

# Interventions to Improve the Health of the Homeless

## A Systematic Review

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**Background:** Homelessness is a widespread problem in the United States. The primary goal of this systematic review is to provide guidance in the development and organization of programs to improve the health of homeless people.

**Methods:** MEDLINE, CINAHL, HealthStar, PsycINFO, Sociological Abstracts, and Social Services Abstracts databases were searched from their inception through July 2004 using the following terms: homeless, homeless persons, and homelessness. References of key articles were also searched. 4564 abstracts were screened, and 258 articles underwent full review. Seventy-three studies conducted from 1988 to 2004 met inclusion criteria (use of an intervention, use of a comparison group, and the reporting of health-related outcomes). Two authors independently abstracted data from studies and assigned quality ratings using explicit criteria.

**Results:** Forty-five studies were rated good or fair quality. For homeless people with mental illness, case management linked to other services was effective in improving psychiatric symptoms, and assertive case management was effective in decreasing psychiatric hospitalizations and increasing outpatient contacts. For homeless people with substance abuse problems, case management resulted in greater decreases in substance use than did usual care. For homeless people with latent tuberculosis, monetary incentives improved adherence rates. Although a number of studies comparing an intervention to usual care were positive, studies comparing two interventions frequently found no significant difference in outcomes.

**Conclusions:** Coordinated treatment programs for homeless adults with mental illness or substance abuse usually result in better health outcomes than usual care. Health care for homeless people should be provided through such programs whenever possible. Research is lacking on interventions for youths, families, and conditions other than mental illness or substance abuse.

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### Introduction

Homelessness is a widespread problem in the United States, with >800,000 individuals currently homeless.<sup>1</sup> Earlier studies have estimated that 5 million to 8 million Americans experienced homelessness within the last 5 years,<sup>2</sup> and about 1.0% of Philadelphians and 1.2% of New Yorkers stayed at a homeless shelter each year.<sup>3</sup> Homelessness affects people of all ages: adolescents, adult men, adult women, and families with children account for 9%,

60%, 16%, and 15% of the U.S. homeless population, respectively.<sup>1</sup>

Homeless people often suffer from serious health conditions.<sup>4</sup> In a cross-sectional study, 43% of homeless people in the United States had either a mental health or a substance use problem, and an additional 23% had concurrent mental health and substance use problems.<sup>1</sup> Injuries, assault, cold exposure, and skin problems are common hazards of life on the street.<sup>5–7</sup> Infectious diseases, including tuberculosis, HIV, hepatitis, and sexually transmitted diseases, occur at higher than average rates.<sup>8–14</sup> Chronic medical conditions, including hypertension and diabetes, are often poorly controlled.<sup>15</sup> Pregnancy is common among adolescent girls,<sup>16</sup> and homeless children are at increased risk for asthma and behavioral disorders.<sup>17,18</sup> More than half of all homeless people in the United States lack health insurance and face major barriers to obtaining care.<sup>19</sup> Not surprisingly, mortality rates among homeless peo-

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ple are greatly elevated.<sup>20–22</sup> As a result of their complex health issues and lack of stable housing, homeless patients present serious challenges to healthcare providers.<sup>23</sup>

The development and support of programs to improve the health of homeless people should therefore be an important priority. However, an evidence-based approach is required to identify interventions that result in demonstrable health benefits. To date, no comprehensive and rigorous survey has been undertaken of the literature in this area.

The primary goal of this systematic review is to summarize the existing evidence on interventions to improve health-related outcomes in homeless people. This information will help guide healthcare and social service providers and government agencies as they seek to identify effective means to assist this population. Furthermore, this knowledge will reduce the likelihood of replicating previously unsuccessful efforts. Recognizing that the literature in this area varies widely in methodologic rigor, this review evaluates the quality of each study using explicit and well-validated criteria. Secondary goals of this review are to identify major gaps in the existing knowledge base of interventions for the homeless, and to provide insights into methodologic pitfalls that future researchers should seek to avoid.

## Methods

### Data Sources

MEDLINE, CINAHL, HealthStar, PsycINFO, Sociological Abstracts, and Social Services Abstracts databases were searched from their inception through July 2004 using the following terms: homeless persons, homelessness, and homeless. Title and abstract of each article were reviewed and placed into a keep or reject database based on predetermined criteria. A second investigator reviewed these databases, a third investigator arbitrated disagreement, and consensus was reached after discussion. To identify additional articles, the bibliographies of relevant reviews and all articles meeting final selection criteria were searched. A total of 4564 articles were identified.

### Study Selection

Studies were included if they examined the effectiveness of an intervention to improve the health of homeless people. Interventions were broadly defined to include both services that a primary care provider could provide and programs to which homeless patients could be referred. Studies had to compare homeless subjects who received an intervention to subjects who received either no intervention (usual care) or a different intervention, and they had to report data on health-related outcomes. Acceptable study designs included randomized controlled trials (RCTs), prospective longitudinal studies with nonrandomized allocation to different treatment groups, retrospective studies with comparison of outcomes among groups receiving different treatments, and secondary analyses of RCT data in which the examined intervention was

not the one randomly allocated in the original RCT. Articles published in English in peer-reviewed journals were eligible; abstracts, commentaries, and preliminary reports were excluded.

Homeless persons were defined as individuals who lack a fixed, regular, and adequate night-time residence, including people living in supervised shelters or places not intended for human habitation.<sup>24</sup> Some studies enrolled homeless and nonhomeless subjects; because none of these studies reported results separately for homeless subjects, they were included only if at least one-half of the subjects were homeless. Health-related outcomes were defined as measures of physical health; mental health (including psychiatric symptoms and psychological or cognitive function); substance use (alcohol, drugs, or tobacco); HIV risk behaviors; healthcare utilization; adherence to health care; and quality of life. Studies that reported only housing or employment outcomes were excluded.

### Critical Appraisal Process

A total of 258 articles appeared to potentially match selection criteria based on title and abstract. Two investigators independently reviewed these articles. When multiple articles reported different outcome measures on the same subjects, data from the articles were combined. Disagreements regarding inclusion or exclusion were resolved by consensus after discussion with a third investigator. After full review, 174 articles were excluded for the following reasons: no intervention examined ( $n=30$ ), no comparison group ( $n=56$ ), no health outcomes reported ( $n=41$ ), less than one half of subjects homeless ( $n=26$ ), duplicate publications ( $n=17$ ), and other reasons ( $n=4$ ). Seventy-three studies (reported in 84 articles published from 1988 to 2004) met inclusion criteria and underwent data abstraction and critical appraisal. Nine of these studies included some subjects who were not homeless at the time of enrollment.

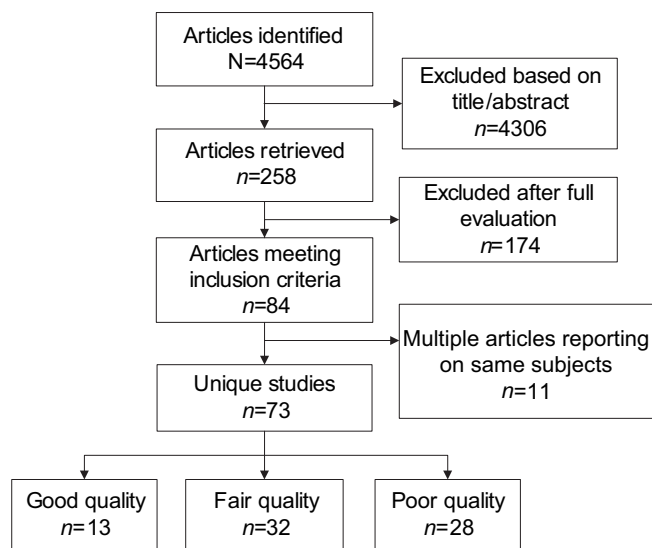
Two investigators independently abstracted data and rated the quality of each article using guidelines developed by the U.S. Preventive Services Task Force Work Group (Appendix A, available at: [www.ajpm-online.net](http://www.ajpm-online.net)).<sup>25</sup> In a modification of these guidelines, studies that did not use an intention-to-treat analysis were rated “fair” rather than “poor.” Results from secondary analyses of “good” quality studies were considered “fair” quality. Disagreements regarding quality ratings were resolved after discussion among all investigators.

Studies were categorized by the subpopulation of homeless persons targeted for intervention, and then subcategorized by the type of intervention. Two investigators prepared a preliminary data synthesis and draft of conclusions. All investigators conferred to discuss these documents, make revisions, and reach unanimous final conclusions.

## Results

### Quality and Categorization of Studies

The database search and study selection process is summarized in [Figure 1](#). Of 73 included studies, 13 were rated as good quality, 32 were fair, and 28 were poor. The most common reasons for poor quality ratings were small sample size (<50 subjects per group)



**Figure 1.** Summary of database search and study selection process.

and low follow-up rates (<50% overall). Studies with a quality rating of good or fair are summarized in Table 1, categorized by the subpopulation targeted and the type of intervention examined.

### Interventions for Homeless People with Mental Illness

Detailed information on these studies is given in Appendix B (available online at [www.ajpm-online.net](http://www.ajpm-online.net)). Five studies examined case management services and/or supported housing. One RCT found that intensive case management with access to drop-in center services, temporary housing, and rehabilitation services resulted in greater improvements in psychiatric symptoms and quality of life, compared to usual care.<sup>26</sup> A longitudinal cohort study of clients receiving outreach, case management, and residential treatment found that having more contacts with the program was associated with greater improvements in psychological distress and greater reductions in alcohol and drug problems.<sup>27</sup> A retrospective study compared homeless people who had severe mental illness and were placed in supportive housing with matched controls not placed in housing, and found that the intervention group had significantly reduced inpatient and outpatient healthcare utilization after being housed.<sup>28</sup>

Two studies examined the effect of housing interventions in persons receiving case management. In the first study, individuals were randomized to supported living in either group housing or individual apartments.<sup>29–31</sup> A second study compared outcomes among subjects receiving case management who were either provided guaranteed housing or given assistance in finding their own housing.<sup>32</sup> Both of these studies were essentially negative in terms of health-related outcomes.

Three RCTs<sup>33–35</sup> assessed the effectiveness of assertive community treatment (ACT), in which a team of psychiatrists, nurses, and social workers with a low client-to-staff ratio provided comprehensive psychiatric care, medication monitoring, intensive case management, and crisis intervention in the community. One of the studies found that ACT was superior to usual care in reducing psychiatric hospitalizations, but not in improving psychiatric symptoms or quality of life.<sup>33</sup> Another study<sup>34</sup> found that ACT was superior to brokered case management in improving certain psychiatric symptoms. An older study found that ACT was superior to drop-in center services or outpatient clinic care in increasing program contacts, but not in improving psychiatric symptoms or substance use.<sup>35</sup>

Six studies<sup>36–41</sup> reported findings from the Access to Community Care and Effective Services and Supports (ACCESS) program, whose primary goal was to determine if greater integration and coordination among agencies within service systems improved outcomes among mentally ill homeless people receiving ACT.<sup>36</sup> Clients at all sites experienced improvements in mental health and substance use problems. At intervention sites, increased integration among service agencies was achieved but did not affect individual-level health outcomes.<sup>36</sup> Four substudies<sup>38–41</sup> showed that the following factors had no effect on outcomes: client selection of ACT (after the client was offered a choice of programs) versus assignment of the client to ACT by a case worker (with no choice of programs offered),<sup>37</sup> assignment to a consumer case manager (a person with a history of treatment for serious mental illness) versus a case manager with no such history,<sup>38</sup> and ethnic/racial concordance between client and case manager.<sup>39,40</sup> When ACT teams used clinical judgment to discharge clients to less-intensive service programs at various points over an 18-month period, clinical outcomes were similar among discharged and continuing clients.<sup>41</sup>

In one study,<sup>42</sup> mentally ill veterans who were applying for Social Security benefits were followed prospectively. Fifty individuals were awarded benefits and 123 were denied benefits. Receipt of benefits was associated with significantly improved quality of life but had no effect on psychiatric, medical, alcohol, or drug problems.<sup>42</sup>

### Interventions for Homeless People with Substance Abuse

Detailed information on these studies is given in Appendix C (available online at [www.ajpm-online.net](http://www.ajpm-online.net)). Six studies<sup>43–48</sup> examined the effects of case management. Two studies<sup>43,44</sup> compared case management to usual care and found that case management had a significant effect in reducing alcohol use and drug use. Two studies<sup>45,46</sup> found that for individuals receiving inpa-

**Table 1.** Summary of studies with a quality rating of fair or good<sup>a</sup>

Subpopulation	Intervention type
Homeless people with mental illness ( <i>n</i> =15) <sup>b</sup>	Case management with access to other services; or case management with or without supportive housing ( <i>n</i> =5) <sup>26–32</sup> Assertive community treatment (ACT) ( <i>n</i> =3) <sup>33–35</sup> ACT with or without service system integration ( <i>n</i> =1) <sup>36</sup> Client selection of ACT vs assignment to ACT ( <i>n</i> =1) <sup>37</sup> Consumer vs nonconsumer case manager ( <i>n</i> =1) <sup>38</sup> Client/case manager ethnic/racial concordance ( <i>n</i> =2) <sup>39,40</sup> Discharge from ACT to less intensive program ( <i>n</i> =1) <sup>41</sup> Approval of social security benefits ( <i>n</i> =1) <sup>42</sup>
Homeless people with substance abuse ( <i>n</i> =13) <sup>c</sup>	Case management ( <i>n</i> =6) <sup>43–48</sup> Post-detoxification stabilization program ( <i>n</i> =1) <sup>49</sup> Abstinence-contingent work therapy ( <i>n</i> =1) <sup>50</sup> Intensive residential treatment program ( <i>n</i> =1) <sup>51,52</sup> Therapeutic community ( <i>n</i> =1) <sup>53</sup> Other treatment programs ( <i>n</i> =1) <sup>54</sup> Accelerated hepatitis B immunizations ( <i>n</i> =1) <sup>55</sup> Smoking cessation program ( <i>n</i> =1) <sup>56</sup>
Homeless people with concurrent mental illness and substance abuse ( <i>n</i> =7) <sup>d</sup>	Integrated treatment program ( <i>n</i> =2) <sup>57,58</sup> Therapeutic community ( <i>n</i> =2) <sup>59–61</sup> Abstinence-contingent housing and work therapy ( <i>n</i> =1) <sup>62,63</sup> Housing First vs Continuum of Care ( <i>n</i> =1) <sup>64,65</sup> Representative payee ( <i>n</i> =1) <sup>66</sup>
Homeless people with latent tuberculosis ( <i>n</i> =2) <sup>e</sup>	Cash and noncash incentives for clinic attendance ( <i>n</i> =2) <sup>67–69</sup>
Homeless or runaway youths ( <i>n</i> =2) <sup>e</sup>	Educational program to reduce sexual risk behaviors for HIV infection ( <i>n</i> =1) <sup>70,71</sup> Standard vs intensive case management ( <i>n</i> =1) <sup>72</sup>
Homeless families and children ( <i>n</i> =2) <sup>e</sup>	Therapeutic community for substance abusing mothers ( <i>n</i> =1) <sup>73</sup> Health advocate outreach worker ( <i>n</i> =1) <sup>74,75</sup>
Homeless women ( <i>n</i> =2) <sup>e</sup>	Educational program to reduce risk behaviors for HIV infection ( <i>n</i> =2) <sup>76,77</sup>
Homeless people at emergency departments or admitted to hospital ( <i>n</i> =2) <sup>e</sup>	Compassionate care from a volunteer in the emergency department ( <i>n</i> =1) <sup>78</sup> Post-hospital transitional care facility ( <i>n</i> =1) <sup>79</sup>

Note: Appendixes are available online at [www.ajpm-online.net](http://www.ajpm-online.net).

<sup>a</sup>For detailed information on quality rating criteria, see Appendix A.

<sup>b</sup>For detailed information on each study, see Appendix B.

<sup>c</sup>For detailed information on each study, see Appendix C.

<sup>d</sup>For detailed information on each study, see Appendix D.

<sup>e</sup>For detailed information on each study, see Appendix E.

tient or outpatient substance abuse treatment, the addition of case management services had no significant effect on severity of alcohol or drug problems. Two RCTs<sup>47,48</sup> compared high-intensity and low-intensity case management services and found no significant differences in mental health or substance use outcomes.

Two of the above studies<sup>44,48</sup> assigned subjects to case management alone or case management with subsidized housing. The provision of housing had no effect on substance use in one study.<sup>44</sup> In the other,<sup>48</sup> it had a positive effect on quality of life, but no effect on substance use, psychiatric symptoms, or outpatient mental healthcare utilization.

In three studies<sup>49–52</sup> that compared usual care to postdetoxification stabilization,<sup>49</sup> abstinence-contingent work therapy,<sup>50</sup> or an intensive residential treatment program,<sup>51,52</sup> the intervention groups had significantly greater reductions in substance use than the usual care groups. However, a study comparing thera-

peutic community to usual care found no significant effect on substance use.<sup>53</sup> Two studies<sup>47,54</sup> compared different types of treatment programs. In these studies, no long-term differences in substance use were seen in subjects receiving case-managed residential care versus brief inpatient substance abuse treatment,<sup>54</sup> or in those receiving residential treatment versus shelter-based case management.<sup>47</sup>

Two studies<sup>55,56</sup> focused on preventive health interventions for homeless people with substance dependence. A study of homeless patients with a history of illicit drug use who were seen at a primary care center demonstrated that an accelerated schedule of three hepatitis B immunizations over 21 days resulted in higher completion rates than a standard schedule of immunizations given over 6 months.<sup>55</sup> Among residents of a therapeutic community for substance users, participation in a smoking-cessation program resulted in higher smoking abstinence rates at 2 months compared to usual care, but no significant differences in smoking

abstinence rates over the remainder of the 13-month follow-up period.<sup>56</sup>

### **Interventions for Homeless People with Concurrent Mental Illness and Substance Abuse**

Detailed information on these studies is given in Appendix D (available online at [www.ajpm-online.net](http://www.ajpm-online.net)). Two studies<sup>57,58</sup> compared integrated programs versus separate mental health and substance abuse programs to treat individuals with concurrent mental illness and substance abuse. Both studies found no significant effect on mental health or substance-use outcomes. Two studies<sup>59,60</sup> focused on therapeutic communities. Compared to usual care, a modified therapeutic community yielded minimal effects (lower depression scores but no difference in other psychiatric symptoms, substance use, or risk behaviors for HIV). In a comparison of a therapeutic community and a psychosocial rehabilitation program, abstinence from substance use was higher among participants in the psychosocial rehabilitation program.<sup>61</sup> A study<sup>62,63</sup> comparing behavioral day treatment alone versus behavioral day treatment with abstinence-contingent housing and work therapy found higher rates of abstinence from drug use in the latter group at 2 and 6 months, but no significant difference at 12 months.

In one study,<sup>64,65</sup> chronically homeless individuals with severe Axis I mental illness (90% of whom had a concurrent alcohol or substance abuse disorder) were randomized to a program providing immediate independent housing with the offer of nonmandatory ACT and housing support services ("Housing First") or a program providing transitional housing followed by permanent supportive housing, contingent on sobriety and adherence to psychiatric treatment. The Housing First group spent less time hospitalized, but there were no differences between the groups in terms of psychiatric symptoms or substance use. A longitudinal study found that the assignment of a representative payee to manage funds for individuals receiving ACT had no effect on substance use or psychiatric symptoms.<sup>66</sup>

### **Interventions for Homeless People with Tuberculosis**

Detailed information on these studies is given in Appendix E (available online at [www.ajpm-online.net](http://www.ajpm-online.net)). Two good-quality studies focused on the treatment of latent tuberculosis (TB). Compared to usual care, a cash incentive increased adherence to an appointment for initial assessment of a positive tuberculin skin test.<sup>67</sup> In homeless people with latent TB receiving directly observed preventive therapy, cash incentives and non-cash vouchers at each visit were equally effective in increasing completion rates.<sup>68,69</sup>

### **Interventions for Homeless or Runaway Youths**

Detailed information on these studies is given in Appendix E (available online at [www.ajpm-online.net](http://www.ajpm-online.net)). Two fair-quality studies focused on homeless youths. A study<sup>70,71</sup> of an educational program intended to reduce sexual risk behaviors for HIV infection found that the number of educational sessions attended was significantly associated with reduced risk behaviors. In a study<sup>72</sup> that randomized runaway youths using a drop-in center to standard case management (maximum of 30 clients per case manager) or intensive case management (maximum of 12 clients per case manager, access to flexible funds to help meet the youths' needs, and enhanced supervision and support for the case manager), no significant differences in outcomes were observed.

### **Interventions for Homeless Families and Children**

Detailed information on these studies is given in Appendix E (available online at [www.ajpm-online.net](http://www.ajpm-online.net)). Two studies<sup>73</sup> focused on homeless families and/or children. In one study, substance-abusing homeless mothers entered a modified therapeutic community. They and their families were randomized to live at the treatment site or to make their own living arrangements. Mothers in the two groups had similar reductions in drug use.

Some general practitioners in the United Kingdom are said to be reluctant to register homeless patients in their practice because of the extra workload entailed.<sup>74</sup> A study from the United Kingdom showed that, compared to usual care, outreach by a health advocate significantly reduced families' utilization of primary health care, even after controlling for baseline characteristics.<sup>74</sup> The health advocate appeared to improve health-related quality of life, but this analysis was conducted in only a small subgroup of subjects.<sup>75</sup>

### **Homeless Women**

Detailed information on these studies is given in Appendix E (available online at [www.ajpm-online.net](http://www.ajpm-online.net)). Two RCTs examined educational programs intended to reduce HIV risk behaviors in homeless women. In one study,<sup>76</sup> whether the woman's partner participated in the program had no effect on mental health or HIV risk behavior outcomes. An educational program on coping strategies was associated with reduction in noninjection drug use, but had no effect on mental health, injection drug use, or sexual risk behaviors for HIV infection.<sup>76</sup> In another study,<sup>77</sup> an intensive educational intervention was compared to offering HIV testing with standard pre-test and post-test counseling. No differences were seen in terms of mental health outcomes or any risk behaviors for HIV infection.

## Homeless People at Emergency Departments or Admitted to Hospitals

Detailed information on these studies is given in Appendix E (available online at [www.ajpm-online.net](http://www.ajpm-online.net)). Two studies<sup>78,79</sup> examined interventions to reduce the use of health services by homeless people in the hospital setting. In one study,<sup>78</sup> homeless adults at an emergency department were randomized to receive compassionate care from a visiting volunteer or usual care. Individuals who received the intervention were less likely to return to an emergency department over the next 8 months. A study of hospitalized homeless veterans<sup>79</sup> examined the impact of discharge to a post-hospital transitional care facility for homeless people on length of stay in hospital. After adjustment for illness severity and other characteristics, length of stay in hospital was not significantly different among homeless inpatients discharged to the transitional facility compared to nonhomeless inpatients discharged to their homes. The authors interpreted this as evidence of effectiveness, based on the assumption that homeless patients would normally stay in hospital longer than nonhomeless patients.

## Discussion

Of >4500 articles on homelessness, <2% met inclusion criteria for this systematic review. A relatively small number of good- and fair-quality controlled studies are available to guide the selection of interventions to improve the health of homeless people. The evidence is most plentiful with respect to the treatment of homeless single adults with mental illness or substance abuse. Studies have examined a heterogeneous group of interventions for these individuals, in part due to regional differences in the characteristics and needs of homeless populations and the services available to them. Frequently, a specific intervention has been evaluated in only one good- or fair-quality controlled study. This heterogeneity often makes it difficult to identify a particular intervention as being clearly superior.

## Limitations

This review has certain limitations. Interventions relevant to the care of homeless people were excluded unless they were evaluated in homeless subjects. For example, methadone maintenance is an effective intervention<sup>80</sup> that should be considered for opiate-dependent individuals who are homeless, even though no study has specifically examined its use in homeless subjects. Healthcare system and social policy interventions (e.g., the provision of universal health insurance or increased availability of subsidized housing) may have substantial effects on the health of homeless people, but controlled designs

are rarely used to examine such interventions. Analyses of the cost-effectiveness of interventions<sup>81</sup> and the clinical significance of intervention effects were beyond the scope of this review. Finally, although only controlled studies were included in this review, other study designs may provide useful information on the effectiveness of interventions.

## Implications for Clinical Care and Policy

The data reviewed here indicate that interventions providing coordinated treatment and support for homeless adults with mental illness and/or substance abuse usually result in greater improvements in health-related outcomes than does usual care. However, when two types of interventions are compared, often no significant differences are found. One possible explanation for this observation is that once programs surpass a modest threshold of service intensity, commonly used outcome measures may lack the sensitivity needed to detect differences between treatment groups. Overall, these findings suggest that clinicians should focus on ensuring that homeless people are able to receive health care through coordinated treatment and support programs that are specifically adapted to the needs of the homeless. Rather than focusing on identifying the “most effective” treatment modality, it is probably more important to simply ensure the availability of at least one modality that has been shown to be effective.

Service providers who work with homeless people face an important question: To what extent is moving an individual from homelessness to stable housing important or even necessary to improve his or her health? This review focused on the effect of interventions on homeless people’s health, although many of the interventions also reduced the amount of time that subjects spent homeless.<sup>26,28,33,35,43,44,48,50,64,66</sup> Few controlled studies have examined the independent effect of providing supported or subsidized housing on the health of homeless individuals.<sup>28,32,44,46,48,64</sup> Surprisingly, these studies have not demonstrated consistent effects on physical health, mental health, or substance use, although significant reductions in healthcare utilization have been observed in a few studies.<sup>28,64</sup> This should not be viewed as an argument against programs that provide long-term housing for homeless people. The health outcome measures used in some of these investigations may not have been adequately sensitive to change. In addition, housing programs are critical to achieving the inherently worthwhile goal of ending homelessness, and they may be cost-effective in terms of cost per night of homelessness averted.<sup>48</sup>

## Implications for Research

Future research efforts should be broadened to reflect the diversity of the homeless population. Few con-

trolled studies have examined the treatment of conditions other than mental illness or substance abuse in single adults. Even more importantly, research has been lacking on interventions to meet the needs of runaway youths and homeless families and children. Given the opportunity to intervene at a formative stage in the life course, and the fact that these individuals constitute about one fourth of the U.S. homeless population,<sup>1</sup> further work in this area is clearly needed.

Investigators should consider the inclusion of usual care control groups in future studies. Some studies have assigned homeless individuals to two different interventions and observed statistically equivalent improvements in both groups; these studies were unable to reach definitive conclusions regarding the effectiveness of either intervention due to the possibility of “regression to the mean.”<sup>82</sup> Although researchers may cite ethical concerns or community resistance to using control groups, this review indicates that the pre-existing evidence for the superiority of a particular intervention is often quite limited.

The maximization of statistical power through adequate and balanced sample size in each study arm is critical. Based on data from positive RCTs included in this review,<sup>26,34,43,62</sup> we estimate that a clinically meaningful and realistically achievable effect size (e.g., the between-group difference in the mean value of a continuous, normally distributed outcome variable) is likely to be approximately 0.5 of the within-group standard deviation. Using these assumptions, outcome data on 65 subjects in each group would be needed to achieve 80% power to detect a difference at  $p < 0.05$ . For studies examining categorical outcomes, an even greater number of subjects may be required. Thus, our requirement of  $\geq 50$  subjects per group to receive a quality rating of good or fair is not overly stringent. Many previous studies have had inadequate sample size, and their negative findings may reflect insufficient statistical power.

Given the high rates of loss to follow-up among homeless subjects, procedures to optimize tracking of participants are critical.<sup>83,84</sup> In studies where the percentage of participants lost to follow-up varies greatly across treatment groups,<sup>32,35,48,61</sup> bias may result if loss to follow-up is systematically related to outcome status. Some studies have reported only health status, substance use, or healthcare utilization outcomes; future studies should report multiple outcomes to allow a comprehensive assessment of intervention effects.

In conclusion, effective interventions to improve the health of individuals experiencing homelessness are urgently needed. Findings from this systematic review can help guide clinicians, researchers, and policymakers as they design, implement, and evalu-

ate such interventions. This work should be linked to continuing efforts to address the problem of homelessness itself.

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