input checked="" type="checkbox"/>	Randomized parallel group trial
<input type="checkbox"/>	Cluster-randomized trial
<input type="checkbox"/>	Randomized cross-over or other matched design

<b>Specify which outcome is being assessed for risk of bias</b>	
---	--

<b>Specify the numerical result being assessed.</b> In case of multiple alternative analyses being presented, specify the numeric result (e.g. RR = 1.52 (95% CI 0.83 to 2.77) and/or a reference (e.g. to a table, figure or paragraph) that uniquely defines the result being assessed.	
---	--

### Is your aim for this study...?

<input type="checkbox"/>	to assess the effect of <i>assignment to intervention</i>
<input type="checkbox"/>	to assess the effect of <i>starting and adhering to intervention</i>

### Which of the following sources have you **obtained** to help inform your risk of bias judgements (tick as many as apply)?

- Journal article(s) with results of the trial
- Trial protocol
- Statistical analysis plan (SAP)
- Non-commercial trial registry record (e.g. ClinicalTrials.gov record)
- Company-owned trial registry record (e.g. GSK Clinical Study Register record)
- "Grey literature" (e.g. unpublished thesis)
- Conference abstract(s) about the trial
- Regulatory document (e.g. Clinical Study Report, Drug Approval Package)
- Research ethics application
- Grant database summary (e.g. NIH RePORTER, Research Councils UK Gateway to Research)
- Personal communication with trialist
- Personal communication with the sponsor

*Risk of bias assessment for a parallel group trial with interest in the effect of assignment to intervention*

Domain	Signalling questions	Response options	Description/Support for judgement
<b>Bias arising from the randomization process</b>	1.1 Was the allocation sequence random?	Y / PY / PN / N / NI	
	1.2 Was the allocation sequence concealed until participants were recruited and assigned to interventions?	Y / PY / PN / N / NI	
	1.3 Were there baseline imbalances that suggest a problem with the randomization process?	Y / PY / PN / N / NI	
	<b>Risk of bias judgement</b>	Low / High / Some concerns	
	Optional: What is the predicted direction of bias arising from the randomization process?	Favours experimental / Favours comparator / Towards null / Away from null / Unpredictable	
<b>Bias due to deviations from intended interventions</b>	2.1. Were participants aware of their assigned intervention during the trial?	Y / PY / PN / N / NI	
	2.2. Were carers and trial personnel aware of participants' assigned intervention during the trial?	Y / PY / PN / N / NI	
	2.3. If Y/PY/NI to 2.1 or 2.2: Were there deviations from the intended intervention beyond what would be expected in usual practice?	NA / Y / PY / PN / N / NI	

	2.4. <u>If Y/PY to 2.3</u> : Were these deviations from intended intervention unbalanced between groups <i>and</i> likely to have affected the outcome?	NA / Y / PY / PN / N / NI	
	2.5 Were any participants analysed in a group different from the one to which they were assigned?	Y / PY / PN / N / NI	
	2.6 <u>If Y/PY/NI to 2.5</u> : Was there potential for a substantial impact (on the estimated effect of intervention) of analysing participants in the wrong group?	NA / Y / PY / PN / N / NI	
	<b>Risk of bias judgement</b>	Low / High / Some concerns	
	Optional: What is the predicted direction of bias due to deviations from intended interventions?	Favours experimental / Favours comparator / Towards null / Away from null / Unpredictable	
<b>Bias due to missing outcome data</b>	3.1 Were outcome data available for all, or nearly all, participants randomized?	Y / PY / PN / N / NI	
	3.2 <u>If N/PN/NI to 3.1</u> : Are the proportions of missing outcome data and reasons for missing outcome data similar across intervention groups?	NA / Y / PY / PN / N / NI	
	3.3 <u>If N/PN/NI to 3.1</u> : Is there evidence that results were robust to the presence of missing outcome data?	NA / Y / PY / PN / N / NI	



	<b>Risk of bias judgement</b>	Low / High / Some concerns	
	Optional: What is the predicted direction of bias due to missing outcome data?	Favours experimental / Favours comparator / Towards null / Away from null / Unpredictable	
<b>Bias in measurement of the outcome</b>	4.1 Were outcome assessors aware of the intervention received by study participants?	Y / PY / PN / N / NI	
	4.2 <u>If Y/PY/NI to 4.1:</u> Was the assessment of the outcome likely to be influenced by knowledge of intervention received?	NA / Y / PY / PN / N / NI	
	<b>Risk of bias judgement</b>	Low / High / Some concerns	
	Optional: What is the predicted direction of bias due to measurement of the outcome?	Favours experimental / Favours comparator / Towards null / Away from null / Unpredictable	
<b>Bias in selection of the reported result</b>	Are the reported outcome data likely to have been selected, on the basis of the results, from...		
	5.1 ... multiple outcome measurements (e.g. scales, definitions, time points) within the outcome domain?	Y / PY / PN / N / NI	
	5.2 ... multiple analyses of the data?	Y / PY / PN / N / NI	

	<b>Risk of bias judgement</b>	Low / High / Some concerns	
	Optional: What is the predicted direction of bias due to selection of the reported result?	Favours experimental / Favours comparator / Towards null / Away from null / Unpredictable	
<b>Overall bias</b>	<b>Risk of bias judgement</b>	Low / High / Some concerns	
	Optional: What is the overall predicted direction of bias for this outcome?	Favours experimental / Favours comparator / Towards null / Away from null / Unpredictable	

## Appendix E *Included studies*

### Study: **Pathways Housing First (PHF)**

Location	Study design	Data collection	Outcome domains	Participant characteristics	Interventions assessed
New York City, NY (USA)	Randomised controlled trial	1997 to 2003	Housing Stability, Substance Use, Mental Health, Health Service Use	Homeless, mental health disorder, individual	Housing First with ACT

#### *Articles reporting this study*

Authors and year	No. participants	Subgroups reported	Outcome domains synthesised	Data reported time points
------------------	------------------	--------------------	-----------------------------	---------------------------

#### *Papers included in meta-analysis*

(Gulcur et al. 2003)	225	Recruited from street/hospital	Health Service Use	24 months
(Tsemberis et al. 2004)	225		Housing Stability, Substance Use, Mental Health	24 months

#### *Other papers*

(Padgett et al. 2006)	225			Baseline to 48 months
-----------------------	-----	--	--	-----------------------

### Study: **At Home/Chez Soi (AHCS)**

Location	Study design	Data collection	Outcome domains	Participant characteristics	Interventions assessed
Moncton, Montreal, Toronto, Vancouver, Winnipeg (Canada)	Randomised Controlled Trial	2009 to 2013	Housing Stability, Substance Use, Mental Health, Health Service Use, Quality of Life	Homeless, mental health disorder, substance use disorder, individual	Housing First with ACT, Housing First with ICM, Congregate Housing First

*Articles reporting this study*

Authors and year	No. participants	Subgroups reported	Outcome domains synthesised	Data reported time points
------------------	------------------	--------------------	-----------------------------	---------------------------

*Papers included in meta-analysis*

(Aubry et al. 2016)	950		Housing Stability, Substance Use, Mental Health, Quality of Life	6 months, 12 months, 18 months, 24 months
(Chung et al. 2017)	2148	Aged ≥50, aged 18-49	Housing Stability, Substance Use, Mental Health, Quality of Life	12 months, 24 months
(Stergiopoulos, Hwang, et al. 2015)	1198	City A, B, C, D	Health Service Use, Housing Stability, Substance Use, Mental Health, Quality of Life	6 months, 12 months, 18 months, <b>24 months</b>

*Other papers*

(Adair et al. 2017)	2140			24 months
---------------------	------	--	--	-----------

(Aubry et al. 2015)	950		Mental Health	6 months, 12 months
(Kirst et al. 2015)	575			6 months, 12 months, 18 months, 24 months
(Kozloff, Adair, et al. 2016)	156		Housing Stability, Substance Use, Mental Health, Quality of Life, Health Service Use	6 months, 12 months, 18 months, 24 months
(O'Campo et al. 2016)	197			6 months, 12 months, 18 months, 24 months
(Palepu, Patterson, Moniruzzaman, Frankish, et al. 2013)	497		Presence/absence substance dependence	12 months
(Parpouchi et al. 2016)	497		Other (sexual behaviour)	6 months, 12 months, 18 months, 24 months
(Patterson, Moniruzzaman, et al. 2013)	497		Congregate for high-needs, HF+ACT for high-needs, HF+ICM for moderate needs	6 months, 12 months
(Patterson et al. 2014)	497		Congregate for high- Other (Community	6 months, 12

		needs, HF+ACT for high- needs, HF+ICM for moderate needs	and psychological integration)	months
(Powell et al. 2017)	1186			6 months, 12 months, 18 months, 24 months
(Rezansoff et al. 2016)	165	Congregate, Scattered Site	Other (medication adherence for psychosis)	24 months
(Somers et al. 2015)	497	Congregate for high- needs, HF+ACT for high- needs, HF+ICM for moderate needs; Substance use at baseline or not		6 months, 12 months, 18 months, 24 months
(Somers et al. 2017)	297	Congregate, Scattered Site	Housing Stability, Substance Use, Mental Health, Quality of Life	24 months
(Stergiopoulos, Gozdzik, et al. 2015)	378			24 months
(Stergiopoulos et al. 2016)	237			12 months, 24 months
(Woodhall-Melnik et al. 2015)	575	High needs, moderate needs	Other (BMI, Waist circumference)	24 months

### Study: **Housing Opportunities for Persons With AIDS (HOPWA)**

Location	Study design	Data collection	Outcome domains	Participant characteristics	Interventions assessed
Baltimore, MD; Chicago, IL; Los Angeles, CA (USA)	Randomised Controlled Trial	2004 to 2007	Housing Stability, Mental Health, Health Service Use	Homeless, HIV-positive, individual	Non-contingent housing, scattered site format, time-unlimited rent subsidy

#### *Articles reporting this study*

Authors and year	No. participants	Subgroups reported	Outcome domains synthesised	Data reported time points
------------------	------------------	--------------------	-----------------------------	---------------------------

#### *Papers included in meta-analysis*

(Wolitski et al. 2010)	630	None	Housing Stability, Mental Health, Health Service Use, Other (Health risk behaviour)	6 months, 12 months, 18 months
------------------------	-----	------	---	--------------------------------

### Study: **Chicago Housing for Health Partnership (CHHP)**

Location	Study design	Data collection	Outcome domains	Participant characteristics	Interventions assessed
Chicago, IL (USA)	Randomised	2003 to 2007	Mental Health, Quality	Homeless, chronic illness	Non-contingent

Controlled Trial	of Life, Health Service Use	(inc. HIV-positive), individual	housing, scattered site or congregate, time-unlimited rent subsidy
------------------	-----------------------------	---------------------------------	--

*Articles reporting this study*

Authors and year	No. participants	Subgroups reported	Outcome domains synthesised	Data reported time points
------------------	------------------	--------------------	-----------------------------	---------------------------

*Papers included in meta-analysis*

(Sadowski et al. 2009)	407	None	Mental Health, Quality of Life, Health Service Use	18 months
------------------------	-----	------	--	-----------

*Other papers*

(Buchanan et al. 2009)	105	None		12 months
------------------------	-----	------	--	-----------



## Appendix F Excluded studies at final screening stage

Article	Inclusion Criteria										Comments
	Homeless population	Housing assistance	Rent subsidy	Permanent	Not contingent	Housing as first	Control as different	Useable measures	RCT		
(Adair et al. 2016)	n									n	randomisation conducted in sampling of positive outcomes after intervention
(Burnam et al. 1995)				n	n						residence provision was not non-contingent or permanent
(Caplan et al. 2006)							n				no control
(Cheng et al. 2007)					n						housing contingent on client intention to 'deal with... substance abuse problems' (section 8 housing voucher)
(Cheung et al. 2015)							n				not comparing with control
(Conrad et al. 1998)				n					n		residence not permanent - temporary accommodation intended to end after 3-6 months
(Dickey et al. 1996)							n				not comparing with control
(Dickey et al. 1997)							n				not comparing with control
(Erdem 2015)									n		not published in peer-reviewed journal
(Fletcher et al. 2008)						n					housing provision not defined as core element (IACT)
(Forchuk et al. 2008)	y	y	y		n	y	y	y	y		exclusion criteria - recent history of drug and alcohol abuse. Contingency on already having achieved sobriety
(Fowler & Chavira 2014)					n						housing contingent on client intention to 'deal with... substance abuse problems' (section 8 housing voucher)
(Fowler & Schoeny 2015)					n						housing contingent on client intention to 'deal with... substance abuse problems' (section 8 housing voucher)
(Geller 2014)									n		<i>not report of research findings in prj</i>
(Gewirtz et al. 2015)							n				control also housed - intervention additional
(Goering et al. 2016)									n		no useable outcome data to compare intervention and control
(Goldfinger et al. 1999)							n	n			not comparing with control

(Greenwood et al. 2005)	y	y	y	y	y	y	y	n	y	no useable outcome data to compare intervention and control
(Gulcur et al. 2007)	y	y	y	y	y	y	n	n		not comparing with control
(Guo et al. 2016)	y	y	y	y	y	y	n	y	y	Control not differing in housing provision
(Harpaz-Rotem et al. 2011)				n						Accommodation not permanent
(Hurlburt et al. 1996)					n					housing contingent on client intention to 'deal with... substance abuse problems' (section 8 housing voucher)
(Hwang et al. 2012)								n		baseline characteristics only
(Hwang & Burns 2014)									n	not reporting RCT results
(Jones et al. 2003)							n			control also housed - intervention additional
(Katz 2015)									n	not reporting RCT results
(Kertesz et al. 2007)	y	y	y	n	y		y	y	y	housing provision defined as 'for maximum 6 months' and "not permanent"
(Kidder et al. 2007)	y	y	y	y	y	y	y	n		baseline characteristics only
(Korr & Joseph 1995)				n						accommodation provided to intervention group was 'SROs, hotels, motels', not qualifying as permanent housing
(Kozloff 2016)								n		conference paper? Not published results
(Kozloff, Stergiopoulos, Adair, et al. 2016)b								n		conference paper? Not published results
(Kozloff, Stergiopoulos, Cheung, et al. 2016)d								n		baseline characteristics only
(Krabbenborg et al. 2015)	n									not relevant intervention
(Lapham et al. 1993)				n				n		housing provision not detailed as permanent, baseline characteristics only
(Lapham et al. 1995)				n	n					housing provision not permanent - four months; also contingent on abstinence
(Latimer & Rabouin 2011)								n		conference paper? Not published results
(Malte et al. 2017)	n									intervention is programme rather than housing provision
(Mares & Rosenheck 2011)									n	not randomised
(McHugo et al. 2004)							n			Both groups had supported housing, difference in integration of care teams
(Milby et al. 2005)				n						Housing not permanent - "allowed to remain if units available" - see also Kertesz 2007

(Morrissey et al. 2002)										n	outcomes measured at programme level, not individuals
(Morse et al. 1994)		n									housing provision not stated as part of intervention
(Morse et al. 2006)		n									housing provision not defined as core element (IACT)
(Morse et al. 2008)		n									housing provision not defined as core element (IACT)
(Nelson et al. 2014)										n	no useable outcome data to compare intervention and control
(Nelson et al. 2015)										n	purposive sampling after random assignment
(O'Connell et al. 2008)										n	housing contingent on client intention to 'deal with... substance abuse problems' (section 8 housing voucher)
(O'Connell et al. 2012)										n	housing contingent on client intention to 'deal with... substance abuse problems' (section 8 housing voucher)
(O'Connell et al. 2017)										n	housing contingent on client intention to 'deal with... substance abuse problems' (section 8 housing voucher)
(O'Toole et al. 2013)										n	not randomised
(Palepu, Patterson, Moniruzzaman & Somers 2013)a										n	conference paper? Not published results
(Parashar et al. 2011)										n	not randomised
(Patterson, Rezanoff, et al. 2013)										n	sampling 'random and purpose' taken after randomisation, participation voluntary
(Piehler et al. 2014)		n								n	participants already housed before sampling
(Poremski et al. 2016)		y	y	y	y	y	y	y	n	y	measures of 'employment and income' deemed not able to be included
(Rosenheck et al. 2003)										n	housing contingent on client intention to 'deal with... substance abuse problems' (section 8 housing voucher)
(Shinn et al. 2015)										n	housing provision not stated as part of intervention (CTI)
(Shinn et al. 2016)										n	some housing provision was contingent, no distinction in data
(Simmons et al. 2017)										n	no outcome - protocol for study to be done
(Somers, Patterson, et al. 2013)										n	baseline characteristics only
(Somers, Rezanoff, et al. 2013)		y	y	y	y	y	y	y	n	y	re-offending outcomes not deemed able to be included
(Sosin et al. 1995)										n	housing contingent on client accessing substance use services
(Stahler et al. 1993)										n	client must 'make a complete commitment to treatment and sobriety' for

(Stefancic & Tsemberis 2007)	y	y	y	y	y	y	y	n	n	'residential treatment'
(Stergiopoulos et al. 2012)									n	reported data not comparison with control
(Tsai et al. 2010)									n	not RCT
(Veldhuizen et al. 2015)								n		Not RCT - cross sectional survey of participants
(Joseph Westermeyer & Lee 2013)									n	Reporting 'study attrition' - an outcome with no clear relationship to health
(Wood et al. 1998)				n						not RCT
										housing contingent on client intention to 'deal with... substance abuse problems' (section 8 housing voucher)

## Appendix G *Measures reported in studies as used in meta-analyses*

### **Pathways Housing First**

Data used in the meta-analyses were collected using the following measures across 24 months:

- Housing Stability was measured using the Residential Timeline Follow Back calendar (Tsemberis et al. 2007; New Hampshire Dartmouth Psychiatric Research Centre 1995b), eliciting self-reporting of residential locations across the 6 months prior to each interview. Tsemberis et al. (Tsemberis et al. 2004) record variance between control and intervention groups in time spent 'stably housed' across the 24 month period.
- Substance Use was measured using the Drug and Alcohol Follow-Back calendar (New Hampshire Dartmouth Psychiatric Research Centre 1995a) eliciting self-reporting of consumption of alcoholic drinks and use "selected [illicit] drugs" (Tsemberis et al. 2004; Padgett et al. 2006) during the 6 month period prior to interview. For the purposes of the meta-analysis, only the use of the calendar to record number of days using the selected drugs as reported in Tsemberis (2004) was used. This was reasoned to be most comparable with the other studies identified, while combination of the two measures of substance abuse was not possible.
- Mental Health was measured as 'psychiatric symptoms' using the Colorado Symptom Index to record scores ranging from 14-70 of number and severity of psychiatric symptoms in the past month (Tsemberis et al. 2004; Ciarlo et al. 1986; Boothroyd & Chen 2008; Conrad et al. 2001) – higher scores representing increased symptom severity. Tsemberis (Tsemberis et al. 2004) reports variance between treatment and control groups across 24 months.
- Health Service Use was measured as 'Proportion of time hospitalised' using the residential follow-back calendar to elicit self-reporting of days spent in specified 'psychiatric hospitalisation' in the 6 months prior to interview (Gulcur et al. 2003, p.176). Uses of 'substance treatment' and 'psychiatric treatment' services were also recorded (Tsemberis et al. 2004; Padgett et al. 2006), however these were not used in meta-analyses as they were not directly comparable to other studies.

### **At Home/Chez Soi**

Data used in the meta-analyses were all collected at baseline and follow-up interviews using the following measures across 24 months (see also Goering et al. 2011 appendix 2):

- Housing Stability was measured using the Residential Timeline Follow Back Inventory (Tsemberis et al. 2007; New Hampshire Dartmouth Psychiatric Research Centre 1995b), eliciting self-reporting of residential locations across the 6 months prior to each interview. Chung et al. (2017) and Stergiopoulos et al. (2015) report this as proportion of total measured days spent in stable housing during trial and Aubry et al. (2016) reports numbers of participants in stable housing at 24 months.
- Substance Use was measured at interview using the Global Appraisal of Individual Needs – Short Screener (GAIN-SS) Substance Problem Scale (Dennis et al. 2006),

recording self-reported substance use problems (not incidents) as a counted score of 0-5 in the six-month period prior to each interview. Both Chung et al. (2017) and Stergiopoulos et al. (2015) reported the 'Ratio of Rate Ratios', dividing the rate ratio of scores between follow-up and baseline of the intervention group by the rate ratio of the control group.

- Two measures relevant to the Mental Health domain were taken:
  - The modified Colorado Symptom Index was used to record scores ranging from 14-70 of number and severity of psychiatric symptoms in the past month (Boothroyd & Chen 2008; Conrad et al. 2001) – higher scores representing increasing symptom severity. Chung et al. (2017) and Stergiopoulos et al. (2015) report difference in mean changes from baseline between intervention and control groups, and Aubry et al. (2016) reports means and standard deviations of scores at baseline and follow-up for both intervention and control groups.
  - The Mental Component Summary score of the SF-12 Health Survey was used to measure self-rated mental health (Ware et al. 1996). Scores ranged from 0-100 with higher scores representing positive results. Chung et al. (2017) and Stergiopoulos et al. (2015) report 'difference in mean changes' between intervention and control groups from baseline to followup.
- Within the domain of Quality of Life several relevant measures were taken:
  - 'Condition specific quality of life' was measured using the Quality of Life Index – 20 item (QoLI-20) structured interview to elicit self-rated quality of life. This tool is primarily developed for grading quality of life of persons with "severe and persistent mental illness" (Lehman 1996; Uttaro & Lehman 1999), scores ranging from 20 to 140 with higher scores representing positive results.
  - 'Generic quality of life' or 'health-related quality of life' was measured using the '5 dimensional' EuroQol tool (EQ-5D), giving a generic measure of quality of life as related to health (The EuroQol Group 1990). Scores ranged from 0-100 or 0-1 with higher scores representing positive results. Aubry et al. (2016) reports both measures as baseline and followup mean scores and standard deviations; Chung et al. (2017) and Stergiopoulos et al. (2015) report 'difference in mean changes' between intervention and control groups from baseline to followup.
  - A further measure in the Quality of Life domain that was used in meta-analysis was the Physical Component Summary score of the SF-12 Health Survey, scoring self-reported physical health 0-100 with higher scores representing positive results. Chung et al. (2017) and Stergiopoulos et al. (2015) report 'difference in mean changes' between intervention and control groups from baseline to followup. Although collected alongside the Mental Component Summary score above, the two were analysed in separate domains as they corresponded to the criteria outlined in section 3.6.4 above.
- Health Service Use was measured using two tools at interview:

- Use of emergency room services was documented using the Health, Social and Justice Service Use Inventory, developed specifically for this trial to elicit participant recollection to produce a count of visits (Goering et al. 2011, p.17). Aubry et al. (2016) reports this as an Incidence Rate Ratio between the intervention and control groups for the 24-months of the trial period. Stergiopoulos et al. (2015) reports the 'Ratio of Rate Ratios' of the uses of emergency room services in the 6 months prior to baseline and followup between the intervention and control groups.
- Hospitalisations were recorded using the Residential Timeline Follow Back Inventory to count nights hospitalised. Stergiopoulos et al. (2015) reports both the mean number of days hospitalised and the number of participants experiencing one or more hospitalisations during the 24-month trial period.

### **Housing Opportunities for Persons with AIDS**

Data was collected at baseline and interviews every six months for a period of 18 months and all were reported in Wolitski et al. (2010). Two of the core outcomes of the study, risk behaviours and adherence to HIV medication therapies, were both classified as 'Other' under the outcome domains of this review, and so have not been included in meta-analysis. Other outcomes were classified as follows:

- Housing Stability was recorded as the percentage of participants in each group who reported staying in their 'own place' for the entirety of the 90 days prior to each interview.
- Three measures of Mental Health were recorded:
  - The Mental Component Summary score of the Medical Outcomes Study Short Form-36 v.2 (SF-36; Ware et al. 2001) was used to record self-rated mental health, with higher scores representing better health. This was included in the meta-analyses alongside similar measures of self-rated health.
  - The 10-item Centre for Epidemiological Studies Depression Scale (CES-D; Andresen et al. 1994) was used to score severity of depression, with higher scores representing worse mood. This was included with comparative measures of psychiatric symptom severity.
  - The Perceived Stress Scale was used to measure stress as a health outcome. Higher scales corresponded to greater perceived stress. This measure was not included in meta-analysis.
- The Physical Component Summary score of the SF-36 was included in the Quality of Life domain alongside similar measures of self-rated physical health.
- Recollections of Health Service Use were elicited at interview and reported. Mean numbers of times in hospital in the past 6 months and percentage of participants with one or more Emergency Room visits were used in relation to this domain. Other measures (such as adherence to prescribed anti-retroviral medication) were not used as they were deemed specific to the health needs of this particular population.

### **Chicago Housing for Health Partnership**

Data was presented for the 18-month period as a whole. Buchanan et al. (2009) report the outcomes of a sub-group of HIV-positive patients and only report clinical measures of HIV/AIDS progression. These participants are reported in Sadowski et al. (2009) and are counted using the following measures to correspond to review outcome domains:

- At interview the participant's 'housing status' was recorded as 'stable' or otherwise. The number of participants in 'stable housing' at 18 months was included as a measure of Housing Stability.
- Mental Health was measured using the AIDS Clinical Trials Group 21-Item Short Form (ACTG Outcome Committee 1999) to elicit self-reported health, and transformed to a 100-point scale, with higher scores representing better health. Baseline and follow-up mean scores were reported.
- The physical functioning sub-scale of the same form was classified under the Quality of Life outcome. Baseline and follow-up mean scores were likewise reported.
- Instances of Health Service Use were measured in two ways. Firstly, at the 'primary site' hospitals of recruitment all medical records were retrieved for participants for the length of the study period by blinded personnel. This was judged to record 100% of the participants' uses of services at these facilities. During interview recollections of service use at other sites was elicited using the HIV/AIDS Treatment Adherence, Health Outcomes and Cost Study (HIV/AIDS Treatment Adherence 2004) health service screening modules. Medical records were then sought from these sites to verify these reported visits. This process of requesting records produced 89% of the corresponding records (Sadowski et al. 2009, p.1773). The number of hospitalisations, total days hospitalised and number of Emergency Room visits (not leading to hospitalisation) for the 18-month period were recorded for each group.