

Systematic Review of the Impact of Behavioral Health Homes on Cardiometabolic Risk Factors for Adults With Serious Mental Illness

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Objective: This systematic review examined the impact of health homes on cardiometabolic risk among adults with serious mental illness.

Methods: The Preferred Reporting Items for Systematic Reviews and Meta-Analyses procedures were used to conduct the systematic review. Databases were searched for peer-reviewed articles published between 1946 and August 2018 that compared health homes with a control condition (e.g., usual care and secondary data analyses using matched samples). Participants, interventions, comparisons, outcomes, and study design criteria were used to assess study eligibility. Studies were assessed for methodological quality by using the Quality Assessment of Before and After Studies With No Control Group and the Quality Assessment of Controlled Intervention Studies.

Results: Eighteen studies (i.e., 11 observational studies, four quasi-experimental studies, and three randomized

controlled trials) reported on 17 health homes. Most studies reported increases in receipt of screening for cardiometabolic risk factors and service use. There was a modest reduction in selected cardiometabolic risk factors among people with serious mental illness, but clinical outcomes varied widely among studies.

Conclusions: Improvement in cardiometabolic risk factors varied across the studies, and the clinical significance of these reductions was not clear. Peer support and self-management training may represent strategies to improve cardiometabolic risk factors. Colocation of services may not be enough to significantly affect cardiometabolic risk factors. Health homes that include standardized screening, peer support and self-management training, and intervention components that target interdependent risk factors may have a greater impact on clinical outcomes.

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People with serious mental illness comprise 4% to 6% of the population (1) and have a reduced life expectancy of 11 to 30 years compared with the general population (2–5). This disparity in mortality is mainly due to high prevalence of cardiovascular disease, obesity, and tobacco use (6). A critical strategy to improve health and reduce early mortality rates among persons with serious mental illness has been the creation of health homes (7), which integrate primary health care within community-based behavioral health care (8)—sometimes referred to as “reverse integration.” The aim of health homes is to better coordinate care and improve the overall health of people with serious mental illness.

Improved integration of the organization, financing, and delivery of primary care and behavioral health services has the potential to address longstanding systemic barriers to accessing care for people with serious mental illness (7). For instance, health homes may facilitate navigation of the

primary care and mental health systems; diminish denial of treatment due to the complexity of conditions; offer parallel, not disjointed treatment; and improve comprehensive

HIGHLIGHTS

- Health homes were associated with increased rates of cardiometabolic screening and service use.
- Improvement in cardiometabolic risk factors varied across the 18 studies reviewed, and the clinical significance of these reductions is not clear.
- Colocation of services may not be enough to significantly affect cardiometabolic risk factors.
- Health homes may have a greater impact on clinical outcomes if they include standardized screening, peer support and self-management training, and intervention components that target interdependent risk factors.

screening and assessment. The promise of health homes to improve care and outcomes has stimulated numerous national and state initiatives (7, 8).

Systematic reviews (9, 10) and evaluations (7, 11) of behavioral health homes have consistently noted that health homes lead to increased receipt of preventive care but that their impact on cardiometabolic risk factors has been variable (7, 9–11). Our objective was to systematically review the peer-reviewed published literature on health homes. Our objective was to examine the impact of health homes on cardiometabolic risk factors among adults with serious mental illness, including examination of strategies that seem to produce the best clinical outcomes, with the eventual goal of informing potential reforms of federal and state health care policies, health plans, and provider systems for treatment of adults with serious mental illness.

METHODS

Search Strategy

We followed Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) procedures (12). Our search strategy protocol was published in the PROSPERO International prospective register of systematic reviews (registration CRD42017056169). We searched the following databases for peer-reviewed articles dating from 1946 to August 2018: CINAHL, Cochrane Central, PubMed, Medline, PsycINFO, and Web of Science. We restricted the search to high-quality electronic reference databases that would allow us to search for the earliest health home models. The following search terms were used for serious mental illness: schizophrenia, disorder with psychotic features, psychotic, schizophrenia spectrum disorder, paranoia, serious mental disease, serious psychotic illness, persistent mental illness, persistent mental disease, schizoaffective disorder, bipolar disorder, serious mental illness, and severe mental illness. These terms were used in combination with the following terms for behavioral health homes: colocation, health home, medical health home, behavioral health home, integrated care, and primary care and mental health care. Each term was entered as a keyword and assigned the corresponding medical subject heading term. To identify articles not included in our original search, we reviewed reference lists of studies that met inclusion criteria, checked prior systematic reviews, and searched Google Scholar by using different combinations of the terms.

Study Selection Criteria

Studies were evaluated by two of us (KLF, PRD), who independently screened titles and abstracts. We (KLF, PRD) piloted our title and abstract review protocol on 10 references to ensure at least 80% concordance/agreement before reviewing the entire set of titles and abstracts. We (KLF, PRD) independently reviewed and rated all full text articles meeting inclusion criteria, resolving discrepancies in ratings

following discussion and arrival at consensus. As stated by PRISMA guidelines (12), we used the participants, interventions, comparisons, outcomes, and study design (PICOS) criteria (13) to assess study eligibility.

Participants. Studies that included individuals age ≥ 18 years with either a schizophrenia spectrum disorder (schizophrenia or schizoaffective disorder) or bipolar disorder were included.

Intervention. Behavioral health homes were defined as models in which primary care services were integrated into a mental health setting. This review focused only on this type of health home rather than health homes focused on substance use treatment or primary care facilities with embedded mental health care.

Comparisons. All included studies were required to have a comparison condition. All study comparison conditions were considered eligible, including other behavioral health home interventions, minimal interventions, usual care, pre-post studies with an experimental or quasi-experimental comparison condition, and secondary data analyses using matched (treated versus nontreated) samples. Any study without a comparison condition was excluded, including case studies, qualitative studies, and pre-post studies without an experimental or quasi-experimental comparison condition.

Outcomes. The outcomes of interest included impact on service utilization (i.e., primary care use, emergency department [ED] use, and hospital admissions); receipt of preventive screening (i.e., laboratory and physical measures of cardiometabolic risk factors); and impact on cardiometabolic risk factors (i.e., objective measures of blood pressure, blood glucose, body mass index, low-density lipoprotein [LDL] cholesterol, high-density lipoprotein [HDL] cholesterol, total cholesterol, triglycerides, cigarette use, and diagnosis of heart disease or hypertension). Studies that did not include at least one of the outcomes were excluded. Subjective measures, such as self-reported health status, were not included as outcomes.

Study design. We included studies with randomized controlled trials, pre-post designs with experimental or quasi-experimental comparison conditions, and secondary data analyses if there was a comparison condition and if outcomes were relevant to the effectiveness of the behavioral health home intervention. Research protocols, letters to the editor, review articles, pharmacological studies, and theoretical articles were excluded. Articles that were not peer reviewed were excluded in this systematic review. We recognize that evaluations of health homes have been reported in nonpeer-reviewed venues such as white papers, government reports, and contracted narratives; however, we chose to include only models that were tested with sufficient

scientific rigor to merit publication in a peer-reviewed journal.

Data Extraction

Relevant data from included studies were extracted in duplicate by two of us (PRD, MCL) by using a standardized data collection tool. Prior to data extraction, we (PRD, MCL) piloted the data collection tool on five included articles to identify and reconcile any unintended omissions of data. One of us (KLF) approved the final set of data and resolved any of the remaining data discrepancies. Extracted study data included study design, sample size, sociodemographic characteristics of the sample, study length, comparison group (control group) type, physical location of health home intervention (e.g., community mental health center, Veterans Administration [VA] facility), health home model description, and study outcomes.

Methodological Quality Assessment

All included studies were assessed for methodological quality by using two National Heart, Lung, and Blood Institute Quality Assessment tools that are commonly used and include instructions for their interpretation, the Quality Assessment of Before and After (Pre-Post) Studies With No Control Group (14) and the Quality Assessment of Controlled Intervention Studies (14). The former tool includes 12 discrete criteria, whereas the latter has 14. Examples of study criteria, which are rated as yes or no, include clarity of hypotheses, representativeness of the sample, sample size power calculations, and blinding of assessment procedures. After rating the study-specific criteria, a methodological quality rating of low risk of bias (good quality), moderate risk of bias (medium quality), or high risk of bias (poor quality) was assigned independently by two of us (PRD and MCL, with disagreements resolved through consultation with KLF).

RESULTS

The search identified 7,101 citations. Of these, 1,729 citations were duplicates. A total of 5,372 titles and abstracts were reviewed, and 5,323 ineligible studies were excluded. The full text of the remaining 49 articles was assessed further for inclusion criteria, and 18 articles met criteria and were included for analysis (see flow diagram in the online supplement).

This systematic review identified 18 studies that reported on 17 behavioral health homes (i.e., 11 observational studies, four studies with quasi-experimental designs, and three randomized controlled trials). As detailed below, studies examined health home models in community mental health centers, outpatient mental health settings, a community mental health center and federally qualified health center partnership, and an inpatient unit. Included studies reported on service utilization, receipt of preventive screening for cardiometabolic risk factors (i.e., laboratory and physical measures), and changes in cardiometabolic risk factors.

Methodological Quality Assessment

Studies were categorized as low risk of bias (good quality) (N=11) (15–25), moderate risk of bias (medium quality) (N=6) (26–31), and high risk of bias (poor quality) (N=1) (32) (Table 1). The most common causes for methodological quality concerns among studies were failure to report participants' baseline characteristics, lack of blinding of assessors, unclear description of the intervention or its delivery, no mention of statistical power, and infrequent assessment or a single assessment of outcomes.

The eligible studies were divided into two categories, health home studies conducted in a VA health home and those conducted in non-VA health homes, because the VA had already integrated primary care providers and behavioral health workers prior to the formal establishment of behavioral health homes (8). Additionally, the VA represents a single integrated health system that does not have distinct funding streams, and, therefore, it faces fewer of the administrative and financial barriers that limit integrated care in non-VA systems. Seven studies were conducted in a VA facility (16, 20, 21, 23, 24, 27, 30), five studies were conducted in community mental health centers (15, 18, 22, 25, 31), two studies were conducted in outpatient mental health settings (19, 26), three studies were conducted in the context of a community mental health center and federally qualified health center partnership (17, 28, 32), and one study was conducted in an inpatient unit (29).

Service Utilization

A total of 10 studies reported changes in service utilization (15–18, 22–27), of which seven were identified as low risk of bias (good quality) (15–18, 22–25) and two were categorized as medium risk of bias (medium quality) (26, 27). Four studies were conducted in the VA (16, 23, 24, 27), two studies were conducted in outpatient mental health settings (18, 25), three studies were conducted in a community mental health center (15, 22, 25), and one study was conducted in a combination of a community mental health center and a federally qualified health center (17). In Table 2, the results for service utilization are listed separately by methodological quality to assist readers in discerning the results.

Primary care utilization. Among studies conducted within a VA facility (all good quality), two studies found a significant increase in primary care use (16, 23).

Participants in a non-VA health home intervention group had a greater likelihood of having a primary care provider compared with participants in usual care (71.2% versus 51.9%, $p=.003$) (15); however, the frequency of visits was not reported. The same research group found in a later study (good quality) that primary care visits in the health home increased from a mean of 0.93 to a mean of 1.73 (versus from 0.65 to 0.86 in the usual care group). The group \times time interaction for this increase in visits was statistically significant ($p<.001$) (17).

TABLE 1. Studies of behavioral health homes (BHH) for people with serious mental illness, by level of bias^a

Study	Setting/type	Description of BHH model	Demographic characteristics			Comparison	Outcomes
			Intervention group	Comparison group	Low level of bias (good quality)		
Breslau et al., 2018 (18)	OP/observational and secondary data analysis	PBHCI program; implementation of the PBHCI program varied across the clinics	Wave 1, PBHCI group (N=6,712): age, 43.41±10.94; male, N=2,385 (35.5%); white, N=1,965 (29.2%); African American, N=2,272 (33.8%); Latino, N=1,733 (25.8%); Asian, N=61 (.9%); other race-ethnicity, N=681 (10.1%); serious mental illness, N=2,197 (32.7%); Wave 2, PBHCI group (N=1,881): age, 45.93±10.91; male, N=707 (37.6%); white, N=484 (25.7%); African American, N=664 (35.3%); Latino, N=410 (21.8%); Asian, N=26 (1.4%); other race-ethnicity, N=297 (15.8%); serious mental illness, N=895 (47.6%)	Wave 1, no IC group (N=13,012): age, 43.28±11.09; male, N=4,120 (31.6%); white, N=4,241 (32.5%); African American, N=4,214 (32.6%); Latino, N=2,725 (20.9%); Asian, N=278 (2.1%); other race-ethnicity, N=1,554 (11.9%); serious mental illness, N=3,794 (29.2%); Wave 2, no IC group (N=11,514): age, 44.81±11.14; male, N=3,847 (33.4%); white, N=3,637 (31.5%); African American, N=3,888 (33.7%); Latino, N=2,357 (20.4%); Asian, N=250 (2.1%); other race-ethnicity, N=1,382 (12.0%); serious mental illness, N=3,691 (32.1%)	Wave 1, no IC group (N=13,012): age, 43.28±11.09; male, N=4,120 (31.6%); white, N=4,241 (32.5%); African American, N=4,214 (32.6%); Latino, N=2,725 (20.9%); Asian, N=278 (2.1%); other race-ethnicity, N=1,554 (11.9%); serious mental illness, N=3,794 (29.2%); Wave 2, no IC group (N=11,514): age, 44.81±11.14; male, N=3,847 (33.4%); white, N=3,637 (31.5%); African American, N=3,888 (33.7%); Latino, N=2,357 (20.4%); Asian, N=250 (2.1%); other race-ethnicity, N=1,382 (12.0%); serious mental illness, N=3,691 (32.1%)	Propensity score-matched PBHCI group and no IC group (persons with serious mental illness who were never enrolled in the intervention)	Wave 1: hospital stays due to chronic health conditions increased significantly in the intervention group compared with the control group (odds ratio [OR]=1.21). Emergency room visits for behavioral health conditions decreased significantly compared with the control condition (OR=.89). Wave 2: hospital stays due to chronic health conditions increased significantly in the intervention group compared with the control group (OR=1.33). No additional significant differences in utilization in the intervention and control groups were identified in waves 1 or 2. The PBHCI program showed statistically significant improvement in LDL/cholesterol screening (OR=.21, 95% confidence interval [CI]=.12-.30, p<.05) for participants taking antipsychotics in one of the two research waves. Wave 1: the PBHCI program showed statistically significant improvement in glucose/HbA1c screening (OR=.22, 95% CI=.12-.33, p<.05). HbA1c monitoring was not affected in either wave.
Breslau et al., 2018 (19)	OP/observational and secondary data analysis	Same as Breslau et al., 2018 (18)	Same as Breslau et al., 2018 (18)	Same as Breslau et al., 2018 (18)	Same as Breslau et al., 2018 (18)	Same as Breslau et al., 2018 (18)	<i>continued</i>

TABLE 1, continued

Study	Setting/type	Description of BHH model	Demographic characteristics			Outcomes
			Intervention group	Comparison group	Comparison	
Druss et al., 2001 (16)	VA OP/RCT	Primary care services provided within a VA mental health clinic by a multidisciplinary team colocated within the VA mental health clinic. Team: full-time nurse practitioner and nurse case manager and part-time family practitioner and administrative assistant. Staff provided education, preventive services, and communication and coordination between primary care and mental health providers.	IC (N=59): age, 45.7±8.4; male, 59±100; white, N=45 (76.3%); schizophrenia, N=13 (22.0); posttraumatic stress disorder, N=19 (32.2%); major affective disorder, N=7 (11.9%); substance use disorder, N=15 (25.4%); other psychiatric diagnosis, N=5 (8.5%); severe psychiatric illness, N=47 (79.7%)	Usual care (N=61): age, 44.8±8.0; male, N=60 (98.4%); white, N=39 (63.9%); schizophrenia, N=12 (19.7%); posttraumatic stress disorder, N=16 (26.2%); major affective disorder, N=9 (14.8%); substance use disorder, N=18 (29.5%); other psychiatric diagnosis, N=6 (9.8%); severe psychiatric illness, N=44 (72.1%)	Usual care participants were provided referral to VA general medicine, located adjacent to the mental health clinic	Participants in the health home intervention group were significantly more likely to have had a primary care visit and also had a greater average number of primary care visits compared with participants in usual care. Participants in the health home were significantly more likely to receive preventive health care.
Druss et al., 2010 (15)	CMHC/RCT	Registered nurse provided medical education, information on medical care providers, and information on appointments. Motivational interviewing was used to monitor participants' readiness to change, support self-management skills, coach participants to interact more effectively with providers, and develop action plans to promote health behavior change. Registered nurses also enrolled uninsured participants in entitlement programs and coordinated care between primary and mental health care providers.	Health home intervention group (N=205): age, 47.0±8.1; male, N=302 (74.2%); African American, N=156 (76.5%); Latino, N=4 (2.0%); schizophrenia or schizoaffective disorder, N=75 (36.6%); bipolar disorder, N=22 (10.7%); posttraumatic stress disorder, N=11 (5.4%); depression, N=94 (45.9%); co-occurring substance use disorder, N=50 (24.4%)	Usual care (control) (N=202): age, 46.3±8.1; male, N=110 (54.4%); African American, N=159 (78.7%); Latino, N=2 (1.0%); schizophrenia or schizoaffective disorder, N=69 (34.2%); bipolar disorder, N=30 (14.9%); PTSD, N=9 (4.5%); depression, N=85 (42.1%); other psychiatric diagnosis, N=1 (5%); co-occurring substance use disorder, N=53 (26.2%)	Usual care participants were provided with a list with contact information to contact local primary care medical clinics	At 12-month follow-up, the health home intervention group received 58.7% of recommended preventive services (i.e., physical examinations, screening tests, vaccinations, and education), compared with 21.8% in the usual care group ($p<.001$). Specifically for screening, individuals in the health home intervention group had a higher likelihood of having a primary care provider (71.2% versus 51.9%, $p=.003$). Among participants with laboratory data (N=100), Framingham Cardiovascular Risk Scores were significantly better for intervention group (6.9%) than the control group (9.8%) ($p=.02$).

continued

TABLE 1, continued

Study	Setting/type	Demographic characteristics			Outcomes
		Description of BHH model	Intervention group	Comparison group	
Druss et al., 2017 (17)	CMHC and FQHC/RCT	Clinic staff included a part-time nurse practitioner with prescribing authority and a full-time nurse care manager, both supervised by an FQHC medical director. A treat-to-target approach was used for the cardiometabolic risk factors, with weekly supervision meetings focusing on patients whose test results were not within the normal range for blood pressure, glucose level, or cholesterol level. The care manager provided health education for lifestyle factors (e.g., smoking, diet) and logistical support to ensure that participants were able to attend their medical appointments. Both providers attended weekly rounds at the CMHC to facilitate integration with the mental health team.	Behavioral health home (N=224): age, 47.3±9.7; male, N=80 (36%); white, N=122 (54%); African American, N=95 (42%); other race-ethnicity, N=7 (3%); schizophrenia or schizoaffective disorder, N=49 (22%); bipolar disorder, N=108 (48%); depression, N=66 (29%); anxiety, N=1 (0%)	Usual care (N=223): age, 47.1±9.6; male, N=81 (39%); white, N=129 (58%); African American, N=84 (38%); other race-ethnicity, N=10 (4%); schizophrenia or schizoaffective disorder, N=40 (18%); bipolar disorder, N=122 (55%); depression, N=58 (26%); anxiety, N=2 (1%); substance use disorder, N=1 (0%)	Compared with usual care, primary care visits in the health home intervention group increased from a mean of 93 to a mean of 173 (65 to .86 in the usual care group). The group × time interaction was statistically significant (p<.001). Compared with usual care, the health home intervention was associated with significant improvements in use of preventive services (p<.001; Cohen's d=1.2, large effect). For most cardiometabolic outcomes, both groups demonstrated improvement, although there were no statistically significant differences between the two groups over time on diastolic blood pressure, total and LDL cholesterol levels, blood glucose level, and HbA1c level or on the Framingham risk score. There were modest, statistically significant differential improvements in systolic blood pressure (improvements of 4.9 points [intervention] and 3.1 [usual care] points, p=.04).
Kilbourne et al., 2011 (20)	VA OP/observational and cross-sectional study	The health home intervention group colocated general medical care within the mental health clinic.	N=40,600. Age, 55±11.6; male, 91%; African American, 26%; no report of specific serious mental illness diagnosis or general medical diagnosis	VA participants who did not receive care at a colocated facility. Detailed description of sample in non-colocated sites was not included in the published article.	Participants in the health home intervention group were more likely to receive all cardiometabolic tests, including diabetes, blood pressure, BMI, and cholesterol screening (OR=1.26, 95% CI=1.18–1.35, p<.001).

continued

TABLE 1, continued

Study	Setting/type	Demographic characteristics			Outcomes
		Description of BHH model	Intervention group	Comparison group	
Kilbourne et al., 2011 (21)	VA OP/observational and cross-sectional study	Same as Kilbourne et al., 2011 (20)	N=7,514, all with serious mental illness. Age, gender, and race not reported	Same as Kilbourne et al., 2011 (20)	Participants in the health home intervention group were more likely than those without colocation to receive foot exams (OR=1.87, $p<.05$), colorectal cancer screening (OR=1.54, $p<.01$), and alcohol misuse screening (OR=2.92, $p<.01$). They were also more likely to have their blood pressure controlled (<140/90 mmHg; OR=1.32, $p<.05$) but less likely to have an HbA1c level <9% (OR= .69, $p<.05$). A higher proportion of participants in the health home intervention group engaged in outpatient medical services following program enrollment ($p<.003$, clinic 1; $p<.001$, clinic 2) compared with the control condition. Health home intervention group clinic 1 was associated with a decrease in the proportion of participants with an inpatient hospital admission ($p=.04$).
Krupski et al., 2016 (22)	CMHC/observational and secondary data analysis	A primary care physician and nurse care managers were embedded within a CMHC. Staff screening and referral services for prevention and treatment, care management, and additional prevention and wellness services	Clinic 1, PBHCl (N=373): Age, 47.60±11.12; male, N=256 (68%); American Indian/Alaska Native, N=6 (2%); Asian, N=18 (5%); African American, N=137 (37%); Hispanic, N=10 (3%); multiracial, N=9 (2%); Native Hawaiian, N=1 (<1%); other, N=5 (1%); white, N=184 (49%); serious mental illness (100%). Clinic 2, PBHCl (N=389): age, 46.00±10.18; male, N=265 (68%); American Indian/Alaska Native, N=9 (2%); Asian, N=12 (3%); African American, N=110 (28%); Hispanic, N=15 (4%); multiracial, N=6 (2%); Native Hawaiian, N=1 (<1%); white, N=229 (59%); serious mental illness (100%)	Clinic 1, comparison (N=373): Age, 47.55±13.15; male, N=270 (72%); American Indian/Alaska Native, N=6 (2%); Asian, N=20 (5%); African American, N=152 (41%); Hispanic, N=7 (2%); multiracial, N=11 (3%); other, N=6 (2%); white, N=168 (45%); serious mental illness (100%). Clinic 2, comparison (N=373): age, 47.00±11.31; male, N=261 (67%); American Indian/Alaska Native, N=10 (3%); Asian, N=10 (3%); African American, N=124 (32%); Hispanic, N=22 (6%); multiracial, N=5 (1%); white, N=208 (53%); serious mental illness (100%)	Propensity score-matched persons with serious mental illness who were never enrolled in the intervention (clinic 1, N=746; clinic 2, N=778)

continued

TABLE 1, continued

Study	Setting/type	Description of BHH model	Demographic characteristics			Outcomes
			Intervention group	Comparison group	Comparison	
McGuire et al., 2009 (23)	VA OP/observational study and pre-post analysis	Participants were screened and referred to the health home intervention group (i.e., primary and mental health care services colocated within the VA mental health outpatient center) within the same day. Case managers provided short-term assistance for participants. Primary care providers included a primary care physician and three advanced-practice registered nurses.	Homeless veterans (N=260): age, 45.8±7.0; male, N=259 (99%); African American, N=130 (50%); bipolar disorder, 20%; depression, 42%; PTSD, 17%; schizophrenia, 13%; substance abuse (drug), 48%; alcohol use disorder, 45%	Same as original sample	Preintegration of primary care services within the VA mental health outpatient center. Medical center was .5 miles from mental health facility and the wait for appointments was approximately 2 months.	Compared with the demonstration (control) group, the health home intervention group had fewer days to primary care enrollment (3±1.8 compared with 53.2 ±1.7) and received significantly more prevention services (including tobacco use screening, depression screening, colorectal cancer screening, breast cancer screening, and alcohol abuse screening) (.57±.1 compared with .44 ±.1) and primary care visits (2.3 more visits over 18-months of follow-up) and significantly fewer emergency department visits (4.3±.7 compared with 5.0±6 mean visits).
O'Toole et al., 2011 (24)	VA PCMH/quasi-experimental study	Traditional patient-centered medical home model with the addition of a special clinic team to manage participants with serious mental illness. Clinic team tailored access and care to address population-specific needs, and provided intensive registered nurse and social work case management with small caseloads. Staff were also trained on specific cultural competencies.	Total N=457. Mean age, not reported; ages ≥65, N=167 (36.5%); male, N=312 (68.2%); race-ethnicity, not reported; serious mental illness, N=74 (16.1%)	Same as original sample	Preimplementation versus full implementation of the patient-centered medical home	For participants with serious mental illness, primary care visits increased from 64.9% (1.30 visits per participant) to 82.4% (3.04 visits per participant) from preimplementation to full implementation of the patient-centered medical home. Average length of hospital stay decreased from 8.75 days to 6.0 days. However, there was also an increase in emergency department use among people with serious mental illness (p<.05).

continued

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TABLE 1, continued

Study	Setting/type	Demographic characteristics			Outcomes
		Description of BHH model	Intervention group	Comparison group	
Tepper et al., 2017 (25)	CMHC/quasi-experimental and secondary data analysis	Health home services included on-site medical care and chronic disease screening, health promotion, support for care coordination and transitions, and opportunities for peers to engage with one another (such as social functions and educational workshops). Electronic health records included alerts for patient transitions through emergency departments or inpatient units and provided a registry for monitoring patients' health status, service delivery, and discharge.	Behavioral health home (N=424): mean age, 48; male, N=224 (53%); white (64%); African American (22%); Hispanic (2%); Asian (2%); psychotic disorder (87%); bipolar disorder (13%)	Control (N=1,521): mean age, 50; male, N=745 (49%); white (59%); African American (18%); Hispanic (8%); Asian (2%); psychotic disorder (63%); bipolar disorder (37%)	Psychiatric hospitalizations declined for health home participants (22 to .10) and remained stable for participants in the control group (.145 and .147) (p=.002 between groups); no differences between groups in medical hospitalizations. Health home participants were more likely to receive HbA1c screening; however, there were no differences between groups in lipid monitoring. No significant differences between groups in metabolic monitoring among participants with diabetes.
Boardman, 2006 (26)	OP/quasi-experimental study	Primary care was colocated within a mental health outpatient clinic. Primary health care was provided by a nurse practitioner (including a physical examination, laboratory tests, referral for additional tests, and ongoing follow-up). Mental health and substance abuse counseling, psychopharmacology, and case management were also provided on-site. The nurse practitioner communicated with other care providers.	Experimental group (N=39): mean age not reported; age range 20–69; male, N=14 (37%); race-ethnicity not reported; serious mental illness (100%)	Usual care (control) (N=37): mean age not reported; age range 20–69; male, N=9 (25%); race-ethnicity not reported; serious mental illness (100%)	The health home intervention group reported a 42% lower number of emergency department visits, 50% increased routine medical care, 70% greater incidence of physical examinations, and notable increases in health care screens (i.e., diabetes, hypertension) compared with the usual care group.

continued

TABLE 1, continued

Study	Setting/type	Description of BHH model	Demographic characteristics			Outcomes
			Intervention group	Comparison group	Comparison	
Scharf et al., 2016 (28)	CMHC and FQHC/ quasi-experimental study	PBHCI clinic include screening and referral for general medical illness prevention and treatment, registry and tracking system for general medical needs and outcomes, care management, and prevention and wellness support.	PBHCI clinics (N=322): age, 42±12; male, N=601 (75.9%); white, N=231 (71%); African American, N=51 (16%); Latino, N=15 (5%); other, N=25 (8%); anxiety, N=33 (10%); bipolar disorder, N=79 (25%); schizophrenia, N=91 (28%); major depressive disorder, N=85 (26%)	Control (N=469): age, 45±12; male, N=162 (34.5%); white, N=393 (84%); African American, N=21 (4%); Latino, N=17 (4%); other, N=38 (8%); anxiety, N=54 (12%); bipolar disorder, N=97 (21%); schizophrenia, N=120 (26%); major depressive disorder, N=143 (30%)	PBHCI vs. usual care (N=791)	Participants in the intervention group had better outcomes for cholesterol: mean reductions in total cholesterol were greater by 36 mg/dL (p<.01), mean reductions in LDL cholesterol were greater by 35 mg/dL (p<.001), and mean increases in HDL cholesterol were greater by 3 mg/dL (p<.05).
Tatreau et al., 2016 (29)	IP/observational study and cross-sectional analysis	A locked inpatient unit included an embedded medical team. The team included a physician's assistant supervised by a physician.	IC group (N=220): age, 36.1±14.3; male, N=146 (66%); white, N=93 (42%); black, N=109 (50%); Asian, N=2 (1%); other race-ethnicity, N=16 (7%); Hispanic, N=6 (3%); schizophrenia spectrum disorder, N=144 (65%); bipolar disorder N=69 (31%); depression, N=35 (16%); autism, N=11 (5%)	TAU group (N=232): age, 38.8±14.5; male, N=150 (65%); white, N=141 (61%); black, N=67 (29%); Asian, N=1 (4%); other race-ethnicity, N=23 (10%); Hispanic, N=6 (3%); schizophrenia spectrum disorder, N=187 (81%); bipolar disorder, N=101 (44%); depression, N=58 (25%); autism, N=2 (1%)	A locked inpatient unit that provided treatment as usual medical care. In this model medical care is provided by resident psychiatrists supervised by attending psychiatrist. A hospitalist is available as needed for consultation regarding medical issues.	Significantly more health screening tests were ordered for the control group compared with the health home intervention group (i.e., HbA1c, 56% versus 16%, p<.001; glucose, 99% versus 66%, p<.001; and lipids, 61% versus 20%, p<.001).
Pirraglia et al., 2012 (30)	VA, OP/observational study and pre-post analysis	A primary care clinic staffed by one primary care physician and patient care assistant and colocated and integrated in the VA mental health outpatient program. The integrated clinic uses open-access scheduling, and primary care visits are scheduled to co-occur with mental health care visits.	Veterans (N=97): age, 55.3±10; male, N=92 (95%); white, N=83 (86%); schizophrenia, N=23 (24%); schizoaffective disorder, N=24 (25%); psychosis, not otherwise specified, N=4 (4%); bipolar disorder, N=14 (14%); major depressive disorder, N=36 (37%); alcohol abuse/dependence, N=41 (42%); substance abuse/dependence, N=28.	Same as original sample	1-year pre-enrollment in the integrated clinic compared with 1-year postenrollment.	Compared with the control group, participants in the health home intervention group had significantly improved goal attainment for blood pressure, LDL cholesterol, triglycerides, and body mass index; there were no statistically significant changes for HDL cholesterol or HbA1c.

continued

TABLE 1, continued

Study	Setting/type	Demographic characteristics				Outcomes
		Description of BHH model	Intervention group	Comparison group	Comparison	
Putz et al., 2015 (31)	CMHC/observational study and pre-post analysis	Participants were referred by their mental health provider to this collaborative care program that included a clinical social worker, physician specializing in metabolic diseases, a family nurse practitioner, two nurse care managers, a peer support specialist, a part-time wellness coach, and an office assistant. Participants received a health assessment, were assigned a medical case manager, and were offered enrollment in one or more wellness programs (e.g., diabetes support, weight-loss support, tobacco cessation, physical activity instruction, stress management, medical self-management, and peer support).	Total (N=169): age 46.3±12.04; male, N=61 (36%); white, N=154 (91.1%); African American, N=11 (6.5%); American Indian, N=4, (2.4%); primary psychotic disorder (42%); primary mood/anxiety disorder (41.4%); borderline personality disorder, ADHD, intermittent explosive disorder, or other (10.7%)	Same as original sample	The control condition was a baseline measurement of study participants.	At 6-month follow-up, significant decreases were found in the following risk factors in the health home intervention group: weight among participants who were overweight and obese at baseline (t=4.19, df=92, p<.001); HDL and LDL cholesterol among at-risk for participants with cardiovascular disease (t=-2.58, df=37, p=.016); significant decrease in cigarette use among baseline cigarette smokers (t=2.65, df=37, p=.012); systolic blood pressure (t=4.997, df=7, p<.002); and diastolic blood pressure (t=3.96, df=15, p<.001).
Snyder et al., 2008 (27)	VA, PC/ observational and ecological study	Medical school residents provide primary and psychiatric care for participants within a VA medical center	Psychiatry primary medical care (N=23): age, 52.2±7.5; male, N=23 (100%); race-ethnicity, not reported; bipolar disorder, N=12 (52.2%); schizophrenia, N=9 (39.1%); schizoaffective disorder, N=1 (4.3%); delusional disorder, N=1 (4.3%)	Usual care (control) (N=23): age, 51.8±8.5; male, N=23 (100%); race-ethnicity, not reported; bipolar disorder N=12 (52.2%); schizophrenia, N=8 (34.8%); schizoaffective disorder, N=3 (13%)	Usual care defined as treatment in the VA mental health clinics and primary care treatment in a general medical ambulatory clinic by staff or trainees (N=46)	There was no difference between the health home intervention group and control group on preventive health screenings, emergency department visits, or inpatient psychiatry.

continued

TABLE 1, continued

Study	Setting/type	Demographic characteristics			Outcomes
		Description of BHH model	Intervention group	Comparison group	
Gilmer et al., 2016 (32)	Observational and ecological study/ model 1, mobile health teams; model 2, CMHC and FQHC	Model 1: integrated mobile health teams paired with an assertive community treatment model for mental health care and FQHCs for general medical care, provided by mobile team. Model 2: integrated clinics paired CMHCs with FQHCs.	High level of bias (poor quality)		
			High-integration homes (N=1,292): mean age, gender, race-ethnicity not reported; serious mental illness (100%)	Low-integration homes (N=649): mean age, gender, race-ethnicity not reported; serious mental illness (100%)	Models were compared based on level of integration (high vs. low) (N=1,941)
					Highly integrated programs were associated with greater improvement in screening rates for blood pressure, cholesterol, and blood glucose and with reduced risk of hypertension, high-risk cholesterol, and prediabetes/diabetes compared with less integrated programs. In the highly integrated group, there was a significant reduction in hypertension yet an increase in prediabetes or diabetes (p= .01).

^a Abbreviations: ADHD, attention-deficit hyperactivity disorder; CMHC, community mental health center; FQHC, federally qualified health center; HDL, high-density lipoprotein; IC, integrated care; IP, inpatient psychiatric unit; LDL, low-density lipoprotein; OP, mental health outpatient; PBHCl, Primary Behavioral Health Care Integration; PC, primary care; PCMH, patient-centered medical home; PTSD, posttraumatic stress disorder; RCT, randomized control trial; TAU, treatment as usual; VA, U.S. Department of Veterans Affairs.

ED utilization. ED utilization results were not consistent across studies of VA health homes. One study (good quality) found that participants in the health home intervention group had fewer mean \pm SD days with an ED visit compared with the control group (4.3 ± 7.0 versus 5.0 ± 6.0), but the difference was not statistically significant (23). Another study (good quality) at a VA health home found a statistically significant increase in ED visits among participants in the health home intervention group compared with the control condition ($p < 0.05$) (24). A third study (medium quality) at a VA health home found no difference between the intervention and control groups on ED visits (27).

Among studies of non-VA health homes, one study (good quality) showed a significant decrease in ED utilization in the health home intervention group compared with a control condition (18); however, the results were not replicated in a subsequent trial (18). Another study at a non-VA health home (medium quality) found the health home intervention group had 42% fewer emergency department visits compared with the control group (26).

Psychiatric hospitalizations. One study at a VA health home (medium quality) found no difference between the intervention and control groups on inpatient psychiatric admissions (27). Decreases in psychiatric hospitalizations were not consistent across studies in non-VA health homes. One study (good quality) showed a decrease in the proportion of participants with an inpatient hospital admission ($p = 0.04$) in one Primary Behavioral Health Care Integration (PBHCl) clinic, but not in the other (22). Another study (good quality) of a non-VA health home found that psychiatric hospitalizations declined for health home participants (from 0.22 to 0.10) and remained stable for participants in the control group (0.145 and 0.147) ($p = 0.002$ between groups) (25).

Medical hospitalizations. In one study (good quality) at a VA health home, the average length of a medical hospital stay for patients with serious mental illness decreased from 8.75 days to 6.0 days, a nonstatistically significant change (24). Medical hospitalization outcomes were null or negative across studies of non-VA health homes. One study (good quality) found no significant differences in medical hospitalization utilization in the health home versus the control group (25). Another study (good quality) found that hospital stays due to chronic health conditions increased significantly in the intervention group compared with the control group (19).

Outpatient medical services. In a study (good quality) of two clinics in a non-VA health home, the proportion of participants who engaged in outpatient medical services following program enrollment was higher in the health home group than in the control group ($p < 0.003$, clinic 1; $p < 0.001$, clinic 2) (22). In another study (medium quality), the health home group had a 50% increase in routine medical care compared with the usual care group (26). None of the identified studies

TABLE 2. Studies that reported on the impact of behavioral health homes on service utilization, by level of bias^a

Study	ER visits	PC visits	Hospital stays	Psychiatric hospital stays	Medical hospital stay	Inpatient psychiatry stay	OP medical services
Low level of bias (good quality)							
Breslau et al., 2018 (18)	* (+/-) R		* (-) R				
Druss et al., 2001 (16) (VA)		* R					
Druss et al., 2017 (17)		* R					
Krupski et al., 2016 (22)			* R				* R
McGuire et al., 2009 (23) (VA)	* R	* R					
O'Toole et al., 2011 (24) (VA)	* (-) R						
Tepper et al., 2018 (25)				* R	(o/o) R		
Medium level of bias (medium quality)							
Boardman, 2006 (26)	R	R					
Snyder et al., 2008 (27) (VA)	(-/-) R					(-/-) R	

^a The "R" indicates that a study reported on the selected outcome. *, statistically significant results; (-), negative finding; (+/-), effect not replicated in a second sample; (-/-), improvement, but no difference compared with the control; (o/o), no improvement in either group. ER, emergency room; OP, outpatient; PC, primary care; VA, U.S. Department of Veterans Affairs.

conducted in a VA health home included outpatient medical services as an outcome.

Screening for Cardiometabolic Risk Factors

Twelve studies reported changes in screening for cardiometabolic risk factors (15–17, 19–21, 23, 25–27, 29, 32) (Table 3). Among these studies, eight were classified as having low risk of bias (good quality) (15–17, 19, 20, 21, 23, 25), three were categorized as having a medium risk of bias (medium quality) (26, 27, 29), and one was categorized as having a high risk of bias (poor quality) (32). Five studies were conducted at a VA facility (16, 20, 21, 23, 27), one study was conducted in an inpatient mental health setting (29), two studies were conducted in outpatient mental health settings (18, 26), two studies were conducted in community mental health centers (15, 25), and two studies were conducted in the context of a partnership between a community mental health center and a federally qualified health center (17, 32).

Two studies examined preventive health care at VA health homes (16, 27). Preventive health care, as defined by the U.S. Preventive Services Task Force guidelines, includes blood pressure screening, mammogram, Pap smear, chlamydia and gonorrhea screening, cholesterol screening, colorectal cancer screening, diabetes screening, and HIV screening (17). In one study (good quality), compared with participants in usual care, participants in the health home group had a statistically significant increase in receipt of preventive health care (16). By contrast, one study (medium quality) found no difference between the intervention and control groups in preventive health screening (27). Two studies (good quality) found that for non-VA health homes, the intervention was associated with significant improvements in receipt of preventive services compared with the control condition ($p < 0.001$; Cohen's $d = 1.2$, large effect (17); 58.7% versus 21.8%, $p < .001$) (15).

Other studies (good quality) of VA health homes found statistically significant increases for the health home groups compared with control groups in foot exams among people with diabetes (21) and screening for the following conditions: colorectal cancer and alcohol misuse (21, 23); lipids, glucose, body mass index, and blood pressure (20); and breast cancer, prostate cancer, tobacco use, and major depressive disorder (23).

Two studies of non-VA health homes found nonstatistically significant improvements in specific types of screening in the health home group compared with the control group. In a poor-quality study, screening for blood pressure, cholesterol, blood glucose, hypertension, and high-risk cholesterol was better in the intervention group (32). In another study (medium quality), the health home was associated with an increase in physical examinations, diabetes screening, and hypertension screening (26).

Other studies found mixed results for individual screening (25, 29). One study (good quality) found increases in HbA1c screening but not in lipid monitoring in the health home group (25). Another study (medium quality) found increases in screening for HbA1c, glucose, and lipids in the control group (i.e., treatment as usual) compared with the health home group (29).

One study (good quality) demonstrated variable results (19). In wave 1 of implementation of a PBHCI program, participants experienced statistically significant improvement in glucose/HbA1c screening (odds ratio [OR]=0.22, 95% confidence interval [CI]=0.12–0.33, $p < 0.05$), but these results were not replicated in the wave 2 sample. Further, the PBHCI program showed statistically significant improvement in low-density lipoprotein/cholesterol screening (OR=0.21, 95% CI=0.12–0.30, $p < 0.05$) for participants taking antipsychotics, but the improvement was not replicated in wave 2 (19).

Two studies (good quality) of non-VA health homes found null results (19, 25). One study found HbA1c

TABLE 3. Studies that reported on the impact of behavioral health homes on screening for cardiometabolic risk factors, by level of bias^a

Screen conducted								
Diabetes (HbA1c, glucose, foot exam)	BP	BMI	Cholesterol	Colorectal cancer	Alcohol misuse	Depression	Tobacco use	Physical exams
Study	Preventive services							
Low level of bias (good quality)								
Breslau et al. 2018 (18)								
Breslau et al., 2018 (19)		(o/o) R	* (+/-) R		* (+/-) R			
Druss et al., 2001 (16) (VA)	* R							
Druss et al., 2010 (15)	* R							
Druss et al., 2017 (17)	* R		* R					
Kilbourne et al., 2011 (20) (VA)		* R	* R	* R	* R			
Kilbourne et al., 2011 (21) (VA)		* R				* R	* R	
Krupski et al., 2016 (22)								
McGuire et al., 2009 (23) (VA)						* R	* R	* R
Tepper et al., 2017 (25)		R			(-/-) R			
Medium level of bias (medium quality)								
Boardman, 2006 (26)		R	R					R
Tatreau et al., 2016 (29)		* (-) R			* (-) R			
Snyder et al., 2008 (27) (VA)	(-/-) R							
High level of bias (poor quality)								
Gilmer et al. 2016 (32)		R	R		R			

^a The "R" indicates that a study reported on the selected outcome. *, statistically significant results; (-), negative finding; (+/-), effect not replicated in a second sample; (-/-), improvement, but no difference compared with the control; (o/o), no improvement in either group. BP, blood pressure; BMI, body mass index; VA, U.S. Department of Veterans Affairs.

monitoring was not affected in two waves of the health home intervention (19). Another study found no significant differences between the health home and control groups in metabolic monitoring among participants with diabetes in (25).

Cardiometabolic Risk Factor Outcomes

A total of seven studies reported changes in cardiometabolic risk factor outcomes (15, 17, 21, 28, 30–32) (Table 4), of which three were identified as low risk (good quality) (15, 17, 21), three were categorized as medium risk (medium quality) (28, 30, 31), and one was categorized as high risk (poor quality) (32). Two studies were conducted in the VA (21, 30), one study was conducted in a community mental health center (31), and three studies were conducted in a partnership between a community mental health center and a federally qualified health center (17, 28, 32).

Studies that examined changes in cardiometabolic risk factors at VA health homes produced mixed results (21, 30). One study (good quality) found statistically significant improvements in blood pressure control for the health home group but also found that these participants were less likely than members of the control group to have well-controlled (<9%) HbA1c (OR=0.69, $p<0.05$) (21). Another study (medium quality) found statistically significant improvements in

body mass index, triglycerides, blood pressure control, and LDL cholesterol for the health home versus the control group (30). Yet, in this study there were no statistically significant changes in HDL cholesterol or HbA1c in the health home or control groups (30).

Two studies (medium quality) produced statistically significant improvements in weight (31), LDL cholesterol (28, 31), systolic and diastolic blood pressure (31), HDL cholesterol (28, 31), total cholesterol (28), and cigarette use (31) among participants in non-VA health homes. However, the remaining studies of non-VA health homes produced mixed results (17, 32). One study (good quality) found statistically significant improvements between groups in systolic blood pressure but no difference on other cardiometabolic outcomes, including diastolic blood pressure, total and LDL cholesterol levels, blood glucose level, HbA1c level, and Framingham risk score (17). Another study (poor quality) found a significant reduction in hypertension yet an increase in prediabetes or diabetes in the health home versus the control group ($p=0.01$) (32).

Strategies to Augment Clinical Improvement

Four studies described an enhanced health home model, which included self-management training (e.g., medical self-management, stress management) (15, 17, 18, 31), peer

support (31), coaching on how to interact more effectively with providers (i.e., self-advocacy) (15), coordinated care between primary and mental health care providers (15), and action planning to promote health behavior change (15).

DISCUSSION

Behavioral health homes may improve the lives of adults with serious mental illness, but colocation of services may not be enough to affect cardiometabolic risk factors, which are responsible for high rates of morbidity and early mortality. This systematic review identified 18 studies that reported on 17 behavioral health homes. Most of the studies reviewed suggested that health homes were effective in increasing screening and service use among adults with serious mental illness. Findings were mixed as to the effectiveness of health homes in improving cardiometabolic risks. Potential strategies that may enhance clinically significant improvement in cardiometabolic risk factors include peer support and illness self-management training.

In theory, increased service utilization could reduce health care costs in the long run by addressing cardiometabolic risk factors, but the impact on costs is likely to be modest in the absence of dedicated efforts to improve health behaviors, given that health behaviors are estimated to contribute four times more proportionally to premature death (40%) than differences in health care (10%) (33). Improving integration and receipt of health services alone, without engaging people with lived experience of serious mental illness in health behavior change activities is unlikely to result in significant and lasting improvements in health and long-term reductions in costs.

This systematic review found that screening for cardiometabolic risk factors in health homes has improved since a previous evaluation of health homes conducted by the RAND Corporation (7), which included four studies demonstrating statistically significant changes in screening (15, 17, 20, 21) and four finding nonstatistically significant improvements in screening (16, 23, 26, 32). Few studies that screened for cardiometabolic risk factors found increases in some but not all of the factors studied (25, 27, 29); no differences in cardiometabolic screening between treatment groups (27); or negative results (meaning screening increased in the control group but not in the behavioral health home) (29). Variation in outcomes across reviewed studies may be due to nonstandardization of health home screening practices. Standardized screening practices could better enable providers to identify and address problems using a population health approach.

Findings were mixed with regard to the impact of health homes on improvement in cardiometabolic risk factors. Health home models often target discrete modifiable risk factors versus composite risk factors. For example, some health homes have targeted dietary practices such as salt reduction to reduce blood pressure.

TABLE 4. Studies that reported on the impact of behavioral health homes on cardiometabolic risk factors, by level of bias^a

Study	BP control	Diastolic BP	Systolic BP	Heart disease risk	TC	HDL	LDL	Cigarette use	BMI/weight	Hyper-tension	HbA1c	Blood glucose	Triglycerides
Low level of bias (good quality)													
Druss et al., 2010 (15)				* R									
Druss et al., 2017 (17)		(-/-) R	* R	(-/-) R	(-/-) R		(-/-) R				(-/-) R	(-/-) R	
Kilbourne et al., 2011b (21) (VA)	* R										* (-) R		
Medium level of bias (medium quality)													
Scharf et al., 2016 (28)					* R	* R	* R						
Pirraglia et al., 2012 (30) (VA)	* R				(-/-) R	* R			* R		(-/-) R		* R
Putz et al., 2015 (31)		* R	* R			* R	* R	* R	* R				
High level of bias (poor quality)													
Gilmer et al., 2016 (32)										* R		* (-) R	

^aThe "R" indicates that a study reported on the selected outcome. * statistically significant results; (-/-) negative finding; (+/-) effect not replicated in a second sample; (-/-), improvement, but no difference compared with the control; (o/o), no improvement in either group. BP, blood pressure; BMI, body mass index; HDL, high-density lipoprotein; LDL, low-density lipoprotein; TC, total cholesterol; VA, U.S. Department of Veterans Affairs.

Individuals with serious mental illness commonly present with several cardiometabolic risk factors and general medical conditions (6). The potential for health homes to widely affect excess morbidity and mortality rates for adults with serious mental illness is limited when only a few discrete risk factors are targeted. In addition, studies of health homes largely reported statistically significant reductions in cardiometabolic risk factors, but they did not report on the proportions of individuals who achieve clinically significant reductions or normalized values in key parameters such as BMI, blood pressure, lipids, and HbA1c. In one study that used a multicomponent approach, the health home was required to assess the impact of physical examinations, screening tests, vaccinations, and education on exercise, self-examination, smoking, nutrition, and weight among 100 participants (15). The study resulted in positive cardiometabolic outcomes on a composite scale (i.e., Framingham cardiovascular risk scores were significantly better for the intervention group [6.9%] compared with the control group [9.8%] [$p=0.02$]) (15).

Morbidity and mortality risk are affected by numerous interacting and modifiable factors that range from biological influences (e.g., chronic health conditions) to psychological (e.g., depressive or anxiety symptoms), behavioral (e.g., physical inactivity, tobacco use), and social (e.g., isolation, loneliness) characteristics. Interventions targeting interdependent risk factors by using a “whole person” approach may positively affect multiple cardiometabolic risk factors and multiple indicators of health status. One such intervention (not included in this review) is integrated illness management and recovery (I-IMR), which teaches people with serious mental illness about multiple chronic general medical conditions as well as serious mental illnesses such as schizophrenia and bipolar disorder; how physical health and mental health are related; and how to better manage them together. I-IMR also provides training in obtaining social support and improving health behaviors (e.g., exercise, healthy diet, smoking cessation) (34).

Among the studies reviewed here, health homes that included elements of peer support and training in self-management skills showed the greatest reduction in cardiometabolic risk factors (17, 31). Building on previous evaluations of health homes (7, 9), systematic reviews (9, 10), and the Interim Report to Congress on the Medicaid Health Home State Plan Option (11), our review used a systematic approach and identified potential strategies to promote health behavior change, including self-management training (15, 17, 31) and peer support (31), which have not traditionally been included in health home models (7) in spite of evidence showing that these approaches help people with serious mental illness to better manage chronic general medical conditions (i.e., diabetes). For example, compared with usual care, I-IMR increased medical and psychiatric self-management skills and reduced hospitalizations among people with serious mental illness (34). If health homes are to have a greater impact on clinical outcomes, peer support

and illness self-management training may need to be included as core components. Including these types of evidence-based interventions within behavioral health homes would require the development of new financing mechanisms as well as a shift in the culture of behavioral health settings, which have not traditionally embraced management of general medical illness as a core responsibility. Future research on the impact of peer support and self-management and the integration of these services within health homes is needed.

We acknowledge several limitations of this review. First, the lack of longitudinal outcomes in the included studies prevented us from assessing the persistence of reduced cardiometabolic risk factors over time. Further research is needed to determine how to sustain clinical improvements, especially among Medicaid beneficiaries, given that long-term risk reduction is critical to reduce mortality risk and control Medicaid costs. Second, although participant age ranged greatly across the studies, from 18 to 75 years, the average age was 47, indicating that our findings may not generalize to particular cohorts of people with serious mental illness, such as older adults or young adults. Older adults with serious mental illness in particular are at greater risk of developing medical comorbidity, which can result in excess medical hospitalizations, nursing home placement, and mortality (2–5). This highlights an important area of future research focused on examining access to primary care within mental health services among adults with serious mental illness or potentially within other service settings.

Third, because few studies met our inclusion criteria, we cannot reliably distinguish which health home intervention features contributed to positive changes in cardiometabolic risk factors. The literature suggests that the design and components of health homes vary considerably across programs. Additional research specifically examining the impact of components such as peer support and illness self-management training in health homes is needed. Finally, given the variability in the types of health homes currently available, future work comparing health homes with different organizational structures is warranted.

CONCLUSIONS

To our knowledge, this is the first systematic review of peer-reviewed studies that examined service utilization, screening, and clinical outcomes of behavioral health homes designed for adults with serious mental illness. Earlier reviews of behavioral health homes did not examine changes in cardiometabolic risk factors (11), did not target people with serious mental illness. (9), and included non-peer-reviewed studies that lacked methodological rigor (7, 10, 11).

Our findings indicate that if health homes are to have a greater impact on clinical outcomes, several enhancements may be necessary. First, standardization of screening practices across health homes models may help providers to identify and address health problems by using a population

health approach. Second, targeting clinically significant thresholds for reduced cardiometabolic risk factors will help provide benchmarks for clinical management and for comparing the effectiveness of different approaches. Third, the addition of self-management skill development and peer support may improve clinical outcomes by improving critical health behaviors outside of the health home clinical encounter. Including self-management skill development and peer support as core components of health homes may be effective in improving cardiometabolic outcomes. Finally, morbidity and mortality are influenced by a myriad of interacting, modifiable risk factors. Targeting multiple interdependent risk factors may produce better results than focusing on only one or two. However, this will require coordination between multiple provider systems and disciplines.

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Submissions Invited for Culture & Mental Health Services Column

A new column in *Psychiatric Services*, Culture & Mental Health Services, edited by Roberto Lewis-Fernández, M.D., aims to clarify the ways that culture shapes the utilization, delivery, and organization of mental health services. Submissions may examine the influence of culture at the level of the individual seeking care (e.g., the impact of a person's cultural views of illness on treatment choice and level of engagement), the provider (e.g., the role of implicit racial-ethnic biases on service recommendations), the program (e.g., how local socioeconomic and organizational factors influence the package of services offered at a clinic), or the mental health system (e.g., how political forces affect reimbursement structures that determine availability of services). Dr. Lewis-Fernández welcomes papers that focus on aspects of culture related to interpretation (meaning making), social group identity (e.g., race-ethnicity, language, and sexual orientation), and social structures and systems. The goal of the column is to make visible the social-contextual frameworks that shape care. Papers, limited to 2,400 words, may be submitted online as columns via ScholarOne Manuscripts at mc.manuscriptcentral.com/appi-ps. The cover letter should specify that the submission is for the Culture & Mental Health Services column.