QUERI

Health Disparities in Quality Indicators of Healthcare Among Adults with Mental Illness

October 2014

Prepared for:
Department of Veterans Affairs
Veterans Health Administration
Quality Enhancement Research Initiative
Health Services Research and Development Service
Washington, DC 20420

Prepared by:
Evidence-based Synthesis Program (ESP) Center
Durham Veterans Affairs Healthcare System
Durham, NC
John W. Williams, Jr., MD, MHSc, Director

Investigators:
Principal Investigator:
Jennifer M. Gierisch, PhD, MPH

Co-Investigators:
Christopher Beadles, PhD, MD
Abigail Shapiro, MSPH
Jennifer R. McDuffie, PhD
Natasha Cunningham, MD
Daniel Bradford, MD
Jennifer Strauss, PhD
Marie Callahan, BS
May Chen, BA
Adam Hemminger, BS
Andrzej Kosinski, PhD
John W. Williams, Jr., MD, MHSc

Research Associate:
Avishek Nagi, MS

VA HEALTH CARE Defining EXCELLENCE in the 21st Century

PREFACE

Quality Enhancement Research Initiative's (QUERI) Evidence-based Synthesis Program (ESP) was established to provide timely and accurate syntheses of targeted healthcare topics of particular importance to Veterans Affairs (VA) clinicians, managers and policymakers as they work to improve the health and healthcare of Veterans. The ESP disseminates these reports throughout the VA, and some evidence syntheses inform the clinical guidelines of large professional organizations.

QUERI provides funding for four ESP Centers and each Center has an active university affiliation. The ESP Centers generate evidence syntheses on important clinical practice topics, and these reports help:

- develop clinical policies informed by evidence;
- guide the implementation of effective services to improve patient outcomes and to support VA clinical practice guidelines and performance measures; and
- set the direction for future research to address gaps in clinical knowledge.

In 2009, the ESP Coordinating Center was created to expand the capacity of HSR&D Central Office and the four ESP sites by developing and maintaining program processes. In addition, the Center established a Steering Committee comprised of QUERI field-based investigators, VA Patient Care Services, Office of Quality and Performance, and Veterans Integrated Service Networks (VISN) Clinical Management Officers. The Steering Committee provides program oversight, guides strategic planning, coordinates dissemination activities, and develops collaborations with VA leadership to identify new ESP topics of importance to Veterans and the VA healthcare system.

Comments on this evidence report are welcome and can be sent to Nicole Floyd, ESP Coordinating Center Program Manager, at Nicole.Floyd@va.gov.

Recommended citation: Gierisch JM, Beadles C, Shapiro A, McDuffie JR, Cunningham N, Bradford D, Strauss J, Callahan M, Chen M, Hemminger A, Kosinski A, Nagi A, Williams JW Jr. Health Disparities in Quality Indicators of Healthcare Among Adults with Mental Illness. VA ESP Project #09-010; 2014.

This report is based on research conducted by the Evidence-based Synthesis Program (ESP) Center located at the Durham VA Medical Center, Durham, NC, funded by the Department of Veterans Affairs, Veterans Health Administration, Office of Research and Development, Quality Enhancement Research Initiative. The findings and conclusions in this document are those of the author(s) who are responsible for its contents; the findings and conclusions do not necessarily represent the views of the Department of Veterans Affairs or the United States government. Therefore, no statement in this article should be construed as an official position of the Department of Veterans Affairs. No investigators have any affiliations or financial involvement (eg, employment, consultancies, honoraria, stock ownership or options, expert testimony, grants or patents received or pending, or royalties) that conflict with material presented in the report.

TABLE OF CONTENTS

EVIDENCE REPORT

INTRODUCTION

The burden of mental illness among Veterans is substantial, but the burden of medical comorbidities among people with mental illness is also noteworthy. Medical illnesses such as diabetes and cardiovascular disease affect a disproportionate number of people with mental illness.[1-3] More than 90% of individuals with serious mental illness (SMI) have co-occurring chronic medical conditions such as hypertension, cardiovascular disease, hyperlipidemia, or diabetes.[4,5] These chronic medical conditions when co-occurring with mental illness are more detrimental to overall health than in the general population.[6] For example, people with comorbid mental illness and chronic medical conditions have higher hospitalization rates and healthcare costs than people with comparable chronic medical conditions alone.[7] Furthermore, preventable medical conditions are the leading cause of premature death among people with SMI.[8,9]

Effects of mental illness on the individual's capacity to maintain health, adverse effects of medications used to treat mental illness, and lower quality of medical care have been implicated as contributors to disparities in health and healthcare between people with and without mental illness. Individual-level modifiable risk factors, such as smoking,[10] obesity,[11-13] and physical inactivity[14-16] are highly prevalent in people with mental illness. Moreover, adverse effects of medications used to treat mental illness (notably second-generation antipsychotics) also increase the risk of conditions such as hyperglycemia, hyperlipidemia, and obesity.[17] People dually diagnosed with mental illness and chronic medical conditions may also face greater challenges to receiving recommended preventive care and screenings. People with mental illness report lower perceived quality of primary care *(eg,* comprehensiveness of care, coordination of care) compared to those in the general population.[18,19] Some studies examining healthcare quality report differences in rates of recommended services between those with and without mental illness.[20,21] For example, people with mental illness are less likely to receive recommended breast, cervical, and colorectal cancer screening,[22-24] and less likely to receive recommended immunizations.[23]

Healthcare systems are complex organizations, and assessing quality within these organizations is challenging. One approach to evaluating quality of care within healthcare systems is the use of tracer conditions as quality indicators.[25] This approach focuses on targeted prevalent conditions for which strong evidence and agreement concerning appropriate processes of care *(eg,* annual foot exams for patients with diabetes) and goals of therapy *(eg,* blood pressure [BP]<140/90) exist, making it possible to uncover deficits in complex healthcare systems.[26] Chronic medical illnesses such as diabetes, heart disease, and hypertension are highly prevalent among Veterans Affairs (VA) patients: an estimated 72% have one or more chronic medical illnesses (compared to 40% to 50% of other U.S. adults), and over half have at least 2 such conditions.[27] Thus, diabetes, hypertension, and ischemic heart disease may serve as ideal tracer conditions to assess quality in the VA healthcare system as a whole. In similar fashion, receipt of selected recommended preventive screenings and services provides an opportunity to examine system-level quality of care among certain subpopulations.

Disparities in health between people with and without mental illness are common.[20,28] In order to guide future research and policy decisions for the VA, the VA Office of Heath Equity partnered with the Evidence-based Synthesis Program (ESP) to conduct a systematic review of health disparities in quality indicators of healthcare among adults with mental illness. This report evaluates comparative studies that assess a broad range of preventive care and chronic disease management quality indicators. The findings will be used to identify areas in need of further research and potential areas for policy change within the VA healthcare system.

METHODS

TOPIC DEVELOPMENT

The topic for this review was nominated after a process that included a preliminary review of published peer-reviewed literature, consultation with internal partners and investigators, and consultation with key stakeholders, namely, the Office of Health Equity, Mental Health Services, and Patient Care Services. We further developed and refined the key questions (KQs) based on published, peer-reviewed literature in consultation with VA and non-VA experts.

The final KQs were the following:

KQ 1: Among adult patients, are there health disparities for those with mental illness compared to those without mental illness in the following areas:

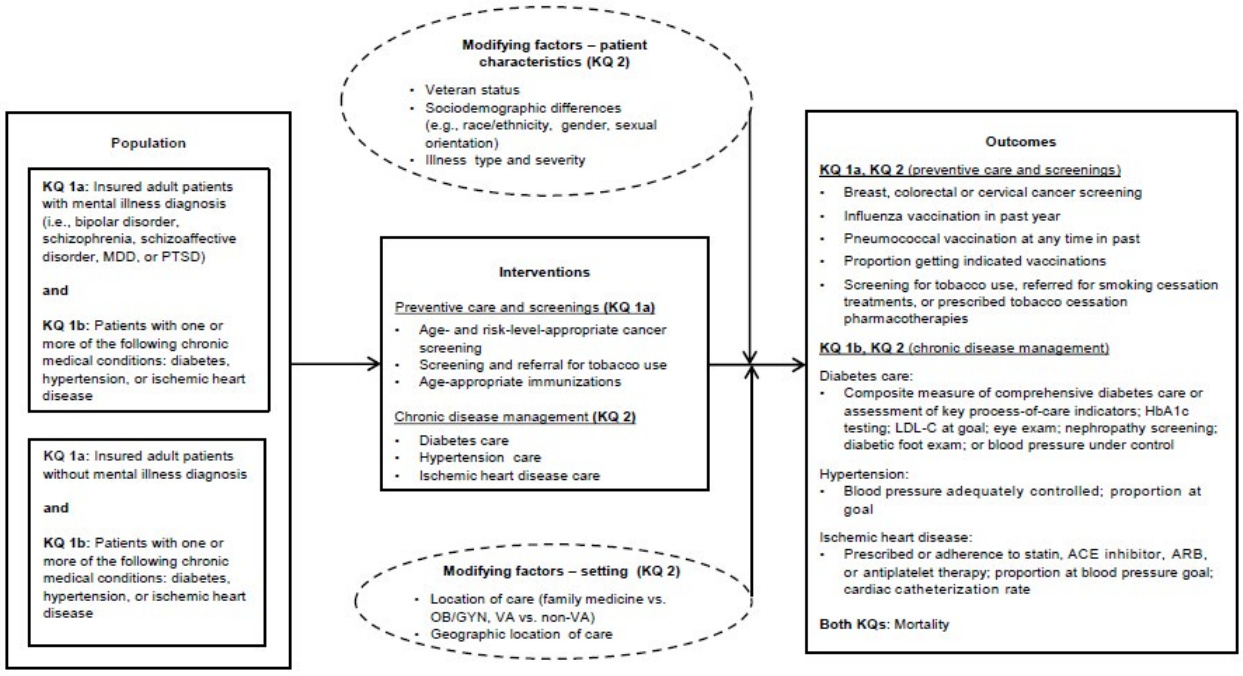
a. Receipt of appropriate preventive care services and indicated screening *(eg,* cancer screening, immunizations)?

b. Management of chronic conditions *(eg,* quality indicators for diabetes care)?

KQ 2: For those with mental illness compared to those without mental illness, do any observed health disparities in preventive care, indicated screening or chronic disease management vary based on race/ethnicity, Veteran status, geographic location, sex, or sexual orientation?

We followed a standard protocol for all steps of this review. Our approach was guided by the analytic framework shown in Figure 1.

Figure 1. Analytic Framework



Abbreviations: ACE inhibitor=angiotensin converting enzyme inhibitor; ARB=angiotensin receptor blocker; HbA1c=glycated hemoglobin; KQ=key question; LDL-C=low-density lipoprotein cholesterol; MDD=major depressive disorder; OB/GYN=obstetrics/gynecology; PTSD=posttraumatic stress disorder; VA=Veterans Affairs

SEARCH STRATEGY

We developed our search strategy in consultation with 2 experienced search librarians. We conducted a primary search of MEDLINE® (via PubMed®), The Cochrane Library, Embase®, and PsycINFO® from 1994 to February 2014. We restricted the search to articles published from 1994 forward due to the limited use of performance measures prior to the mid-1990s. We used a combination of Medical Subject Heading (MeSH) keywords such as "Mental Disorders," "Depressive Disorder," "Diabetes Mellitus," and "Colorectal Neoplasms" and selected free-text terms *(eg,* psychotic disorders, eye exams, vaccinations) to search titles and abstracts. We limited the search to articles published in English and involving human subjects 18 years of age and older. The exact search strategies used are provided in Appendix A.

We supplemented the electronic searches with a manual search of the reference lists of systematic and nonsystematic reviews, as well as a set of key primary articles.[20,21] All citations were imported into 2 electronic databases (for referencing, EndNote® Version X5, Thomson Reuters, Philadelphia, PA; for data abstraction, DistillerSR; Evidence Partners Inc., Manotick, ON, Canada).

STUDY SELECTION

Using prespecified inclusion/exclusion criteria, 2 investigators screened titles and abstracts of articles identified through our search process for potential relevance to the KQs. Articles included by either investigator underwent full-text screening. At the full-text screening stage, 2 independent investigators were required to agree on a final inclusion/exclusion decision. Disagreements were arbitrated by consensus or by a third investigator. The criteria for inclusion or exclusion at both the title/abstract and full-text screening stages for the KQs are detailed in Table 1. In brief, we included U.S.-based comparative studies involving patients with and without bipolar disorder, schizophrenia, schizoaffective disorder, major depressive disorder (or depressive disorders), and post-traumatic stress disorder (PTSD) that reported at least one of the prespecified preventive or chronic disease outcomes.

Table 1. Inclusion/Exclusion Criteria

Study Characteristic	Inclusion Criteria	Exclusion Criteria
Population	KQ 1a and KQ 1b: Adults with bipolar disorder, schizophrenia, schizoaffective disorder, MDD (or depressive disorders), or PTSD. (For mixed study populations, ≥65% of those with mental health diagnoses were required to have a diagnosis of primary interest. Studies including populations with unspecified mental illness—*eg,* "chronic mental illness"—were eligible for inclusion only if we were able to isolate the subset of participants without comorbid SUD.) KQ 1b: Insured populations or mixed populations of insured and uninsured, provided one of the following conditions is met: (1) the analysis controls for insurance status; (2) results are reported separately by insurance status; or (3) ≥80% of total population has insurance.	• Children • Patient samples without a clinical diagnosis *(eg,* chart diagnosis), administrative code *(eg,* ICD-9) or research diagnosis for one of the specified mental illnesses • Uninsured populations (unless meet inclusion criteria exemptions)
Interventions	KQ 1a: • Age- and risk-level-appropriate breast, colorectal, and cervical cancer screenings • Age-appropriate immunizations • Screening and referral for tobacco use KQ 1b: • Diabetes care • Hypertension care • Ischemic heart disease care	Interventions not listed at left
Comparators	Populations not selected for mental illness or without a diagnosis of mental illness	No non-mental health comparator Population control *(eg,* general population surveys)

Study Characteristic	Inclusion Criteria	Exclusion Criteria

Outcomes	As informed by VA EPRP metrics, the HEDIS process of care indicators, and NQF measures for the following conditions:
	
	KQ 1a:
	• Cancer screening (as per study definition):
	  ○ Breast cancer screening *(eg,* average-risk woman aged 50-75 with one or more mammograms in prior 2 years)
	  ○ Colorectal cancer screening *(eg,* average-risk adults aged 50+ with annual FOBT, flexible sigmoidoscopy in past 5 years, colonoscopy in past 10 years)
	  ○ Cervical cancer screening *(eg,* average-risk women aged 21–64 who had cervical cytology performed every 3 years, or women aged 30–64 who had cervical cytology/HPV co-testing performed every 5 years)
	  ○ Composite: 1 or more of the above
	• Immunizations: Influenza vaccination in past year; indicated pneumococcal vaccination at any time in past; proportion getting indicated vaccinations
	• Tobacco use: Proportion screening for tobacco use; if current smoker, proportion referred for smoking cessation treatments; if current smoker, proportion prescribed tobacco cessation pharmacotherapy
	•
	KQ 1b:
	• Diabetes care: Composite measure of comprehensive diabetes care or assessment of key process of care indicators: HbA1c testing; LDL-C at goal; proportion with hyperlipidemia prescribed a statin; eye exam; nephropathy screening; diabetic foot exam; blood pressure under control (as defined by what was applicable at the time of the study)
	• Hypertension: BP adequately controlled *(eg,* <140/90 during the measurement year); proportion at goal
	• Ischemic heart disease: Prescribed or adherence to statin therapy or proportion at BP; prescribed or adherence to ACEI or ARB therapy; prescribed or adherence to *a*ntiplatelet therapy *(eg,* aspirin or clopidogrel); cardiac catheterization rate
		Ad hoc performance metrics not endorsed by VA's EPRP, HEDIS, or NQF

Timing	Studies of any duration	None
Setting	• Studies conducted in the U.S. • Conducted in non-mental health, outpatient primary care settings (ED, FP, GIM, primary OB/GYN, geriatrics) and selected specialty settings *(eg,* endocrinology, cardiology)	• Conducted in countries outside the U.S. • Inpatient setting only • Mental health specialty care setting only

Study Characteristic	Inclusion Criteria	Exclusion Criteria
Study design	• Comparative studies (cohort studies, case-control studies), cross-sectional, pooled patient-level meta-analyses • Study sample size ≥100 subjects	• Not a research study *(eg,* editorial, non-systematic review, letter to the editor) • Exploratory/pilot study • Studies without a comparator
Publication type	• English language only • Peer-reviewed articles • Published from 1994 forward	Non-English articles Abstracts only

Abbreviations: ACEI=angiotensin converting enzyme inhibitor; ARB=angiotensin receptor blocker; BP=blood pressure; ED=emergency department; EPRP=External Peer Review Program; FP=family practice; FOBT=fecal occult blood test; GIM=general internal medicine; HbA1c=glycated hemoglobin; HEDIS=Healthcare Effectiveness Data and Information Set; HPV=human papillomavirus; ICD-9=*International Classification of Diseases, 9th revision;* KQ=key question; LDL-C=low-density lipoprotein cholesterol; MDD=major depressive disorder; NQF=National Quality Forum; OB/GYN=obstetrics and gynecology; PTSD=posttraumatic stress disorder; SUD=substance use disorder; VA=Veterans Affairs

DATA ABSTRACTION

Data from published reports were abstracted into a customized DistillerSR database by one investigator and overread by a second investigator. Disagreements were resolved by consensus or by obtaining a third investigator's opinion when consensus could not be reached. Data elements include descriptors to assess applicability, quality elements, intervention/exposure details, and outcomes. When outcomes were reported in more than one form, the odds ratio (OR), relative risk (RR), or hazard ratio (HR), with 95% confidence intervals (CIs), were preferentially abstracted over percentages or raw data for numerator and denominator.

Key abstraction elements were the following:

- Study characteristics
  - Design
  - Recruitment dates
  - Geographic location and number of sites
  - Setting or data source
  - Inclusion/exclusion criteria
  - Type of comparator
  - Mental health conditions of interest represented
  - Means of mental health diagnosis determination
  - Preventive screening or immunization services examined
  - Chronic disease quality measures examined
- Population characteristics (both intervention and comparator groups)
  - Veteran status and era of service, if given
  - Age, race/ethnicity, sex
  - Sexual orientation

- Outcomes
  - Mammogram
  - Pap smear
  - Fecal occult blood test (FOBT) in last year
  - Sigmoidoscopy in past 5 years
  - Colonoscopy in past 10 years
  - Influenza vaccination in last year
  - Pneumococcal vaccination ever
  - Screening for tobacco use
  - Referral for smoking cessation treatment
  - Prescribed tobacco-cessation pharmacotherapy
  - Glycated hemoglobin (HbA1c) testing
  - Low-density lipoprotein cholesterol (LDL-C) at goal
  - Eye (or retinal) exam
  - Nephropathy screening (urine screen or microalbumin)
  - Diabetic foot exam (by provider)
  - Blood pressure controlled or proportion of patients at BP goal
  - Statin therapy
  - Angiotensin converting enzyme inhibitor (ACEI) or angiotensin receptor blocker (ARB) therapy
  - Antiplatelet therapy
  - Cardiac catheterization rate
  - Reported subgroup analyses

Multiple reports from a single study were treated as a single data point. We captured any subgroup analyses of particular interest to our stakeholders, including differential intervention effects by sex, age, and VA healthcare user status. When critical data were missing or unclear in published reports, we requested the data from study authors. Applicability was addressed by examining key features such as the match between the sample and target populations.

QUALITY ASSESSMENT

Quality assessment was performed by the investigator abstracting or evaluating the included article and overread by a second, highly experienced investigator. Disagreements were resolved by consensus or by arbitration from a third investigator.

We used the Newcastle-Ottawa Scale (NOS) to rate quality of these observational studies.[29] The NOS uses a "star system" in which a study is rated on 3 broad perspectives: (1) the selection of the study groups *(eg,* representativeness of the exposed cohort, ascertainment of the exposure); (2) the comparability of the groups based on analysis or design elements (study controls for the most important factors); and (3) the ascertainment of either the exposure or outcome of interest for case-control or cohort studies, respectively *(eg,* assessment of outcome by self-report vs record linkages, was follow-up long enough for the outcome to occur). Studies could get a total of 4 points for selection, 2 for comparability, and 3 for assessment of the outcome or exposure for a total of 9 points per study. While not explicitly stated in the NOS rating guidance, we used the following score ranges to qualitatively categorize the overall quality of the included

observational studies: 0 to 4=poor quality; 5 to 7=fair quality; 8 to 9=high quality. See Appendix B for a complete version of quality assessment tool.

DATA SYNTHESIS

We summarized key features of the included studies from the abstracted data. We determined the feasibility of completing a quantitative synthesis (meta-analysis) to estimate summary effects. Feasibility depended on the volume of relevant literature, conceptual homogeneity of the studies, and completeness of the reporting of results. We performed meta-analyses only when there were at least 3 studies with the same outcome based on the rationale that fewer studies do not provide adequate evidence for summary effects. We also took into consideration the conceptual homogeneity of the mental health conditions assessed and pooled studies only if the mental health diagnoses were similar across studies. For example, we pooled studies of SMI cohorts if they were comprised of a single diagnosis *(eg,* bipolar disorder, schizophrenia only) or multiple SMI diagnoses (composite SMI). We anticipated heterogeneity of effects and hypothesized that VA healthcare user status, sex, race/ethnicity, geographic location, and sexual orientation might be associated with variation in the estimates. We planned subgroup analyses to explore these moderators as potential sources of heterogeneity; however, we did not have sufficient studies to conduct these analyses.

If quantitative synthesis was feasible, we calculated summary odds ratios (ORs). Because of the relatively small number of studies, we used a random-effects model with the Knapp and Hartung method to adjust the standard errors of the estimated coefficients.[30,31] We evaluated statistical heterogeneity by visual inspection and Cochran's Q and I^2 statistics. If heterogeneity was high ($I^2 \geq 75\%$), we present forest plots without a pooled estimate of effect and report the range and median of point estimates from individual studies instead. We used the metafor package of the R statistical software.[32,33]

When quantitative synthesis was not possible, we summarized findings qualitatively. We gave more weight to the evidence from higher quality studies with more precise estimates of effect. A qualitative synthesis focused on documenting and identifying patterns in the interventions across conditions and outcome categories. We analyzed potential reasons for inconsistency in effects across studies by evaluating differences in the study population, intervention, comparator, and outcome definitions.

RATING THE BODY OF EVIDENCE

We graded the overall strength of evidence (SOE) based on the specific criteria outlined by the Grading of Recommendations Assessment, Development and Evaluation (GRADE) approach. We provide our assessment of the overall SOE across all included study designs by assessing 4 domains: risk of bias, consistency, directness, and precision. For risk of bias, we considered basic *(eg,* cohort or cross-sectional) and detailed study design *(eg,* how the outcome was assessed). When possible, we used results from meta-analyses when evaluating consistency (forest plots, tests for heterogeneity), precision (confidence intervals), and strength of association. These domains were considered qualitatively, and a summary rating of high, moderate, low, or very low SOE was assigned. This 4-level rating scale consists of the following definitions:

- High—We are very confident that the true effect lies close to that of the estimate of the effect. (Alternative: Further research is very unlikely to change our confidence on the estimate of effect.)
- Moderate—We are moderately confident in the effect estimate; the true effect is likely to be close to the estimate of effect, but there is a possibility that it is substantially different. (Alternative: Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.)
- Low—Our confidence in the effect estimate is limited: the true effect may be substantially different from the estimate of the effect. (Alterative: Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.)
- Very low—We have very little confidence in the effect estimate; the true effect is likely to be substantially different from the estimate of effect. (Alternative: Evidence on an outcome is absent or too weak, sparse, or inconsistent to estimate an effect.)

PEER REVIEW

A draft of this report was reviewed by technical experts and clinical leadership. A transcript of their comments and our responses is provided in Appendix C.

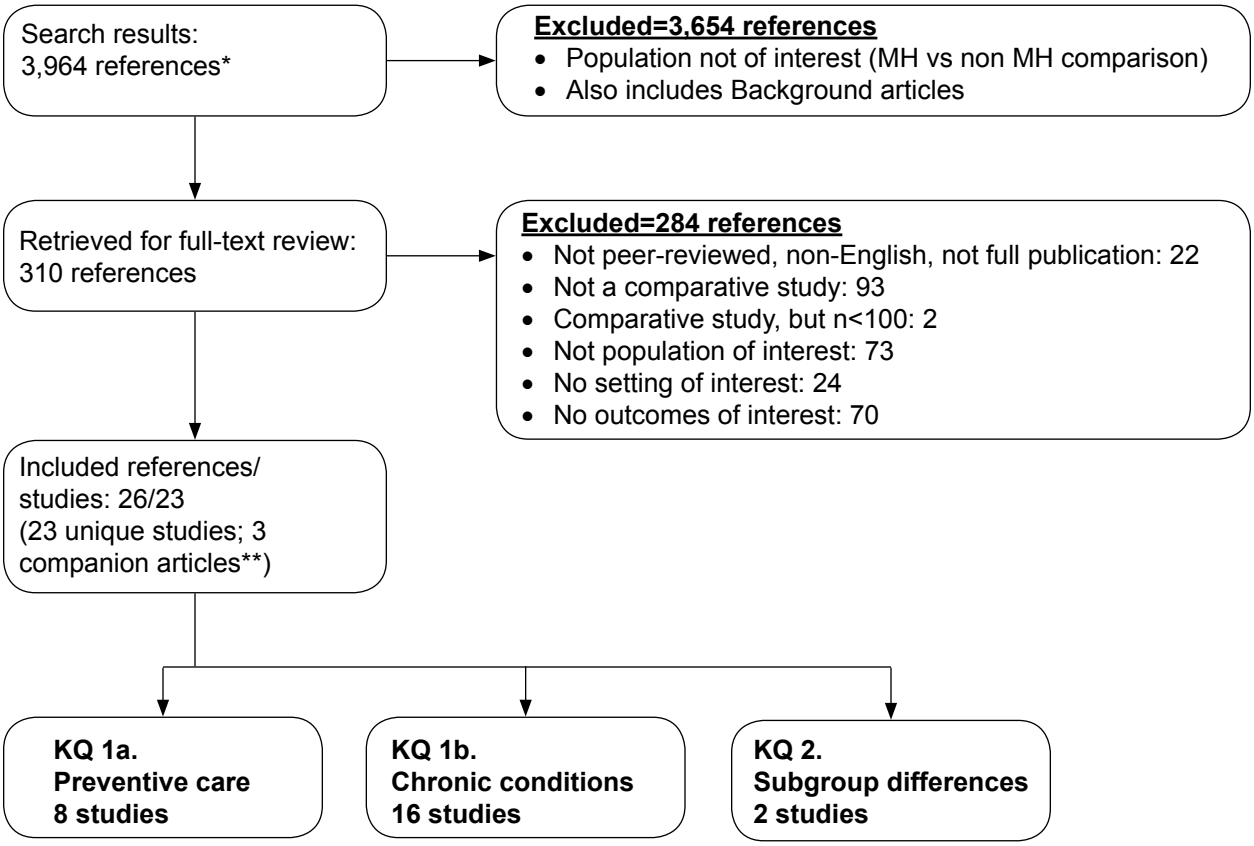
RESULTS

In this section of the report, we describe the results of the literature search, followed by a synthesis of each preventive service (cancer screening, immunizations, smoking) and chronic disease state (diabetes, hypertension, ischemic heart disease) and finally, a meta-synthesis describing the volume of studies across all conditions.

LITERATURE SEARCH

The flow of articles through the literature search and screening process is illustrated in Figure 2. A combined search of PubMed (n=1,927), Embase (n=1,599), PsycINFO (n=363), and The Cochrane Library (n=22) on the 6 conditions of interest yielded 3,911 citations from 1994 through February 2014. We supplemented the electronic searches with a manual search of the reference lists of systematic and nonsystematic reviews, as well as a set of key primary articles.[20,21] which identified 53 more citations, for a total of 3,964 citations. After applying inclusion and exclusion criteria at the title-and-abstract level, 310 full-text articles were retrieved for further evaluation. Of these, 285 were excluded at the full-text screening stage, leaving 26 articles describing 23 unique primary studies for data abstraction.

Figure 2. Literature Flow Chart



*Results from PubMed (1,927), Embase (1,599), PsycINFO (363), The Cochrane Library (22), and manual searching (53)
**Companion articles provided additional details on methods and results for included studies.

The 23 included studies examined whether disparities in care exist for patients with mental health disorders regarding 3 preventive services—cancer screening (n=7), receipt of immunizations (n=3), and screening for tobacco use and referral for treatment (n=2)—and the management of 3 chronic diseases—type 2 diabetes mellitus (n=14), hypertension (n=2), and ischemic heart disease (n=1). Most studies used cross-sectional (n=11) or retrospective cohort (n=10) designs; 2 were prospective cohort studies. All studies used national (n=10), state (n=5), or local (n=8) databases. Approximately half of all included studies (n=12) studies were conducted within the VA healthcare system.

The mental health disorders examined were those of most interest to our stakeholders due to their prevalence in Veterans. The majority of studies described the subjects with mental health disorders versus those without mental health disorders separately (n=17). In the 23 included studies, the subjects with a mental health diagnosis had a median age of 58 years (range 42.2 to 67.0 years; not reported in 6 studies) and fell into 2 categories in terms of their sex distribution: those with 0 to 20% females (n=11) and those with 50% to 100% females (n=12), with a grand median of 48.7% female. A median of 58.3% (range 11.7 to 79.2) were white. Subjects without a mental health diagnosis had a median age of 58 years (range 46.9 to 68.5; not reported in six studies) and also fell into 2 categories in terms of their sex distribution: those with 0 to 14% female (n=10) and those with 35% to100% female (n=13), with a grand median of 46.0% female. A median of 62.0% (range 4.3% to 82.4%) were white. The studies that described subjects as a total population (n=6) did not differ to a large extent on age or sex distribution, but none of them reported race/ethnicity. Appendix D provides detailed study characteristics for each of the included studies. Appendix E provides the NOS quality scores for each study per domain.

KEY QUESTION 1A: Among adult patients, are there health disparities for those with mental illness compared to those without mental illness in receipt of appropriate preventive care services and indicated screenings?

Cancer Screening

Key Points

- We identified one prospective cohort, 3 retrospective cohort, and 3 cross-sectional studies that addressed cancer screening among individuals with mental illness compared to those without mental illness. Total NOS scores ranged from 5 to 7, suggesting that most studies were of fair quality.
- While we had adequate studies of sufficient homogeneity to conduct 3 meta-analyses, all but one pooled analysis displayed high heterogeneity ($I^2 \geq 75\%$).
- Meta-analysis of 3 studies demonstrated that women with a diagnosis of depression were significantly less likely to have cervical cancer screenings (OR 0.87; 95% CI, 0.77 to 0.98; $I^2=6.3\%$).
- Existing evidence suggests small to moderate disparities in cancer screening for people with mental illness. Nearly all studies displayed a similar pattern of a negative association

between having a mental health diagnosis and receipt of cancer screenings; however, not all comparisons were statistically significant.

- The 3 studies that assessed cancer screening among VA users with and without mental illness displayed a similar pattern of negative associations. Results, however, were inconsistent. Two reported statistically significant disparities in receipt of cancer screenings, while one study reported no significant differences between those with and without mental health diagnoses.

Description of Included Studies

Seven studies[22-24,34-37] met inclusion criteria and compared rates of cancer screening among those with and without mental illness. Table 2 summarizes the characteristics of these studies. We identified 4 cohort[24,35-37] and 3 cross-sectional studies.[22,23,34] Three studies[23,24,37] were exclusively with VA user populations. Most studies (n=4) used national[22,23,34] or multi-city[36] data. The remaining 3 studies used state,[37] regional,[35] or single-center[24] data.

Four studies[22,23,34,37] assessed screening for all 3 cancers of interest and included 161,236 patients. Demographically, the populations of these 4 studies varied, with the percentage of women ranging from 17% to 100% and the percentage of white participants ranging from 31% to 76%. One study[35] addressed mammography only and included 526 women. Another[36] addressed both breast and cervical cancer screening and included 3,297 women. One study with 855 participants[24] addressed only colorectal cancer screening and included predominantly men (72%). All 3 of these studies[24,35,36] enrolled around 50% white participants (47% to 58%). Three studies recruited participants with major depressive disorder,[22,34,36] and 4 assessed composite groups with broad sets of mental health diagnoses.[23,24,35,37]

Table 2. Characteristics Cancer Screening Studies

Article	Geographic Location; Data Source; Total N	Population: Age in Years; % Female; % White	Mental Health Diagnoses; Measurement	Study Design	Data Source	Outcomes
Druss, 2002[23]	National VA Healthcare systems (general and specialty) N=113,495	Age (mean [SD]): MI=60.8 (12.9) NMI=66 (11.5) % Female: MI=20.1 NMI=13.1 % White: MI=67.6 NMI=62.1	Composite of mental health conditions: psychiatric disorders (excluding substance abuse) ICD-9 codes	Cross-sectional	EPRP chart review, 1998-1999; Patient Encounter, OP, and Patient Treatment files	Breast cancer screening; Cervical cancer screening; Colorectal cancer screening: FOBT, sigmoidoscopy, or colonoscopy
Druss, 2008[22]	National National-level survey data N=30,081	Age (mean [SD]): MI=42.2 (0.41) NMI=46.9 (0.18) % Female: MI=70 NMI=55 % White: MI=76 NMI=76	Major depression Score ≥3 on CIDI-SF	Cross-sectional	NHIS, 1999	Breast cancer screening; Cervical cancer screening; Colorectal cancer screening: FOBT
Egede, 2010[34] (Companion: Egede, 2009[38])	National Randomized survey N=16,754	Age (category): MI: 18-34: 8.1% 35-49: 28.3% 50-64: 42.5% 65+: 21.1% NMI: 18-34: 4.6% 35-49: 17.4% 50-64: 38.4% 65+: 39.6% % Female: MI=61.6 NMI=46.3 % White: MI=63 NMI: 62	Major depression among those with diabetes PHQ-8	Cross-sectional	BRFSS 2006	Breast cancer screening; Cervical cancer screening; Colorectal cancer screening: FOBT, sigmoidoscopy, or colonoscopy

Article	Geographic Location; Data Source; Total N	Population: Age in Years; % Female; % White	Mental Health Diagnoses; Measurement	Study Design	Data Source	Outcomes
Kodl, 2010[24]	Minneapolis, MN Facility-level VA Healthcare system N=855	Age (mean [SD]): MI=59.4 (6.6) NMI=63.8 (7.6) % Female: MI=20.3 NMI=35.6 % White: MI=48 NMI=68.7	PTSD Composite of mental health conditions: unipolar or bipolar depression, bipolar disorder, MDD, depressive disorders SMI composite: schizophrenia, delusional disorders, nonorganic psychoses ICD-9 codes	Retrospective cohort	Electronic medical record (1996-2006)	Colorectal cancer screening: FOBT, sigmoidoscopy, or colonoscopy
Lasser, 2003[35]	Cambridge & Somerville, MA Local-level database from PC centers N=526	Age range: 40 to 70 % Female=100 % White=52.1	PTSD Composite of mental health Psychotic disorders Mood disorders (depressive disorders) PRIME-MD (modified)	Retrospective cohort	PRIME-MD records, 1998 to "present" (precise year/date not specified), from CHA administrative files	Breast CA screening
Pirraglia, 2004[36]	Boston, MA; Chicago, IL; Detroit, MI; Los Angeles & Oakland, CA; Hudson County, NJ; Pittsburgh, PA Databases N=3,297	Age (category): >50 years: (10.2%) % Female=100 % White=47	Major depression (high ≥21) Depressive disorder (moderate 16-20) CES-D	Prospective cohort	SWAN longitudinal Cohort, 1996-1997	Breast cancer screening; Cervical cancer screening
Yee, 2011[37]	New Mexico State-level VA Healthcare system N=606	Age (mean [SD]): MI=57.2 (5.1) NMI=57.7 (5.7) % Female=100 % White: MI=42 NMI=20	Composite of mental health conditions: anxiety, depressed mood, dissociative symptoms, eating disorders, impulse control or somatoform disorders, manic symptoms, personality disorders, psychosis, and SUD ICD-9 codes	Retrospective cohort	NMVAHCS database (includes any clinic type), October 1, 2003 to September 30, 2006	Breast cancer screening; Cervical cancer screening; Colorectal cancer screening: FOBT, sigmoidoscopy, or colonoscopy

Abbreviations: BRFSS=Behavioral Risk Factor Surveillance Survey; CHA=Cambridge Health Alliance; CIDI-SF=Composite International Diagnostic Interview-Short Form; EPRP=External Peer Review Program; FOBT=fecal occult blood test; ICD-9=*International Classification of Diseases, 9th revision;* N=number of participants; MI=mental illness; NHIS=National Health Interview Survey; NMI=no mental illness; NMVAHCS=New Mexico VA healthcare system; OP=outpatient; PC=primary care; PRIME-MD=Primary Care Evaluation of Mental Disorders; SUD=substance use disorder; SWAN=Study of Women's Health Across the Nation

Synthesis of Findings: Cancer Screening

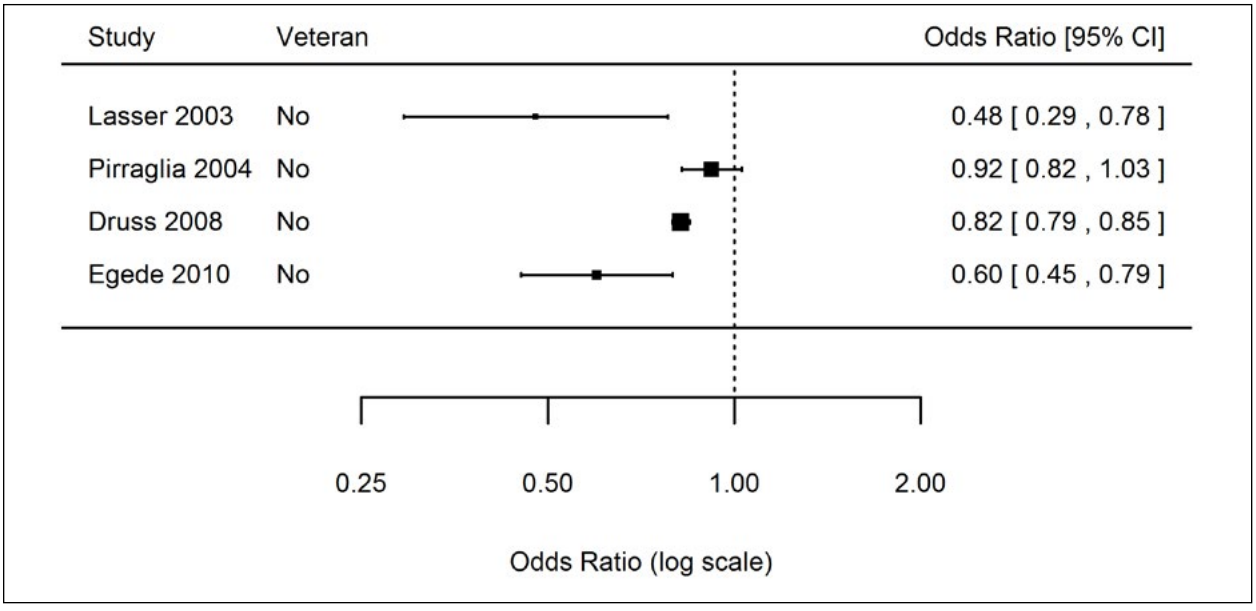
We classified studies and organized findings by outcome *(eg,* mammography, Pap test, colorectal cancer screening). We had adequate studies of sufficient homogeneity to perform 3 meta-analyses comparing cancer screening rates among populations with and without depressive disorders; however, all but one displayed high heterogeneity. We synthesized other findings qualitatively.

Breast Cancer Screening (Mammograms)

Six studies—3 cohorts[35-37] and 3 cross-sectional[22,23,34]—addressed mammography. All of the studies reported on the proportion of participants who had received mammography in the past 2 or 3 years. Five studies specified minimum age for participants. One evaluated women 42 years or older,[36] 2 evaluated women 50 years or older,[22,23] and one evaluated women 40 years and older and 50 years and older in separate groups.[34] The other 2 studies did not specify an age range.[35,37]

We identified 4 studies—2 cohorts and 2 cross-sectional—that met criteria for a random-effects meta-analysis assessing mammography screening among individuals with depressive disorders compared to those without depression.[22,34-36] The summary estimate, however, displayed high heterogeneity (I^2=77.5%); therefore, it is not reported. All studies found negative relationships between receipt of mammography and depressive disorders (OR range: 0.48 to 0.92) and 3 of the 4 studies reported negative and significant difference in the odds of mammography (OR range: 0.48 to 0.82)[22,34,35] (Figure 3).

Figure 3. Forest Plot of Meta-analysis for Mammography Screening Among Women With Depressive Disorders Relative to Women Without Depressive Disorders



Lasser et al[35] also provided estimates for mammography use among women with PTSD and psychotic disorders compared to women without mental illness. Women with PTSD had a statistically significantly lower rate of mammograms compared to women without mental illness (37% vs 56%; chi-squared p=0.06), while women with psychotic disorders did not have significantly lower rates (67% vs 56%; chi-squared p=not statistically significant [NS]).

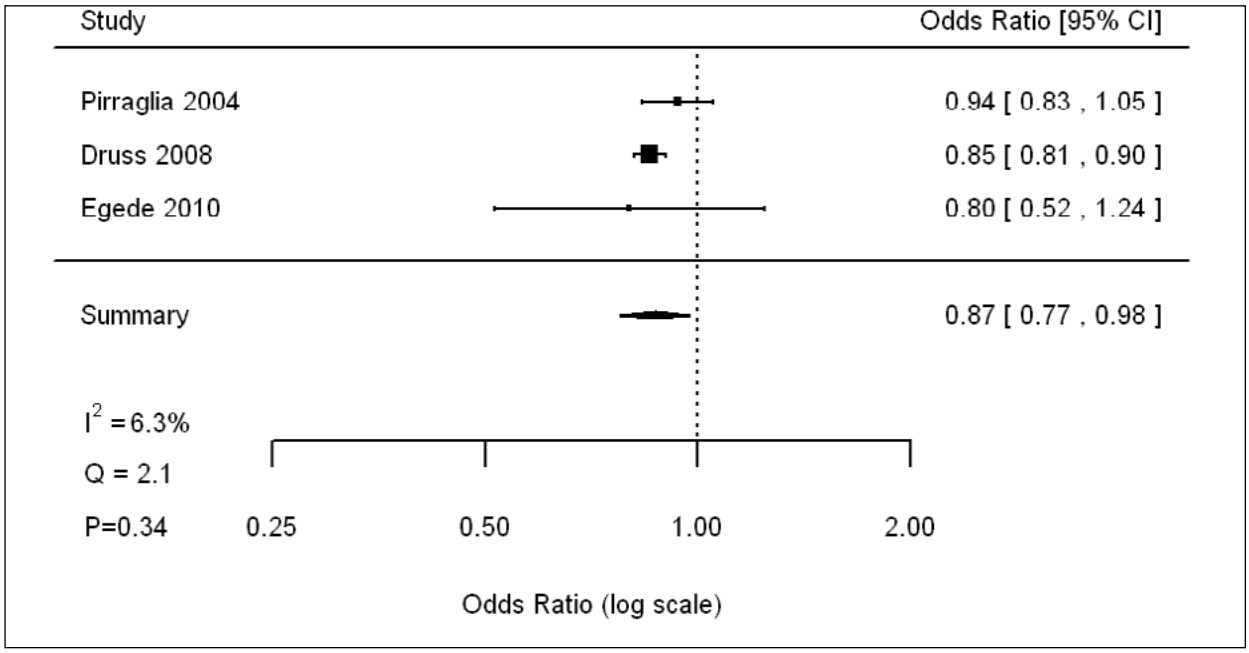
We identified 2 additional studies that provided estimates of mammography screening rates among Veteran women with broadly defined mental illness compared to those without mental illness.[23,37] Results were mixed. One cross-sectional study used the 1999 VA External Peer Review Program (EPRP) chart review-based database and found significantly lowers odds of mammography among Veterans with mental illness (OR 0.78; 95% CI, 0.67 to 0.91; p<0.01).[23] The second retrospective cohort study used the New Mexico VA healthcare system database and found no statistically significant difference in mammography screening among Veterans with and without diagnoses of mental illness (OR 0.79; 95% CI, 0.50 to 1.25).[37]

Cervical Cancer Screening

Five studies evaluated rates of cervical cancer screening via Pap test among women with and without mental illness.[22,23,34,36,37] All 5 studies reported the completion of Pap tests over the past 1 to 3 years. Two studies specified that the participants were 65 years old or younger,[22,23] and one specified that participants were 42 to 56 years old.[36] The other studies specified only that participants were adults.[34,37]

We identified 3 studies—2 cross-sectional and one prospective cohort—that met criteria for a random-effects meta-analysis assessing Pap tests among women with depressive disorders compared to those without depression.[22,34,36] Women with depressive disorders were significantly less likely to receive Pap smears (OR 0.87; 95% CI, 0.77 to 0.98), and the summary estimate displayed low heterogeneity (I^2=6.3%) (Figure 4).

Figure 4. Forest Plot of Meta-analyses for Pap Testing Among Women With Depressive Disorders Relative to Women Without Depressive Disorders



Two additional studies provided estimates of cervical cancer screening rates among women with broadly defined mental illness compared to those without mental illness.[23,37] One cross-sectional study[23] addressed Pap smear screening in the VA as assessed through the 1999 VA EPRP chart review-based database and found significantly lower odds of Pap smear screening among female Veterans with mental illness (OR 0.87; 95% CI, 0.78 to 0.96; p<0.001). The second retrospective

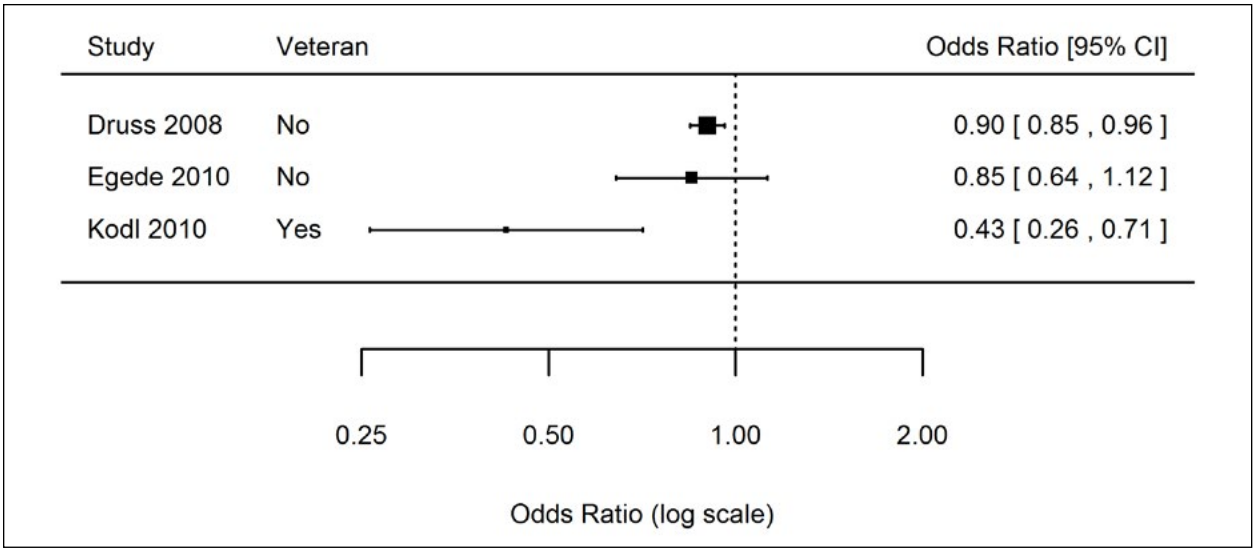
cohort study also addressed Pap smear screening among Veterans, but used state-level data from the New Mexico VA healthcare system database.[37] This study did not find a significant difference in Pap smear screening among Veterans with and without diagnoses of mental illness; the estimate of effect was imprecise (OR 1.71; 95% CI, 0.91 to 3.21).

Colorectal Cancer Screening (FOBT, Sigmoidoscopy, or Colonoscopy)

Five studies addressed colorectal cancer screening disparities.[22-24,34,37] Three used a composite outcome that included FOBT within the past year or flexible sigmoidoscopy within the past 5 years or colonoscopy within the past 10 years.[23,24,37] One study assessed rates of FOBT, sigmoidoscopy, and colonoscopy separately.[34] One study assessed only for FOBT within the past year.[22]

We identified 3 studies—2 cross-sectional and one retrospective cohort—that met criteria for a random-effects meta-analysis assessing colorectal cancer screening among individuals with depressive disorders compared to those without depression.[22,24,34] the summary estimate, however, displayed high heterogeneity (I^2=75.9%); therefore, it is not reported. All studies reported a negative association between depressive disorders and receipt of colorectal cancer screening (OR range: 0.43 to 0.90; median OR=0.85). Two of the 3 studies reported statistically significant findings (Figure 5).

Figure 5. Forest Plot of Meta-analyses for Colorectal Cancer Screening Among Individuals With Depressive Disorders Relative to Those Without Depressive Disorders



Three studies provided estimates of colorectal cancer screening rates among Veterans with broadly defined mental illness compared to those without mental illness.[23,24,37] These studies used a composite outcome for colorectal cancer screening including FOBT, sigmoidoscopy, or colonoscopy. One cross-sectional study addressed colorectal cancer screening in the VA as assessed through the 1998/1999 VA EPRP chart review-based database.[23] This study found a significantly lower odds of colorectal cancer screening among Veterans with mental illness (OR 0.95; 95% CI, 0.91 to 0.99; p<0.05). The second retrospective cohort study addressed colorectal cancer screening among Veteran using administrative claims data from the Minneapolis VA Medical Center (timeframe 1996 to 2006) and found that patients with any mental health diagnosis were less likely to receive colorectal cancer screenings (57% vs 47%; p<0.01).[24] The

third study, also a retrospective cohort, used state-level data from the New Mexico VA healthcare system database.[37] This study did not find a significant difference in colorectal cancer screening among Veterans with and without diagnoses of mental illness (OR 0.85; 95% CI, 0.56 to 1.28).

Kodl et al[24] also provided estimates for receipt of colorectal cancer screening for those with PTSD and psychotic disorders versus those without these diagnoses. There was a significant and negative association between a psychotic disorders diagnosis and receipt of colorectal cancer screening (β coefficient -0.90; $p<0.001$), but not for PTSD (β coefficient -0.37; $p=0.19$).

Composite measures of cancer screening

No studies reported on general cancer screening as a composite outcome.

Summary of Findings: Cancer Screening

We identified 7 studies that addressed cancer screening among individuals with mental illness compared to those without mental illness.[22-24,34-37] Most studies (n=4) addressed all 3 types of cancer screening.[22,23,34,37] We had adequate studies of sufficient homogeneity to conduct meta-analyses only for studies addressing disparities in breast, cervical, or colorectal cancer screening among those with depressive disorders compared to those without depression. Cervical cancer screening was the only area where the meta-analysis displayed low to moderate heterogeneity and showed significant differences in screening rates. Meta-analysis of 3 studies demonstrated that women with a diagnosis of depression were less likely to have cervical cancer screenings (OR 0.87; 95% CI, 0.77 to 0.98; $I^2=6.3\%$).

Existing evidence suggests small to moderate disparities in cancer screening for people with mental illness. Nearly all studies displayed a similar pattern of a negative association between having a mental health diagnosis and receipt of cancer screenings; however, several comparisons were not statically significant. The studies conducted that assessed the odds of breast, cervical, and colorectal cancer screening among VA users with and without mental illness displayed a similar pattern of negative associations. Results, however, were inconsistent. Two studies addressed all 3 cancers of interest among individuals with broadly defined mental illness compared to those without mental illness,[23,37] and one assessed disparities in colorectal cancer screening only.[24] A VA study using national data on 113,495 VA users[23] reported significantly lower odds of mammography (OR 0.78; 95% CI, 0.67 to 0.91; $p<0.01$), Pap smears (OR 0.87; 95% CI, 0.78 to 0.96; $p<0.001$), and colorectal cancer screening (OR 0.95; 95% CI, 0.91 to 0.99; $p<0.05$) among Veterans with mental illness. Another VA study using state-level data on 606 Veterans in the New Mexico VA healthcare system database[37] reported no significant difference in the odds of mammography (OR 0.79; 95% CI, 0.50 to1.25), Pap smears (OR 1.71; 95% CI, 0.91 to 3.21), or colorectal cancer screening (OR 0.85; 95% CI, 0.56 to 1.28) among Veterans with mental illness. The last VA study provided estimates for receipt of colorectal cancer screening for those with PTSD, psychotic disorders, depression, or any mental health diagnosis.[24] There was a significant and negative association between mental health diagnosis and receipt of colorectal cancer screening for all groups except those with PTSD.

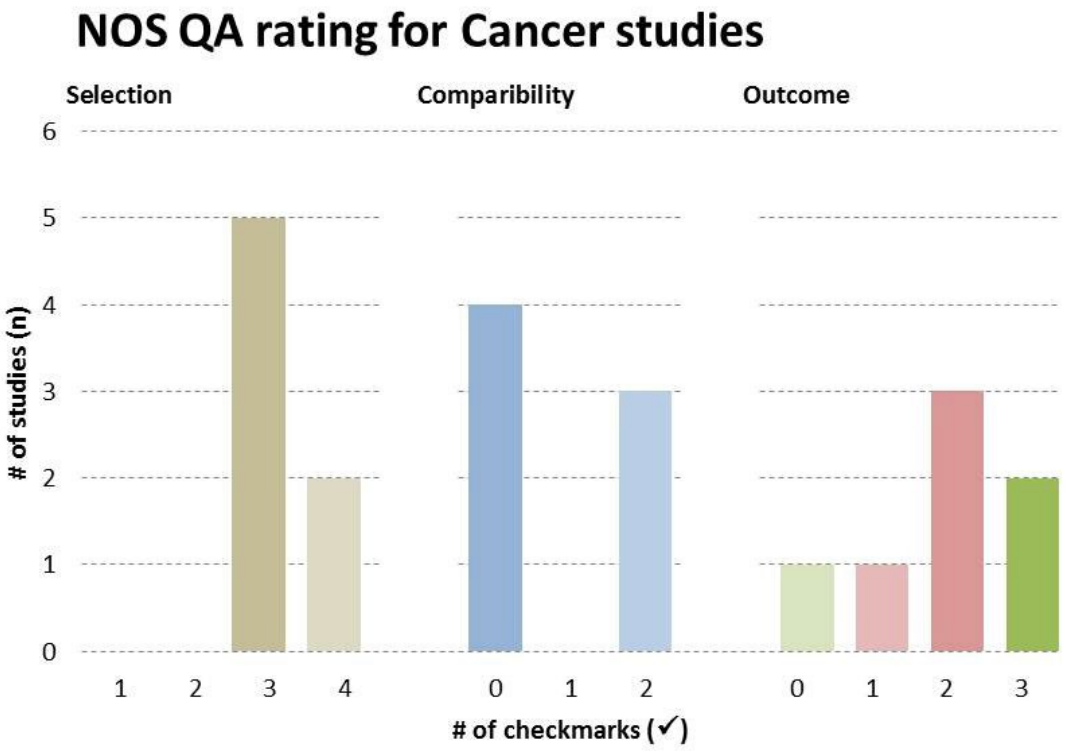
Of note, it is likely that differences in power drive the differences in statistically significant outcomes observed across these studies. An alternative hypothesis is that there are regional differences *(eg,* state-level variability) that are washed out in larger studies with national

samples. The largest study[23] included 113,495 participants recruited from a national sample of individuals with a diverse group of psychiatric illnesses and found significantly lower odds of cancer screening among those with mental illness in all 3 areas of interest: breast, cervical, and colorectal cancer. The second largest study[22] included 30,081 participants recruited from a national sample of individuals with major depressive disorder and also found significant disparities in screening for all 3 cancers of interest. The 3 state-level studies had sample sizes ranging from 416 to 855 and reported mixed results. These studies may have been underpowered to detect the differences seen in the 2 larger studies. Alternatively, these studies may be assessing regional variations in cancer screening between those with and without mental illness.

Quality of Evidence for Cancer Screening Studies

Total NOS scores ranged from 5 to 7, suggesting that most studies were of fair quality, with 3 of the studies scoring a 5,[22,23,35] one scoring a 6,[36] and 3 scoring a 7[24,34,37] (Figure 6). The included studies rated high on selection, with all studies receiving either a 3[22,23,34-36] or a 4[24,37] in this area. This indicates a high level of representativeness of the selected population and fidelity in ascertainment of the exposure of interest. There was significant variability in the area of comparability, with about half of the studies receiving a 2[22,34,36] and half receiving a 0[23,24,35,37] on this 2-point scale. This indicates variability in the adequacy of controls for potential confounders in the studies reviewed. There was also significant variability in the area of outcomes assessment and adequacy of follow-up windows, with scores of 0,[22] 1,[36] 2,[23,34,35] and 3[24,37] on this 3-point scale. Appendix E provides the scores for each study per domain.

Figure 6. Summary Newcastle-Ottawa Scale Quality Rating for Studies Reporting Cancer Outcomes



Abbreviations: NOS=Newcastle-Ottawa Scale; QA=quality assessment

Immunizations

Key Points

- We identified 3 cross-sectional studies that compared vaccination use of those with mental illness and those without. Total quality scores ranged from 5 to 7 on the NOS, suggesting fair quality studies.
- Evidence for the existence of disparities in vaccination is limited. Overall, results were mixed, with no large disparities reported across studies.
- Three studies addressed influenza vaccination. Two studies found evidence to support disparities in receipt of influenza vaccinations, while another study found no significant differences in self-reported receipt of influenza vaccinations.
- Of the 2 studies that assessed ever receiving pneumococcal vaccinations, one medical chart-based study among VA users reported that patient with a psychiatric diagnosis had a lower probability of receiving a pneumococcal vaccine than patients without a psychiatric diagnosis. In contrast, another study reported that those with depression were no less likely to report receiving a pneumococcal vaccine than those without depression.

Description of Included Studies

Three studies met inclusion criteria and compared the use of age-appropriate immunizations *(ie,* influenza, pneumococcal) among those with and without mental illness.[22,23,38] Table 3 summarizes the study characteristics of these studies. All studies were cross-sectional and used using national-level survey data. One study[23] was conducted exclusively with VA user populations. Of the 160,330 patients included across the 3 studies, most were male, white, and aged 50 years or older. Two studies recruited patients with depressive disorders.[22,38] The third study included a broad group of those with *International Classification of Diseases, 9th revision* (ICD-9) codes for psychiatric disorders, with and without a dual diagnosis of substance use disorder (SUD).[23]

Table 3. Characteristics of Immunization Studies

Article	Geographic Location; Data Source; Total N	Population: Age in Years; % Female; % White	Mental Health Diagnoses; Measurement	Study Design	Data Source	Outcomes
Druss, 2002[23]	National VA Healthcare systems (general and specialty) N=113,495	Age (mean [SD]): MI=60.8 (12.9) NMI=66 (11.5) % Female: MI=20.1 NMI=13.1 % White: MI=67.6 NMI=62.1	Composite of mental health conditions: psychiatric disorders (excluding substance abuse) ICD-9 codes	Cross-sectional	EPRP chart review, 1998-1999; Patient Encounter, OP, and Patient Treatment files	Influenza vaccine past year; Pneumococcal vaccine ever
Druss, 2008[22]	National National-level survey data N=30,081	Age (mean [SD]): MI=42.2 (0.41) NMI=46.9 (0.18) % Female: MI=70 NMI=55 % White: MI=76 NMI=76	Major depression Score ≥3 on CIDI-SF	Cross-sectional	NHIS, 1999	Influenza vaccination in past year
Egede, 2009)[38] (Companion to: Egede, 2010[34])	National Randomized survey n=16,754	Age (category): MI: 18-34: 8.1% 35-49: 28.3% 50-64: 42.5% 65+: 21.1% NMI: 18-34: 4.6% 35-49: 17.4% 50-64: 38.4% 65+: 39.6% % Female: MI=61.6 NMI=46.3 % White: MI=63 NMI: 62	Major depression among those with diabetes PHQ-8	Cross-sectional	BRFSS 2006	Flu shot in past year; Pneumonia vaccine ever

Abbreviations: BRFSS=Behavioral Risk Factor Surveillance Survey; CIDI-SF=Composite International Diagnostic Interview-Short Form; EPRP=External Peer Review Program; ICD-9=*International Classification of Diseases, 9th revision*; MI=mental illness; N=number of participants; NHIS=national Health Interview Survey; NMI=no mental illness; OP=outpatient; PHQ-8= Patient Health Questionnaire-8; SD=standard deviation; VA=Veterans Affairs

Synthesis of Findings: Immunization

We classified studies and organized findings by outcome *(eg,* influenza vaccination, pneumococcal vaccination). We did not have adequate studies of sufficient homogeneity to perform meta-analyses; therefore, we synthesize finding qualitatively.

Influenza Vaccination

Three studies compared likelihood of influenza vaccination between those with mental illness and those without. One large cross-sectional, medical chart-based study[23] (n=91,806) compared VA users who were either older than age 65 or in high-risk groups with psychiatric disorders versus Veterans without psychiatric disorders for the outcome of receiving an influenza vaccination within the past year. Presence of a psychiatric diagnosis as measured by ICD-9 codes predicted a significantly lower probability of receiving an influenza vaccine than no psychiatric diagnosis (OR 0.90; 95% CI, 0.87 to 0.94).

Two studies assessed the receipt of influenza vaccinations in the past year among those with depressive disorders. The first[22] used data from the 1999 National Health Interview Study (NHIS) and found that among person aged 50 and older, those with depression were significantly more likely than those without depression to report not receiving an influenza vaccination in the past year (OR 1.24; 95% CI, 1.18 to 1.30). Depression was assessed via the Composite International Diagnostic Interview-Short Form (CIDI-SF). The second study[38] used data from the 2006 Behavioral Risk Factor Surveillance Survey (BRFSS) and found no significant difference in influenza vaccination among adults 18 and older with major depression as assessed via the Patient Health Questionnaire-9 (PHQ-9) compared to those without depression (OR 0.85; 95% CI, 0.67 to 1.09). Of note, the BRFSS study did not control for other mental health diagnoses in the comparisons group; thus the comparisons group could have contained individuals with other mental illnesses.

Pneumococcal Vaccination

Two studies compared the likelihood of lifetime pneumococcal vaccination in those with mental illness versus those without. One VA medical chart-based study[23] compared Veterans either older than age 65 or in high-risk groups with psychiatric disorders versus Veterans without psychiatric disorders for the outcome of ever receiving a pneumococcal vaccination. This study found that presence of a psychiatric diagnosis predicted a significantly lower probability of receiving a pneumococcal vaccine than no psychiatric diagnosis (OR 0.95; 95% CI, 0.93 to 0.96). A second study used data from the 1999 NHIS[22] and found no significant difference in patient-reported lifetime pneumococcal vaccination among adults 18 and older with major depression as assessed via the PHQ-9 compared to those without depression (OR 1.03; 95% CI, 0.88 to 1.30). Again, this study did not report controlling for other mental illnesses in the comparisons group.

Summary of Findings: Immunization

We identified 3 cross-sectional studies that compared vaccination use of those with mental illness and those without. All 3 studies addressed influenza vaccination, while 2 studies also addressed pneumococcal vaccination. Evidence for the existence of disparities in vaccination is mixed. The 2 studies of older adult and high-risk subpopulations[22,23] found evidence to support disparities in receipt of influenza vaccinations, while another study found no significant differences in

self-reported receipt of influenza vaccinations[38] among a general population of adults. Of the 2 studies that assessed ever receiving pneumococcal vaccinations, one medical chart-based study among VA users reported that patients with a psychiatric diagnosis had a lower probability of receiving a pneumococcal vaccine than patients without a psychiatric diagnosis.[23] In contrast, another study conducted outside the VA reported that those with depression were no less likely to report receiving a pneumococcal vaccine than those without depression, but this study did not control of the presence of other mental illnesses in the comparator.[22]

Quality of Evidence for Immunization Studies

Total quality scores ranged from 5 to 7 on the NOS, with 2 of the studies scoring a 5[22,23] and one scoring a 7.[38] Appendix E provides the scores for each study per domain. All 3 studies were rated as representative of the average person with mental illness from the community; however, 2 studies[22,38] ascertained depression status by self-report via telephone interviews, while the other study[23] used ICD-9 codes from VA medical records. Of note, 2 studies[22,38] did not report whether those with and without depression had other comorbid mental illnesses. Two studies had at least adequate control of confounding variables in the design or analysis,[22,38] while the other study[23] did not control for the minimal confounding variables of age, sex, race/ethnicity, and socioeconomic status. One study[23] used record linkage to determine the outcomes of interest, and the other 2[22,38] used self-report measures, which may be subject to greater bias than clinical records. The timeframe utilized was adequate for observing the outcomes in 2 studies,[23,38] but may have been inadequate in the third.[22] However, all 3 studies were of cross-sectional design; therefore we cannot demonstrate that the outcome of interest was not present at the start of the study.

Screening and Referral for Tobacco Use

Key Points

- There is limited comparative evidence to describe disparities in tobacco use process of care indicators between those with mental illness and those without mental illness. We identified only 2 comparative studies that assessed screening for tobacco use and referral for smoking cessation treatment; no identified study directly reported on prescriptions for smoking cessation pharmacotherapy. Both studies were conducted with VA users and received total NOS scores of 5, suggesting studies of fair quality.
- A single cross-sectional study suggests that those with mental illness are more likely to be screened for tobacco use and referred for counseling than those without mental illness.
- One cross-sectional study suggests that smokers with PTSD and depressive disorders may be more likely to receive a physician's recommendation for smoking cessation medications than those without mental illness, while smokers with schizophrenia may be less likely to receive advice to quit from physicians. No differences were found between smokers with a diagnosis of bipolar disorder and those without a mental health diagnosis for receipt of smoking cessation services.

Description of Included Studies

Two cross-sectional studies met inclusion criteria and compared screening for tobacco use, referrals to smoking cessation treatments, and prescriptions for smoking cessation pharmacotherapy among those with and without mental illness.[23,39] Table 4 summarizes the study characteristics of these studies. Both studies were conducted exclusively with VA user populations and used data from nationwide surveys conducted by the Veterans Health Administration (VHA), the 1999 VHA EPRP[23] and the 2007 VHA Outpatient Survey of Healthcare Experiences of Patients (SHEP).[39] Of the 337,688 patients across the 2 studies, most were male, white, and over 60 years of age. One study included patients with schizophrenia, bipolar disorder, depressive disorder, and PTSD, determined by ICD-9 codes.[39] The other study included a broad group of those with ICD-9 codes for psychiatric disorders, with and without a dual diagnoses of SUD.[23]

Table 4. Characteristics of Tobacco Screening and Referral Studies

Article	Geographic Location; Data Source; Total N	Population: Age in Years; % Female; % White	Mental Health Diagnoses; Measurement	Study Design	Data Source	Outcomes
Druss, 2002[23]	National VA Healthcare systems (general and specialty) N=113,495	Age (mean [SD]): MI=60.8 (12.9) NMI=66 (11.5) % Female: MI=20.1 NMI=13.1 % White: MI=67.6 NMI=62.1	Composite of mental health conditions: psychiatric disorders (excluding substance abuse) ICD-9 codes	Cross-sectional	EPRP chart review, 1998-1999; Patient Encounter, OP, and Patient Treatment files	Proportion screened for tobacco use; Proportion referred for smoking cessation treatments
Duffy, 2012[39]	National National-level VHA outpatient survey N=224,193	Age (category): <45: 3.4% 45-64: 37.4% ≥65: 59.2% % Female: 3.5 % White: 83.1	Schizophrenia Bipolar disorder Depressive disorder PTSD ICD-9 codes	Cross-sectional	VHA Outpatient SHEP (fiscal year 2007)	Proportion prescribed tobacco cessation pharmacotherapy

Abbreviations: EPRP=External Peer Review Program; ICD-9=*International Classification of Diseases, 9th revision*; MI=mental illness; N=number of participants; NHIS=National Health Interview Survey; NMI=no mental illness; OP=outpatient; PTSD= posttraumatic stress disorder; SD=standard deviation; SHEP=Survey of Healthcare Experiences of Patients; VA=Veterans Affairs; VHA= Veterans Health Administration

Synthesis of Findings: Tobacco

We classified studies and organized findings by outcome *(eg,* screening for tobacco use). We did not have adequate studies to perform meta-analyses; therefore, we synthesize findings qualitatively. While screening for tobacco use, referral for smoking cessation treatment, and prescribed tobacco-cessation therapies were outcomes of interest, no identified study reported on outcomes for prescribed tobacco-cessation therapies. However, one study[39] reported 3 related outcomes: physician advice to quit, recommendations for medications, and physician discussions of quitting methods.

Screening for Tobacco Use

One large, cross-sectional, medical chart-based study[23] compared the proportion of individuals with psychiatric disorders versus those without psychiatric disorders receiving screening for smoking or other tobacco use within the last year (n=113,505). This study reported that presence of a psychiatric diagnosis (without co-occurring SUD) predicted a significantly higher probability of tobacco screening than no psychiatric diagnosis (OR 1.17; 95% CI, 1.08 to 1.27).

Referred for Smoking Cessation Treatment

One study[23] compared the proportion of smokers with psychiatric disorders versus smokers without psychiatric disorders receiving at least one documented counseling session or referral to a tobacco cessation program. Smokers with psychiatric disorders were significantly more likely to be referred to tobacco cessation programs than those without (OR 1.1; 95% CI, 1.00 to 1.20; $p<0.05$).

Another study[39] reported 2 outcomes related to referrals for smoking cessation treatment: 1) physician advice to quit smoking, and 2) physician discussions of quitting methods during clinic visits. This study was a secondary analysis of patient-reported outcomes from the VA SHEP study linked with VA administrative data on diagnosis and sociodemographic characteristics of the respondents (n=224,193). Separate estimates were provided for smokers with bipolar disorder, depressive disorders, PTSD, and schizophrenia diagnoses compared to current smokers without a mental health diagnosis. Smokers with ICD-9 codes for schizophrenia were significantly less likely to report receiving a physician's advice to quit than smokers with no mental disorder diagnoses (OR 0.69; 95% CI, 0.58 to 0.81). The study found no significant differences between smokers with no mental health disorder diagnosis and smokers with ICD-9 codes for bipolar disorder (OR 0.9; 95% CI, 0.76 to 1.06), depressive disorders (OR 1.04; 95% CI, 0.96 to 1.13), or PTSD (OR 1.09; 95% CI, 0.99 to 1.19). This study also compared rates of whether a physician had discussed quitting methods and found no significant differences between smokers with no mental health disorder diagnosis and smokers with bipolar disorder (OR 0.97; 95% CI, 0.86 to 1.1), depressive disorders (OR 1.05; 95% CI, 0.99 to 1.12), or schizophrenia (OR 1.00; 95% CI, 0.88 to 1.15). However, smokers with PTSD were significantly more likely to have a physician discuss quitting methods with them than smokers with no mental health disorder diagnosis (OR 1.09; 95% CI, 1.02 to 1.17).

Prescribed Tobacco-cessation Pharmacotherapy

Though no study directly reported physician prescribed tobacco-cessation pharmacotherapy, one study[39] reported physician recommended medication for smoking cessation during ≥1

visits in a year. This study compared patient-reported rates of physician recommendations of smoking cessation medications among current smokers with a mental health diagnosis *(ie,* bipolar disorder, depressive disorders, PTSD, schizophrenia) and those without any mental health diagnosis. The study found no significant differences between smokers with no mental health disorder and smokers with bipolar disorder (OR 1.01; 95% CI, 0.88 to 1.14) or schizophrenia (OR 0.92; 95% CI, 0.8 to 1.05). However, smokers with depressive disorders (OR 1.07; 95% CI, 1.01 to 1.14) and PTSD (OR 1.14; 95% CI, 1.06 to 1.23) were significantly more likely report that a physician recommended medication for smoking cessation than patients without a mental health diagnosis.

Summary of Findings: Tobacco

Overall, there is limited comparative evidence to describe disparities in tobacco use process of care indicators between those with mental illness and those without mental illness. We identified only 2 comparative studies that assessed screening for tobacco use and referral for smoking cessation treatment; neither reported on prescriptions for smoking cessation pharmacotherapy. Both studies were conducted with VA users. One used self-report of receipt of smoking cessation services and reported results separately for the following groups: bipolar disorder, depressive disorders, PTSD, and schizophrenia.[39] The other study used data obtained from medical chart reviews[23] and compared individuals with any psychiatric diagnosis to individuals without a psychiatric diagnosis. The available evidence suggests those with mental illness are more likely to be screened for tobacco use and referred for counseling than those without mental illness. This result is based on a single cross-sectional study. One cross-sectional study suggests that smokers with PTSD and depressive disorders are more likely to receive a physician's recommendation for smoking cessation medications than those without mental illness; smokers with PTSD were also more likely to report that a physician had discussed quitting methods with them. Smokers with schizophrenia reported they may be less likely to receive advice to quit from physicians compared to smokers without a mental health diagnosis; however, no significant differences were found for having a physician discuss quitting methods or having a physician recommend medication for smoking cessation. No differences were found between smokers with a diagnosis of bipolar disorder and those without a mental health diagnosis for receipt of smoking cessation services.

Quality of Evidence for Tobacco Use Studies

Both studies received a total score of 5 points on the NOS, suggesting fair quality studies (see Appendix E for details). Both studies were strongly representative, with appropriate non-exposed cohorts. Each study utilized clinical records to ascertain mental health status. Each study was of cross-sectional design; therefore we cannot demonstrate that the outcome of interest was not present at the start of the study. Only one study[23] had adequate control of confounding variables in the analysis. The same study[23] used record linkage to determine the outcomes of interest, while the other[39] used self-report measures, which may be subject to greater bias than clinical records. The timeframe utilized was adequate for observing the outcomes in one study,[23] but may have been inadequate in the other.[39]

KEY QUESTION 1B: Among adult patients, are there health disparities for those with mental illness compared to those without mental illness in management of chronic conditions?

Diabetes Care

Key Points

- We identified 14 studies that met inclusion criteria and compared diabetes process of care outcomes among those with mental illness and those without mental illness. While several studies addressed depressive disorders, SMI, or composite groups of diabetic patients with mental illness, only one study assessed the impact of PTSD on diabetes quality of care indicators. Studies were of fair (n=11) to high (n=3) quality (NOS scores ≥5); however, most (n=10) did not adequately control for key potential confounders.
- We had adequate studies of sufficient homogeneity conduct 8 meta-analyses; however, all but one pooled analysis displayed high heterogeneity (I^2 ≥75%).
- Meta-analysis of 3 studies demonstrated that people with a diagnosis of depression were no less likely than those without such diagnosis to have eye exams (OR 0.89; 95% CI, 0.56 to 1.41; I^2=62.2%).
- For most outcomes, results were inconsistent and suggest small to modest disparities in diabetes care for people with mental illness.
- We observed some qualitative differences in care patterns for studies conducted inside the VA healthcare system versus outside the VA healthcare system.
    - For composite indicators of diabetes care, the one study conducted outside the VA reported a significant and negative association, while 2 studies conducted with VA users reported mixed results.
    - For patients with SMI, we observed a positive trend of more HbA1c monitoring for VA users, while results were inconsistent in the non-VA study.
    - VA users with a diagnosis of SMI were statistically significantly less likely to get eye exams. In contrast, the 2 studies conducted outside the VA displayed positive trend effects, but only one estimate was statistically significant.
    - This trend was reversed for adequacy of LDL-C control among patients with SMI. The VA studies demonstrated no significant differences between VA users with and without SMI. Yet, the one study that provided comparative estimates outside the VA reported significant and negative effects of SMI on achieving adequate LDL-C control.
    - Patterns for receipt of diabetic foot exams were similar inside and outside the VA; patients with mental illnesses were less likely to received foot exams compared to those without mental illness, but estimates were only significant for those patients seeking care inside the VA.

Description of Included Studies

Fourteen studies described in 16 papers met inclusion criteria and compared process of care outcomes *(eg,* HbA1c testing) among those with and without mental illness.[38,40-54] Table 5 summarizes the study characteristics of these studies. All studies were relatively recent and published in a 10-year timeframe (2002 to 2012). We identified one prospective cohort, 6 retrospective cohort, 7 cross-sectional, and no case-control studies. Seven studies were conducted exclusively with VA user populations.[41,44,45,47-49,51] Only 3 studies[38,49,52] used patient interviews as part of the data sources; all other studies used medical or administrative records reviews. The 14 included studies encompassed 1,236,048 subjects, and sample sizes ranged considerably (from 124 to 657,628). Most subjects were white; however, 4 studies[45,47,50,52] did not report race/ethnicity data. While almost half (45%) of the subjects were female, 8 studies were comprised of predominantly male samples. Seven studies provided estimates of effects between those without mental illness and groups comprised of a broad set of mental health diagnoses. Six studies provided estimates of effects for people with SMI.[41,42,45,46,48,50] Five studies provided effect estimates among people with depressive disorders,[38,45,47,50,52] and only one study provided separate effect estimates for people with PTSD.[47]

Table 5. Characteristics of Diabetes Studies

Article	Geographic Location; Data Source; Total N	Population: Age in Years; % Female; % White	Mental Health Diagnoses; Measurement	Study Design	Data Source	Outcomes
Desai, 2002[51]	National VA healthcare system databases N=36,528	Age (mean [SD]): MI=62.2 (12.0) NMI=65.9 (10.6) % Female: MI=18.9 NMI=11.1 % White: MI=67.9 NMI=61.2	Composite of mental health conditions: psychiatric disorders (excluding SUD and dual diagnosis) ICD-9 codes	Retrospective cohort	VA computerized medical records: 1999 VA EPRP; Patient encounter files; Patient treatment files (January 1998 to December 1999)	HbA1c testing; Diabetic foot exam; Eye exam
Druss, 2012[40]	National National-level database N=657,628	Age (mean [SD]): MI=48.2 (0.4) NMI:=47.7 (0.6) % Female: MI=63.7 NMI=68.2 % White: MI=56.8 NMI=51.7	Composite of mental health conditions: any mental health diagnosis excluding dementia/ delirium ICD-9 codes	Retrospective cohort	Medicaid eligibility, service utilization, and payment database (2003-2004)	HbA1c testing; Eye exam; Nephropathy screening; At least 2 HEDIS quality indicators completed in a year

Article	Geographic Location; Data Source; Total N	Population: Age in Years; % Female; % White	Mental Health Diagnoses; Measurement	Study Design	Data Source	Outcomes
Egede, 2009[38] Companion to: Egede, 2010[34]	National Randomized survey N=16,754	Age (category): MI: 18-34: 8.1% 35-49: 28.3% 50-64: 42.5% 65+: 21.1% NMI: 18-34: 4.6% 35-49: 17.4% 50-64: 38.4% 65+: 39.6% % Female: MI=61.6 NMI=46.3 % White: MI=63 NMI: 62	Major depression among those with diabetes PHQ-8	Cross-sectional	BRFSS 2006	HbA1c testing; Diabetic foot exam; Eye exam
Frayne, 2005[49]	National VA databases and survey N=313,586	Age (category; n): MI: <55: 28,339 55-64: 16,051 65-74: 20,429 ≥75: 11,981 NMI: <55: 39,780 55-64: 47,357 65-74: 94,241 ≥75: 55,645 % Female: MI=3.3 NMI=1.8 % White: MI=73.4 NMI=74.5	Composite of mental health conditions: depressed mood, anxiety, psychosis, manic symptoms, SUD, personality disorders, dissociative symptoms, somatoform symptoms, impulse control disorders, eating disorders ICD-9 codes	Cross-sectional	6 sources (October 1997-September 1999): DEpiC; Medicare claims; VA National Patient Care Database; VHA Health Care Analysis Information Group (lab data); VHA Pharmacy Database; 1999 Large Health Survey of Veteran Enrollees	No HbA1c testing; No eye exam; LDL-C not at goal; Composite diabetes outcome: no monitoring for diabetes (no HbA1c test done, no LDL-C-test done, and no eye exam done)

Article	Geographic Location; Data Source; Total N	Population: Age in Years; % Female; % White	Mental Health Diagnoses; Measurement	Study Design	Data Source	Outcomes
Green, 2010[43]	Atlanta, GA Facility-level database N=8,817	Age (mean [SD]): MI=49.4 (10.2) NMI=55.6 (11.8) % Female: MI=61.4 NMI=64.3 % White: MI=11.7 NMI=4.3	Schizophrenia Mood disorders ICD-9 codes	Retrospective cohort	ER, urgent care, and PC records (OP), 2004-2005, from urban, public hospital	HbA1c testing; Eye exam; Nephropathy screening
Jones, 2004[50]	Iowa State-level population-based database N=26,020	Age (mean [SD]): MI=47.1 (9.4) NMI=48.4 (10.2) % Female: MI=50.2 NMI=46.0 % White: NR	Mood disorders Psychotic disorders ICD-9 codes	Retrospective cohort	Administrative claims data from BCBS of Iowa (January 1996 to December 2001)	HbA1c testing; Eye exam; Nephropathy screening
Kilbourne, 2008[45] (Companion: Morden, 2010[53])	National VA healthcare system registries and databases N=10,943	Age: 66.3 (11.) %Female Total=2.6 %White=NR	Composite SMI: schizophrenia, bipolar disorder, other psychosis Depression: unipolar depression, depressive disorders ICD-9 codes	Cross-sectional	VA National Registries for (1) Psychosis; and (2) Depression; EPRP national quality of care databases, fiscal year 2005	BP under control; LDL-C at goal; Diabetic foot exam; Eye exam; HbA1c testing not received†
Krein, 2006[48]	National VA healthcare system registries N=36,546	Age (mean [SD]): Total=58 (12) % Female: MI=4.0 NMI=: 14.0 % White: MI=64.0 NMI=69.0	Composite SMI: schizophrenia, schizoaffective disorder, bipolar disorder, other nonorganic psychoses, paranoid states, affective psychoses ICD-9-CM codes	Cross-sectional	VA National Psychosis Registry & Healthcare Analysis and Information Group/ QUERI-DM (diabetes registry), October 1997 to September 1998	HbA1c testing; LDL-C at goal

Article	Geographic Location; Data Source; Total N	Population: Age in Years; % Female; % White	Mental Health Diagnoses; Measurement	Study Design	Data Source	Outcomes
Leung, 2011[42]	Massachusetts State-level database N=10,6174	Average age range: 52 to 65 yr % Female: MI=64.0 NMI=68.2 % White: MI=79.2 NMI=82.4	Schizophrenia Bipolar disorder Depression/ anxiety Other MI ICD-9 codes	Cross-sectional	Massachusetts Medicaid & Medicare, 2004-2005	HbA1c testing; Eye exam; Nephropathy screening
Lin, 2004[52]	Seattle, WA HMO member survey N=4,385	Age (mean [SD]): Total=63.3 (13.4) % Female=48.7 % White=NR	Major depression Depressive disorders PHQ-9	Prospective cohort	GHC diabetes registry, 2001-2003	No HbA1c testing; No eye exam; No nephropathy screening within past year among patients not taking ACEI
Nelson, 2011[41]	Kansas City, KS Facility-level VAMC database N=124	Age (mean [SD]): MI=57.9 (7.0) NMI=57.9 (2.2) % Female=0 % White: MI=35.5 NMI=69.5	Composite SMI: schizophrenia, schizoaffective disorder, and psychosis NOS) ICD-9 codes	Cross-sectional	Computerized patient record system (CPRS) for 2008	LDL-C at goal
Taveira, 2008[44] (Companion: Cohen, 2010[54])	Providence, RI VAMC facility-level database N=297	Age (mean [SD]): MI=59.9 (9.4) NMI=68.5 (9.3) % Female: MI=4.1 NMI=1.1 % White: MI=49.6 NMI=39.8	Schizophrenia Mood disorders (including depression and bipolar disorder) Depressive disorder Anxiety Dissociative and somatoform disorders PTSD ICD-9 codes	Cross-sectional	VAMC electronic medical records from CRRC, January 2001-January 2002	Composite diabetes outcome: achieve at goal levels for at least 2 of these 3 values: SBP, LDL-C, or HbA1c

Article	Geographic Location; Data Source; Total N	Population: Age in Years; % Female; % White	Mental Health Diagnoses; Measurement	Study Design	Data Source	Outcomes
Trief, 2006[47]	New York (state) VA Healthcare Network Upstate New York facility-level database N=14,438	Average age range: MI: 59.6 to 64.3 NMI: 69.5 % Female: 0 % White: NR	PTSD with depression PTSD without depression Depression without PTSD ICD-9 codes	Retrospective cohort	Veterans Health Information Systems and Technology Architecture (VistA) for PC visits (July 1, 2003 to October 4, 2004)	LDL-C at goal
Weiss, 2006[46]	Boston, MA 5 internal medicine practices N=3,808	Age (mean [SD]): MI=62 (15) NMI=65 (13) % Female: MI=57.9 NMI=48.6 % White: MI=72.0 NMI=71.2	Schizophrenia and other psychotic disorders ICD-9 codes	Cross-sectional	Review of charts or electronic medical records (January 1, 2000 to July 31, 2003)	Proportion with hyperlipidemia prescribed a statin; LDL-C at goal; BP under control

Abbreviations: ACEI=angiotensin converting enzyme inhibitor; BCBS=Blue Cross Blue Shield; BP=blood pressure; BRFSS=Behavioral Risk Factor Surveillance Survey; DEpiC=Diabetes Epidemiology Cohort; DM=diabetes mellitus; EPRP=External Peer Review Program; ER=emergency room; GHC=Group Health Cooperative; GIM=general internal medicine; HbA1c=glycated hemoglobin; HEDIS=Healthcare Effectiveness Data and Information Set; HMO=health maintenance organization; ICD-9=*International Classification of Diseases, 9th revision*; IP=inpatient; LDL-C=low-density lipoprotein cholesterol; MI=mentally ill; N=number of participants; NMI=no mental illness; OP=outpatient; PC=primary care; PHQ-9=Patient Health Questionnaire-9; PTSD=posttraumatic stress disorder; QUERI-DM=Diabetes Mellitus Quality Enhancement Research Initiative; SBP=systolic blood pressure; SD=standard deviation; SMI=serious mental illness, usually schizophrenia, schizoaffective disorder, and bipolar disorder; SUD=substance use disorder; VA=Veterans Affairs; VAMC=Veteran Affairs Medical Center

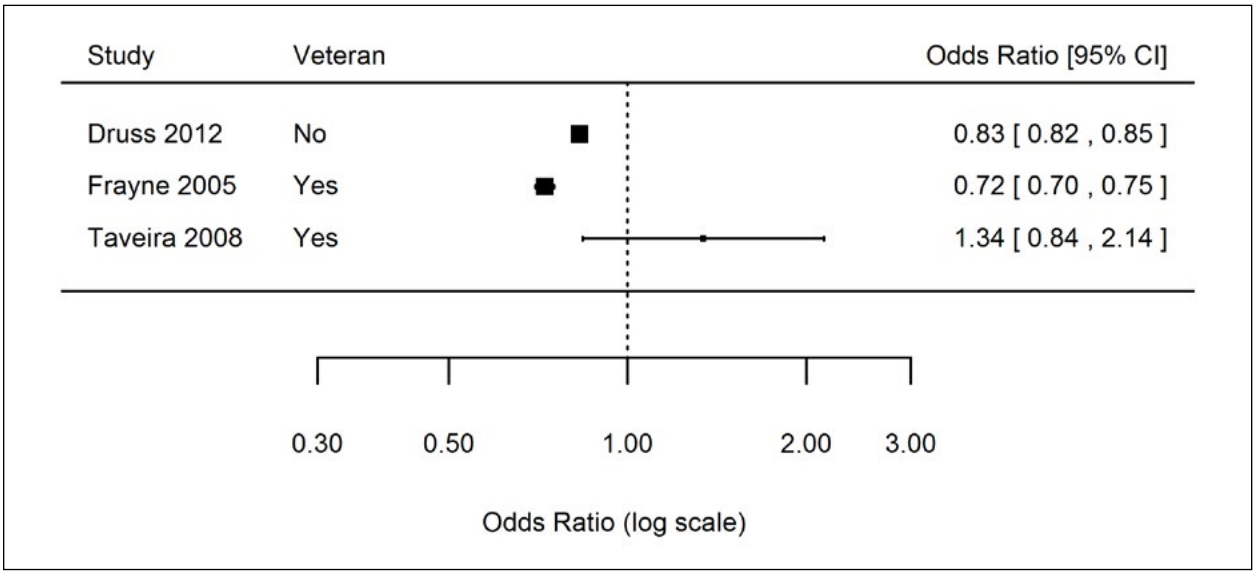
Synthesis of Findings: Diabetes Care

We classified studies and organized findings by outcome. We had adequate studies of sufficient homogeneity to perform 8 meta-analyses for selected process of care indicators; most of these analyses yielded high heterogeneity. We synthesized other finding qualitatively, grouped by diabetes process of care indicator and then by mental health condition assessed.

Composite Measure of Comprehensive Diabetes Care

Three studies reported on a composite measure of care for patients with diabetes and compared those with and without mental illness.[40,44,49] One study created a composite measure that included the proportion of subjects who had not received any of 3 key quality indicators *(ie,* no HbA1c test done, no LDL-C test done, and no eye examination performed) in the past year.[49] Another study created a composite measure based on achievement of target levels for at least 2 of the 3 goal values for systolic BP, LDL-C, or HbA1c.[44] The last study developed a composite measure based on obtaining 2 or more of the Healthcare Effectiveness Data Information Set (HEDIS) diabetes performance measures *(ie,* HbA1c testing, LDL-C screening, eye examinations, treatment for nephropathy).[40] All 3 of these studies were conducted with medical or administrative record reviews and identified subjects with mental illness based on ICD-9 codes for a broad range of diagnoses. Two were conducted among VA users.[44,49] These studies met criteria for a random-effects meta-analysis that assessed the impact of mental illness on composite indicators of diabetes care, but the summary estimate displayed high heterogeneity (I^2=95.8%); therefore, it is not reported. Results were mixed, with effects ranging from negative and statistically significant (OR 0.72; 95% CI, 0.70 to 0.75) to positive and not statistically significant (OR 1.34; 95% CI, 0.84 to 2.14) (Figure 7). Of note, the patients in Taveira et al[44] were drawn from a group of VA patients who had just completed a pharmacist-led cardiovascular risk reduction clinic and likely contributed to the high heterogeneity in the summary estimate.

Figure 7. Forest Plot of Meta-analyses of the Association of Mental Illness and Composite Indicators of Diabetes Care

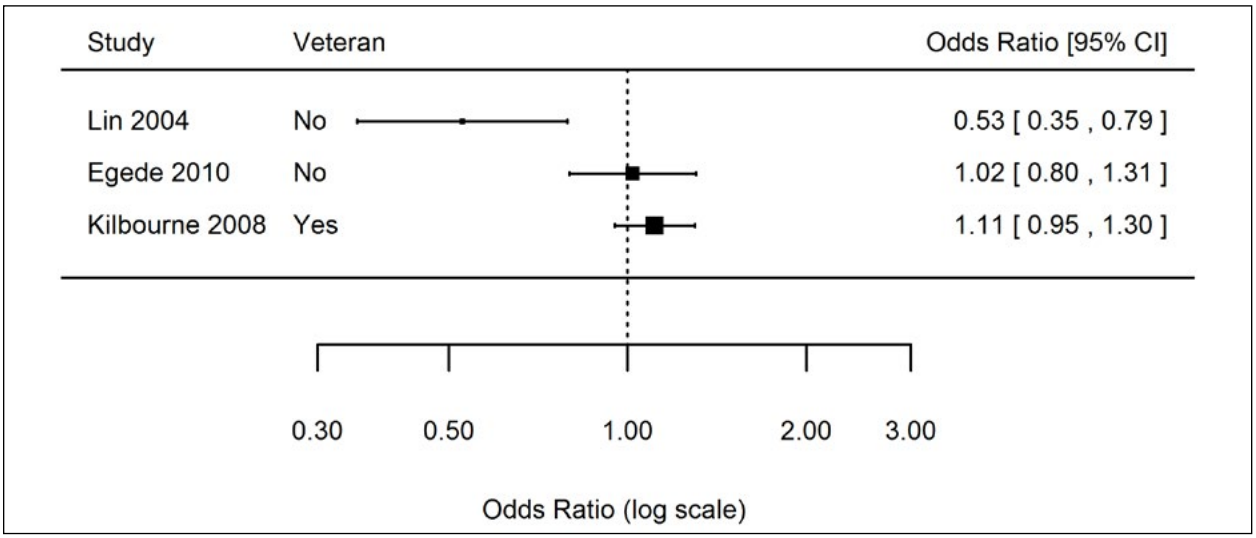


HbA1c Testing

Ten studies assessed the association of mental health status on the receipt of HbA1c testing among patients with diabetes.[38,40,42,43,45,48-52] Four of these studies were conducted with VA users.[45,48,49,51] Four studies provided estimates for those with depressive disorders, 4 for those with SMI, and 5 for those diagnosed with any of a broad range of mental illnesses. We were able to perform 3 meta-analyses for the receipt of HbA1c comparing those without a mental health diagnosis to those with depressives disorders, SMI, or a group composite group of a broad set of mental health diagnoses. All 3 summary estimates, however, displayed high heterogeneity. Thus, we synthesize results qualitatively.

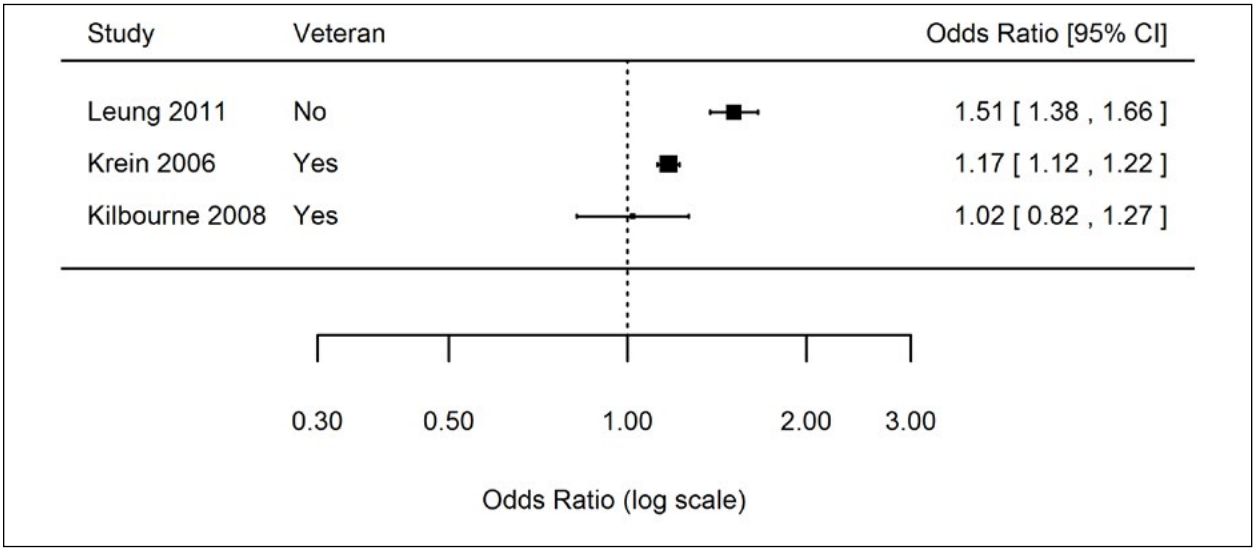
Four studies reported on the receipt of HbA1c testing among patients with diabetes and compared those with and without a diagnosis of depressive disorders.[38,45,50,52] Three of these studies met criteria for a random-effects meta-analysis assessing the impact of mental illness on receipt of HbA1c testing, but the summary estimate displayed high heterogeneity (I^2=82.3%); therefore, it is not reported. Results were mixed, with effects ranging from negative and statistically significant (OR 0.53; 95% CI, 0.35 to 0.79) to positive and not statistically significant (OR 1.11; 95% CI, 0.95 to 1.30) (Figure 8). One other study provided estimates of effects but provided only a hazard ratio (HR);[50] this study, conducted with claims data from Blue Cross Blue Shield of Iowa, also did not find a statistically significant effect of depressive disorders on receipt of HbA1c testing (HR 0.97; 99.9% CI, 0.90 to 1.06).

Figure 8. Forest Plot of Meta-analyses of the Association of Depressive Disorders and Receipt of HbA1c Testing Among Patients with Diabetes



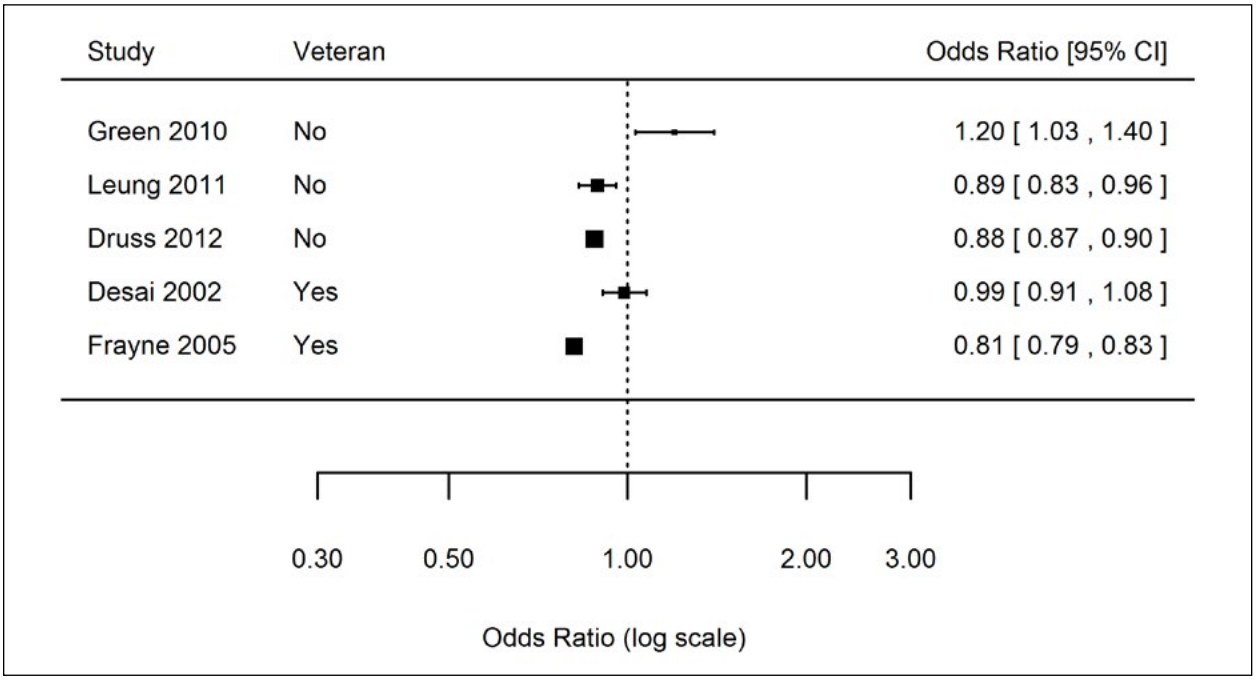
Four studies assessed the impact of SMI on the receipt of HbA1c testing among patients with diabetes, and 3 of these were amenable to pooled analyses in a random-effects meta-analysis.[42,45,48] but the summary estimate displayed very high heterogeneity (I^2=92.4%); therefore, it is not reported. All studies displayed a positive association between presence of an SMI diagnosis and receipt of HbA1c (OR range: 1.02 to 1.51; median OR=1.17), and 2 of these estimates were statistically significant[42,48] (Figure 9). One other study provided estimates of effects but provided only an HR[50]; this study, conducted with claims data from Blue Cross Blue Shield of Iowa, reported a negative but statistically insignificant association of SMI and receipt of HbA1c testing (HR 0.79; 99.9% CI, 0.54 to 1.15).

Figure 9. Forest Plot of the Association of SMI and Receipt of HbA1c Testing Among Patients with Diabetes



Five studies assessed the association of broadly defined mental illness on receipt of HbA1c testing. All met criteria for a random-effects meta-analysis, but the summary estimate displayed very high heterogeneity (I^2=92.8%); therefore, it is not reported.[40,42,43,49,51] Four of these studies displayed a negative association between presence of a mental health diagnosis and receipt of HbA1c, and one found a positive association (OR range: 0.81 to 1.20; median OR=0.89). Four of these estimates were statistically significant (3 negative studies[40,42,49] and one positive study[43]). (Figure 10).

Figure 10. Forest Plot of the Association of Mental Health Diagnosis and Receipt of HbA1c Testing Among Patients With Diabetes

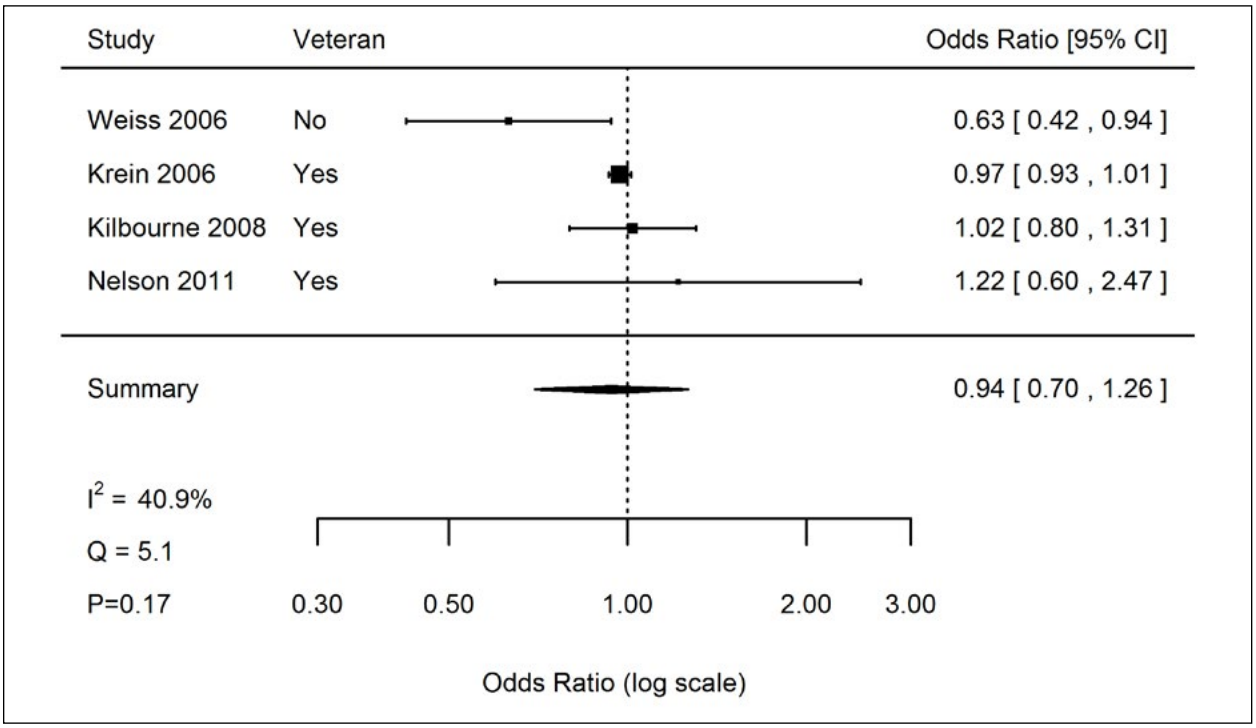


LDL-C

Six studies assessed the association of mental health status on the ability to have LDL-C values at goal level.[41,45-49] Five of these were conducted with VA users and the sixth[46] was a medical chart review of 5 internal medicine practices in Boston. Two studies provided estimates for those with depressive disorders, 4 for those with SMI, one for those with PTSD, and 2 for those diagnosed with any of a broad range of mental illnesses. We were able to perform one meta-analysis for the association of a diagnosis of SMI on the ability to have LDL-C values at goal level. The other results are summarized qualitatively.

Four studies assessed the association of an SMI diagnosis on LDL-C levels, and all met criteria for a random-effects meta-analysis.[41,45,46,48] Patients with an SMI diagnosis were no less likely to have LDL-C values at goal level compared to diabetes patient without a diagnosis of mental illness (OR 0.94; 95% CI, 0.70 to 1.26). The summary estimate displayed moderate heterogeneity (I^2=40.9%) (Figure 11).

Figure 11. Forest Plot of Meta-analysis of the Association of SMI Diagnosis and LDL-C Among Patients With Diabetes



Two studies[45,47] assessed the association between a diagnosis of depressive disorders and adequacy of LDL-C control for patients with diabetes; one of these studies[47] also provided an estimate for patients with PTSD. Both studies were conducted with VA users and used ICD-9 codes to classify patients with depressive disorders. One study used 2005 national VA EPRP data,[45] and the other[47] used state-level medical records data. Across both studies, patients with depressive disorders or PTSD were no less likely to have LDL-C values at goal than patients without a diagnosis of mental illness.

Two studies with VA users assessed the association of a diagnosis of composite groups of multiple mental health diagnoses on LDL-C control. One large study of 313,586 VA users with

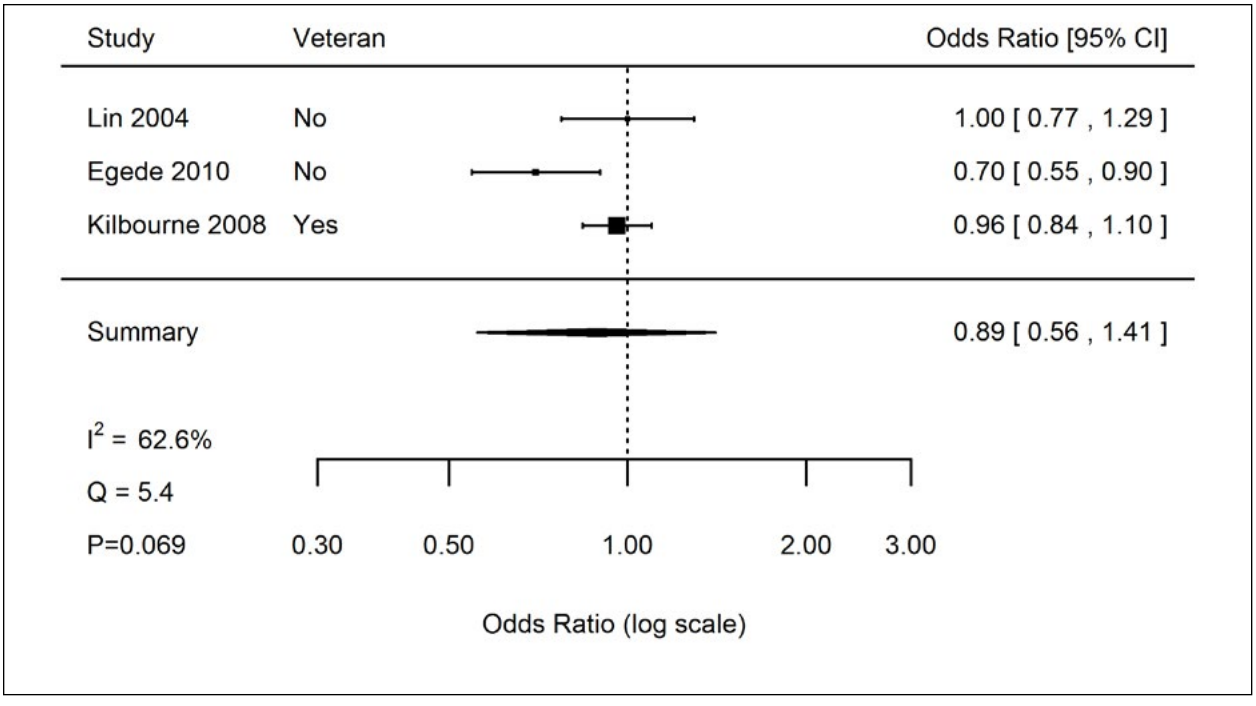
ICD-9 codes for mental health conditions[49] reported that patients with mental health diagnoses were more likely to have poor lipid control, defined as no testing done in the past year or an LDL-C value ≥130 mg/dL (OR 1.20; 95% CI, 1.18 to 1.22). The other VA study[47] evaluated the impact of a dual diagnosis of PTSD and depression on lipid control and found that patients with a dual diagnosis of PTSD and depression were also more likely to have poor LDL-C control compared to patients without depression or PTSD (OR 1.41; 95% CI, 1.09 to 1.82).

Eye Examinations

Nine studies assessed the association of mental health status on the receipt of eye exams among patients with diabetes.[38,40,42,43,45,49-52] Three of these studies were conducted with VA users.[45,49,51] Four studies provided estimates for those with depressive disorders, 3 for those with SMI, and 5 for those diagnosed with any of a broad range of mental illnesses. We were able to perform meta-analyses for each of these groups of mental health conditions to assess the association of mental health diagnosis on receipt of eye exams among diabetic patients.

Four studies assessed the association of depressive disorders on receipt of eye exams,[38,45,50,52] and 3 met criteria for a random-effects meta-analysis.[38,45,52] Patients with diagnoses for depressive disorders were no less likely to have eye exams compared to diabetes patients without a diagnosis of mental illness (OR 0.89; 95% CI, 0.56 to 1.41). The summary estimate displayed moderate heterogeneity (I^2=62.6%) (Figure 12). One other study provided only an HR[50]; this study also found no significant association of depression and receipt of eye exams (HR 1.02; 99.9% CI, 0.92 to 1.14).

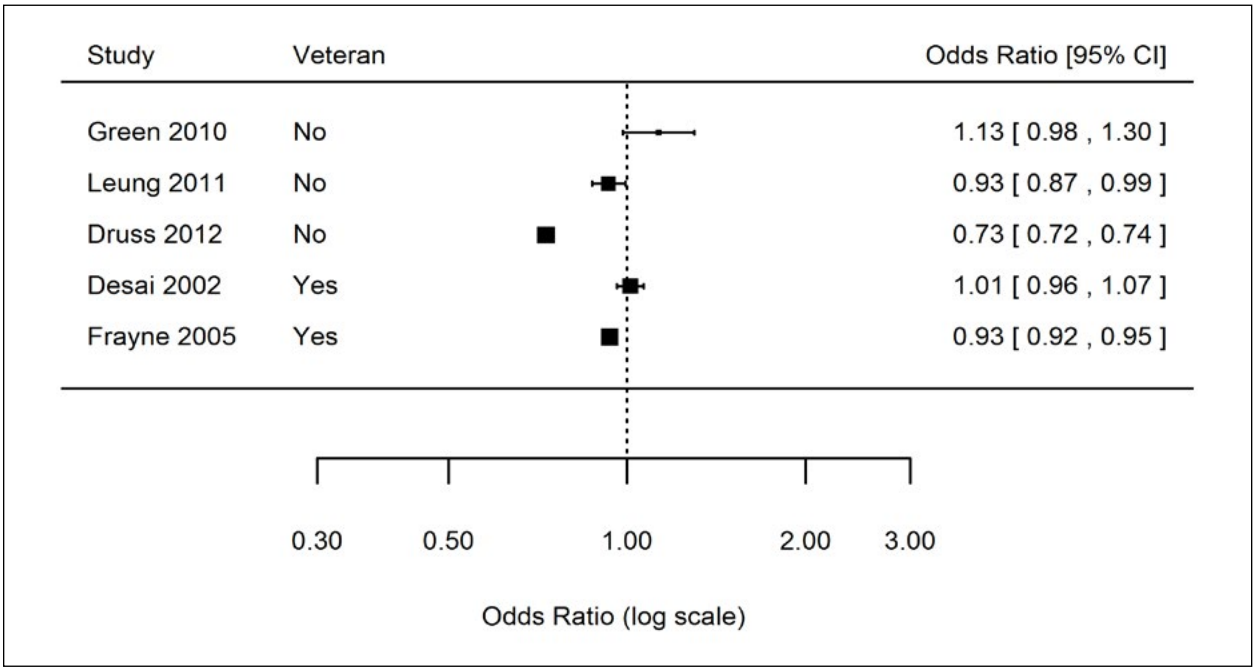
Figure 12. Forest Plot of Meta-analysis of the Association of Depressive Disorders and Eye Exams Among Patients With Diabetes



Three studies assessed the association of SMI on receipt of eye exams, but results could not be pooled.[42,45,50] These studies had mixed results. One study conducted with VA users reported a negative association between a diagnosis of SMI and claims for eye exams (OR 0.65; 95% CI, 0.55 to 0.76).[45] A non-VA study with Medicare and Medicaid beneficiaries in Massachusetts reported a significant and positive association between receipt of eye exams and a diagnosis of schizophrenia (OR 1.19; 95% CI, 1.06 to 1.33).[42] Another non-VA study reported a positive but not significant association of SMI diagnosis and receipt of eye exams (HR 1.36; 99.9% CI, 0.90 to 2.06).[50]

Five studies assessed the association of a diagnosis of mental illness on receipt of eye exams, and all met criteria for a random-effects meta-analysis, but the summary estimate displayed very high heterogeneity (I^2=99.4%); therefore, it is not reported.[40,42,43,49,51] Again, results were mixed and ranged from negative and statistically significant to positive and not statistically significant (OR range: 0.73 to 1.13; median OR=0.93) (Figure 13). The 2 statistically significant studies both demonstrated negative associations (OR range: 0.73 to 0.93).

Figure 13. Forest Plot of Meta-analysis of the Association of Mental Illness and Eye Exams Among Patients With Diabetes



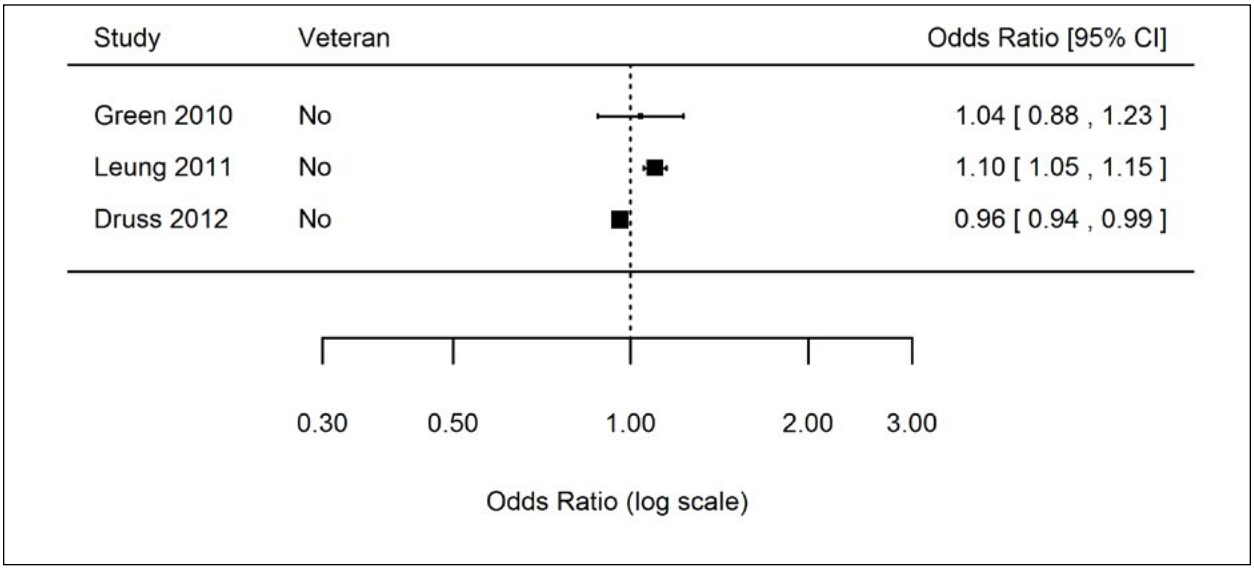
Nephropathy Screening

Five studies assessed the association between mental health status and the receipt of nephropathy screening among patients with diabetes.[40,42,43,50,52] None of these studies were conducted with VA users. Two studies provided estimates for those with depressive disorders, 2 for those with SMI, and 3 for those diagnosed with any of a broad range of mental illnesses. We were able to perform one meta-analysis for the association of a diagnosis of broadly defined mental illness on receipt of nephropathy screening among patients with diabetes. The other results will be summarized qualitatively.

Three studies assessed the association of a diagnosis of mental illness on receipt of nephropathy

screening among patients with diabetes, and all met criteria for a random-effects meta-analysis, but the summary estimate displayed very high heterogeneity (I^2=92.4%); therefore, it is not reported.[40,42,43] Visual inspection of the forest plot shows little variability in point estimates, which all cluster around no effect of mental illness on receipt of nephropathy screening, but direction of effects were mixed (OR range: 0.96 to 1.10; median OR=1.04) (Figure 14).

Figure 14. Forest Plot of Meta-analysis of the Association of Mental Illness and Nephropathy Screening Among Patients With Diabetes



Two studies assessed the receipt of nephropathy screening among patients with and without depressive disorders.[50,52] Both used administrative claims data from private health insurance organizations to assess access to preventive services. Neither study found a significant association between depression and receipt of nephropathy screening among diabetic patients.

Two studies assessed the association of SMI diagnoses on receipt of nephropathy screening.[42,50] Results were mixed. One study conducted with claims form a private health insurance organization[50] reported a similar rate of screening between those with ICD-9 codes for psychotic disorders and those without a mental health diagnosis (HR 0.94; 99.9% CI, 0.65 to 1.36). The other study, conducted with Medicare and Medicaid beneficiaries in Massachusetts,[42] reported a significant and positive association between receipt of nephropathy screening and a diagnosis of schizophrenia/paranoid states (OR 1.39; 95% CI, 1.28 to 1.50) and bipolar disorder (OR 1.34; 95% CI, 1.23 to 1.45) when compared to those without mental illness.

Diabetic Foot Exam

Three studies assessed the association of mental health status on the receipt of foot exams among patients with diabetes.[38,45,51] Of these, 2 were conducted with VA users,[45,51] and the third study was a national population-based study using 2006 BRFSS data.[38] Two studies provided estimates for those with depressive disorders, one for those with SMI, and one for those diagnosed with any of a broad range of mental illnesses. We were unable to perform any meta-analyses; results are summarized qualitatively.

Two studies assessed the receipt of foot exams among patients with and without depressive disorders.[38,45] One study (n=10,943) used data from the 2005 VA EPRP dataset and registries of VA users with SMI and depression.[45] This study found a statistically significant and negative association between a diagnosis of depression and medical records claims of receipt of foot exams in the past year among diabetic VA users (OR 0.85; 95% CI, 0.71 to 0.99). The other study used 2006 BRFSS data (n=16,754)[38] and found a similar but statistically insignificant effect of depression as assessed by the Patient Health Questionnaire-8 (PHQ-8) on self-reported foot exams (OR 0.80; 95% CI, 0.62 to 1.04).

One study conducted with VA users reported on the association of SMI diagnoses and receipt of foot exams among patients with diabetes.[45] This study used national-level VA claims data and reported a statistically significant and negative association between ICD-9 codes for schizophrenia, bipolar disorder, and other psychosis (OR 0.68; 95% CI, 0.56 to 0.82)[45] and receipt of foot exams. One additional national-level study with VA users[51] found no difference in foot sensory exams between those with a diagnosis of mental illness without dual diagnosis of SUD and those without mental illness (77.5% vs 78.6%).

Blood Pressure Control

Three studies assessed the association between mental health status and adequacy of blood pressure control among patients with diabetes.[46,53,54] All 3 used medical records review. Two were conducted with VA users,[53,54] and the last study[46] used medical records from 5 internal medicine practices in the Boston area. One study provided estimates for those with SMI, and 2 for those diagnosed with any of a broad range of mental illnesses. We were unable to perform any meta-analyses; results are summarized qualitatively.

One study assessed the effect of SMI diagnoses on adequacy of blood pressure control among diabetic patients seen in 5 general internal medicine clinics in Boston.[46] This study reported a statistically insignificant effect for patients with ICD-9 codes for schizophrenia (OR 1.22; 95% CI, 0.78 to 1.91).

Two studies, both conducted among VA users, reported on the effect of mental illness on adequacy of blood pressure control and found no statistically significant results. One national-level study with VA users[53] found a statistically insignificant effect of ICD-9 codes for schizophrenia, other psychoses, bipolar disorder, or depression on blood pressure control (OR 1.11; 95% CI, 0.99 to 1.25). A final study[54] assessed the impact of diagnoses for depression, anxiety, and schizophrenia disorders on adequacy of blood pressure control among patients who had just completed a VA pharmacist-led cardiovascular risk reduction clinic. This study also reported no significant differences in adequacy of blood pressure control for diabetic patients with or without mental illness (HR 0.96; 95% CI, 0.68 to 1.35).

Patient with Hyperlipidemia Prescribed a Statin

Only one study assessed the impact of mental illness on receipt of a prescription for a statin among diabetic patient with hyperlipidemia.[46] This study was conducted with general internal medicine patients in the Boston area and identified patients with schizophrenia or other psychotic disorders (n=3,808). Investigators reported a statistically significant and negative association between a diagnosis of SMI and prescriptions for statins (OR 0.54; 95% CI, 0.36 to 0.81).

Summary of Findings: Diabetes

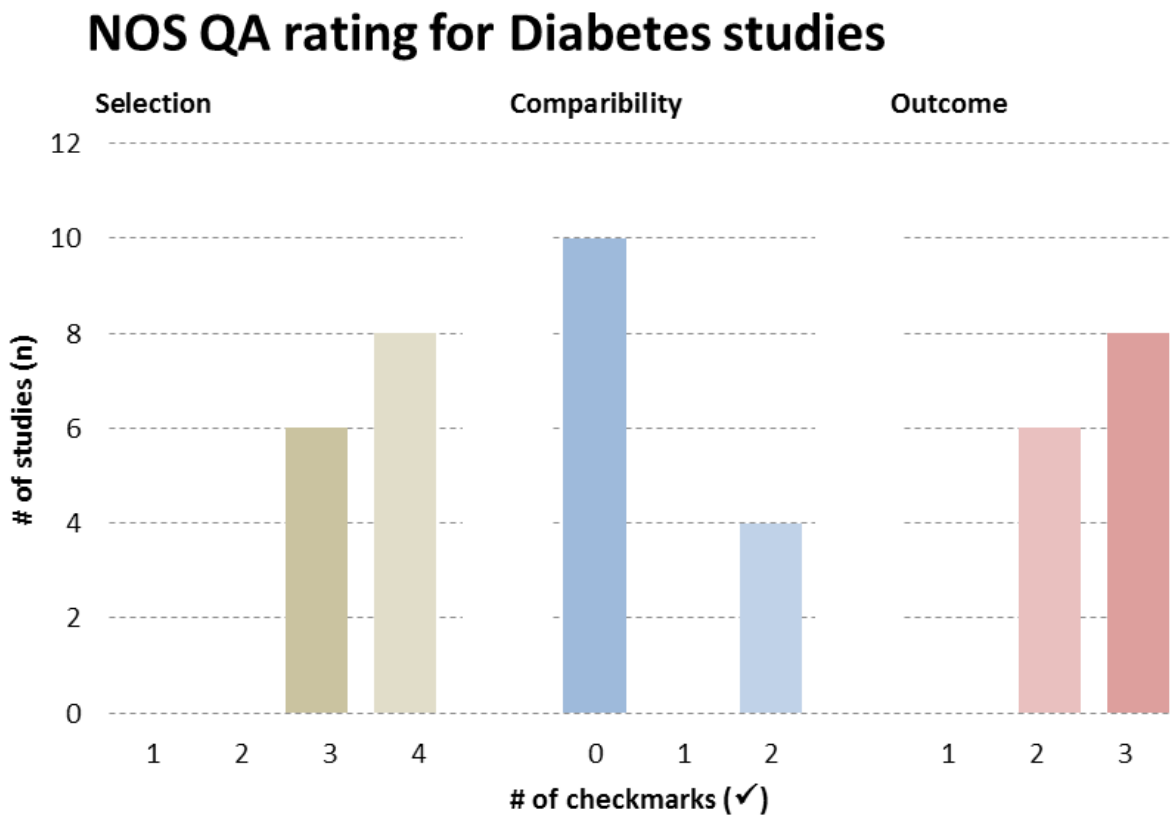
We identified 14 studies that met inclusion criteria and compared diabetes process of care outcomes *(eg,* HbA1c testing, LDL-C at goal) among those with and without mental illness.[38,40-54] Most studies addressed multiple quality indicators of diabetes. While several studies addressed depressive disorders, SMI, or composite groups of diabetic patients with mental illness, only one study[47] assessed the impact of PTSD on diabetes quality of care indicators. We had adequate studies of sufficient homogeneity to conduct 8 meta-analyses for studies addressing disparities with diabetes quality indicators. Yet nearly all meta-analyses displayed high heterogeneity in the estimates, likely due to small number of studies, differences in populations *(eg,* identification of those with current vs lifetime mental illness), and assessment of outcomes *(eg,* self-report vs claims data), and study design issues *(eg,* covariates used in adjusted analysis).

We observed some qualitative differences in care patterns for studies conducted inside the VA versus outside the VA. For composite indicators of diabetes care, the one study conducted outside the VA reported a statistically significant and negative association, while 2 studies conducted with VA users reported mixed results for patients diagnosed with mental illnesses. There was a positive trend of more HbA1c monitoring for VA users with SMI compared to VA users without SMI,[45,48] but results were inconsistent in the non-VA studies.[42,50] The trend was reversed for diabetic eye exams. The one VA study that assessed receipt of eye exams among diabetic VA users with SMI[45] compared to those without mental illness reported that patients with SMI were statistically significantly less likely to received eye exams than VA users without mental illness. In contrast, the 2 studies that assessed receipt of eye exams outside the VA[42,50] found that diabetic patients with SMI were more likely to received eye exams than those without mental illness diagnoses, but only one estimate was statistically significant. Three VA studies[41,45,48] assessed the adequacy of LDL-C control among patients with SMI and found no significant differences between VA users with and without SMI. Yet, the one study that provided comparative estimates outside the VA[46] reported significant and negative effects of SMI on achieving adequate LDL-C control. Patterns for receipt of diabetic foot exams were similar inside and outside the VA; patients with mental illness were less likely to receive foot exams compared to those without mental illness, but estimates were statistically significant only for those patients seeking care inside the VA.

Quality of Evidence for Diabetes Care Studies

Total quality scores ranged from 5 to 9 on the NOS, suggesting that all studies were of fair to good quality, with 2 of the studies scoring a 9,[40,49] one scoring an 8,[52] 5 scoring a 7,[41-43,51] 3 scoring a 6,[38,44,45,48] and 3 scoring a 5[46,47,50] (Figure 15). The included studies rated high on selection, with all studies receiving a score of 3 or 4 out of 4 possible points. This indicates a high level of representativeness of the selected population and fidelity in ascertainment of the exposure of interest *(eg,* ICD-9 codes for mental illness). There was significant variability in the area of comparability; more than half the studies (n=10[41-48,50,51]) received zero points, indicating inadequacy of controls for potential confounders *(ie,* socioeconomic status) in the studies reviewed. Most studies (n=8[40-44,49,51,52]) also displayed high quality in the assessment of outcomes via use of medical records review and adequacy of follow-up windows; they received the maximum of 3 points on this scale. Appendix E provides the scores for each study per domain.

Figure 15. Summary Newcastle-Ottawa Scale Quality Rating for Studies Reporting Diabetes Process of Care Outcomes



Abbreviations: NOS=Newcastle-Ottawa Scale; QA=quality assessment

Hypertension Care

Key Points

- There is limited comparative evidence to describe disparities in hypertension process of care indicators between those with mental illness and those without mental illness. Two studies met inclusion criteria for comparison of hypertension and adequacy of blood pressure control between those with and without mental illness. Both studies were conducted with VA users and were of fair quality.
- A qualitative review found no significant differences in adequacy of blood pressure control between individuals with and without mental illness diagnoses.

Description of Included Studies

Two studies met inclusion criteria and comparing adequacy of blood pressure control for individuals with hypertension with and without mental illness.[45,55] Table 6 summarizes the characteristics of these studies. We identified one retrospective cohort study and one cross-sectional study. Both studies were conducted exclusively with VA user populations, with data ranging from 2001 to 2005. Both studies used healthcare databases for patients receiving care in

outpatient general medicine clinics either at a single facility or as part of a national sample. Of the 24,194 patients across the 2 included studies, most were male in the sixth or seventh decade of life. Of note, one of the 2 studies did not report data on race/ethnicity. Both studies utilized a composite definition (implemented with *International Classification of Diseases, 9th Revision, Clinical Modification* [ICD-9-CM] diagnosis codes) of mental illness that included schizophrenia and bipolar disorder. Major depressive disorder (n=1), schizoaffective disorder (n=1), and other psychoses (n=2) were also included in the composite definition.

Table 6. Characteristics of Hypertension Studies

Article	Geographic Location; Data Source; Total N	Population: Age in Years; % Female; % White	Mental Health Diagnoses; Measurement	Study Design	Data Source	Outcomes
Dolder, 2005[55]	San Diego, CA VAMC facility-level clinic database N=178	Age (mean [SD]): MI=57.1 (9.1) NMI=57.9 (9.0) % Female: MI=5.6 NMI=3.4 % White: MI=58.4 NMI=53.9	Composite SMI: psychotic disorders (schizophrenia, schizoaffective disorder, or psychosis not otherwise specified) ICD-9 codes	Retrospective cohort	Chart review of VA healthcare system database, calendar year 2001	BP at goal
Kilbourne, 2008[45] (Companion: Morden, 2010[53])	National VA Healthcare system databases N=24,016 for HTN	Age (mean [SD]): Total=67.0 (11.8) % Female: 3.2 % White: NR	Composite SMI: schizophrenia, bipolar disorder, other psychosis Depression: unipolar depression, depressive disorders ICD-9 codes	Cross-sectional	VA National Registries for (1) Psychosis; and (2) Depression; EPRP national quality of care databases, fiscal year 2005	BP adequately controlled

Abbreviations: BP=blood pressure; CA=California; EPRP=External Peer Review Program; HTN=hypertension; ICD-9=*International Classification of Diseases, 9th revision*; ICD-9-CM=*International Classification of Diseases, 9th Revision, Clinical Modification*; MI=mental illness; N=number of participants; NMI=no mental illness; NR=not reported; SD=standard deviation; SMI=serious mental illness, usually schizophrenia, schizoaffective disorder, and bipolar disorder; VA=Veterans Affairs; VAMC=Veteran Affairs Medical Center

Synthesis of Findings: Hypertension

We classified studies and organized findings by outcome and by mental health condition. Results are synthesized qualitatively.

Proportion of Patients at BP Goal

Two studies assessed the proportion of individuals with hypertension and adequately controlled blood pressure among those with SMI compared to those without SMI.[45,55]

A small retrospective cohort study assessed the adequacy of blood pressure control among VA patients with hypertension and a psychotic illness (n=89) compared to those without a diagnosed psychiatric disorder (n=89).[55] Medical chart review was used to abstract blood pressure measurements in a general medicine clinic, and adequacy of blood pressure control was determined based upon the sixth report of the Joint National Committee on prevention, detection, evaluation, and treatment of high blood pressure.[56] The percentage of blood pressure measurements considered adequately controlled (35%) among those with a psychotic disorder was lower than among those without a diagnosed psychiatric disorder (49%). This result was reported as a statistically significant difference with no test statistics reported; we were unable to confirm this finding.

A large cross-sectional study also assessed the adequacy of blood pressure control among VA patients with hypertension and a diagnosis of depression or SMI compared to VA patients without a diagnoses of SMI or depression (n=24,016).[45] This medical chart-based study assessed mental health diagnoses by ICD-9 codes and blood pressure outcomes via the 2005 EPRP data. In bivariate and multivariate results, there were no significant differences in adequacy of blood pressure control for the depression group (OR 1.01; 95% CI, 0.93 to 1.09) or the SMI group (OR 1.00; 95% CI, 0.89 to 1.13) compared to patients without a psychiatric diagnosis.

Summary of Findings: Hypertension

We reviewed 2 studies that compared blood pressure control in individuals with hypertension with and without mental illness. Both studies were with VA healthcare users. These studies examined a set threshold (BP <140/90) to determine adequacy of blood pressure control. One study found a statistically significant lower proportion of people with adequately controlled blood pressure among individuals with psychotic disorders compared to individuals without any psychiatric disorder, but we were unable to confirm this result.[55] The second study found no significant difference in adequacy of blood pressure control between mental illness *(ie,* SMI, depression) and non-mental illness groups.[45]

Quality of Evidence for Hypertension Studies

Quality ratings were 7 points[55] and 6 points, suggesting fair quality studies.[45] Both studies received 4 points for selection, suggesting a high degree of quality on the representativeness of the cohorts, ascertainment of exposure, and demonstration that the outcome of interest was not present at the start of the studies. However, neither study displayed a high degree of comparability, and neither controlled for a minimal set of the most important moderating variables. One study[55] received 3 points for outcome assessment, while the other[45] received 2 points for outcome assessment. Overall, the included studies were high in quality with respect to selection and outcome assessment, but low in quality with respect to comparability due to inadequate control of moderating variables.

Ischemic Heart Disease Care

Key Points

- There is limited comparative evidence to describe disparities in quality of care indicators for ischemic heart disease between those with and without mental illness.
- Only one retrospective cohort study met inclusion criteria. This study received an NOS score of 7, suggesting fair quality. It compared receipt of care for ischemic heart disease between individuals with and without SMI and found no difference in receipt of appropriate pharmacotherapy or rate of invasive intervention procedures post-myocardial infarction.
- No study provided comparative evidence on prescriptions for or adherence to antiplatelet therapy or proportion of individuals at blood pressure goal among those with and without mental illness.

Description of Included Studies

One study met inclusion criteria and compared the receipt of process of care outcomes for ischemic heart disease among those with mental illness and those without mental illness[57] (Table 7). This study was a retrospective cohort design and was conducted using a state-level population database of administrative claims for Maryland Medicaid enrollees from fiscal years 1994 to 2004. Of the 633 patients with a principle diagnosis of acute myocardial infarction, the majority were female, slightly less than half reported as white race/ethnicity, and 137 were defined as having SMI. The criteria for identifying individuals with SMI were an ICD-9 code for schizophrenia or being disabled (as assessed by Supplemental Security Income) and a diagnosis of bipolar disorder, major depressive disorder, or other mental health diagnosis and specialty mental healthcare use.

Table 7. Characteristics of Ischemic Heart Disease Study

Article	Geographic Location; Data Source; Total N	Population: Age in Years; % Female; % White	Mental Health Diagnoses; Measurement	Study Design	Data Source	Outcomes
McGinty, 2012[57]	Baltimore or eastern shore, MD State-level, population-based database N=633	Age (mean [SD]): MI=51.7 (NR) NMI=54.1 (NR) % Female: MI=63.5 NMI=61.5 % White: MI=46.7 NMI=41.9	Composite of mental health disorders: schizophrenia, bipolar disorder, MDD, other psychoses, organic psychosis, OCD, anxiety disorders ICD-9 codes	Retrospective cohort	Maryland administrative claim files for disabled participants on Medicaid (fiscal years 1994-2004)	*30 days after hospitalization:* Cardiac catheterization rate; PTCA (includes catheterization); ACEI/ARB therapy % of patients on statin therapy *1 year after hospitalization:* ACEI/ARB therapy: % of patients on statin therapy

Abbreviations: ACEI=angiotensin converting enzyme inhibitor; ARB=angiotensin receptor blocker; ICD-9=*International Classification of Diseases, 9th revision*; ICD-9-CM=*International Classification of Diseases, 9th Revision, Clinical Modification*; MDD=major depressive disorder; MI=mental illness; N=number of participants; NMI=no mental illness; NR=not reported; OCD=obsessive-compulsive disorder; PTCA=percutaneous transluminal coronary angioplasty; SD=standard deviation

Synthesis of Findings: Ischemic Heart Disease

We classified one study as eligible, organized findings by outcomes of interest, and synthesized the findings qualitatively. Although receipt of appropriate antiplatelet therapy and proportion of individuals at blood pressure goal were outcomes of interest, no identified comparative study reported on these outcomes for patients with ischemic heart disease.

Statin Therapy

The included study assessed individuals for a filled statin prescription using pharmacy claims at 1 month and 1 year after index hospitalization for myocardial infarction, stratified by the presence or absence of SMI. While the overall rate of statin use was low at both time points (10.8% to 12.9% and 22.8% to 29.3% at 1 month and 1 year, respectively), no statistically significant differences were observed between patients with SMI and those without SMI.

ACEI or ARB Therapy

The study also assessed the percentage of individuals with a filled ACEI or ARB prescription at 1 month and 1 year after index hospitalization for myocardial infarction. The percent of individuals with a claim for an ACEI or ARB was 19.3% at 1 month and 40.0% at 1 year among individuals with SMI (22.3% and 38.5% among non-SMI individuals, respectively). The differences in use of ACEI or ARB between SMI and non-SMI individuals were not statistically significant at either time point.

Cardiac Catheterization Rate

The included study also examined rates of invasive therapeutic intervention *(eg,* cardiac catheterization) during index hospitalization and within 1 month of index hospitalization. There were no significant differences in rates of cardiac catheterization or percutaneous coronary angioplasty during index hospitalization or at 1 month post-hospitalization between SMI and non-SMI individuals.

Summary of Findings: Ischemic Heart Disease

We identified only one study the met inclusion criteria and compared receipt of care after index hospitalization for myocardial infarction between individuals with and without mental illness.[57] This study found no differences in receipt of appropriate pharmacotherapy or rate of invasive intervention procedures between individuals with and without SMI. Of note, the study reflects a Medicaid population in one eastern state (Maryland) from 1994 to 2004 and may not generalize to other populations.

Quality of Evidence for Ischemic Heart Disease

The included study received a total of 7 points (4 for selection, 0 for comparability, and 3 for outcome assessment), suggesting a fair quality study. It did not control for the minimal covariates desired (low quality for comparability), but was rated high quality based on the representativeness of the exposed cohort, sections of non-exposed cohort, and ascertainment of the exposures via ICD-9 codes. The study was also judged to have adequate outcome assessment and adequacy of follow-up of the cohort.

KEY QUESTION 2: For those with mental illness compared to those without mental illness, do any observed health disparities in preventive care, indicated screening or chronic disease management vary based on race/ethnicity, Veteran status, geographic location, sex, or sexual orientation?

Key Points

- There are limited data on the interaction effects of mental health status by key moderators. There were no analyses for the subgroups of interest in the eligible studies for cancer screening, immunizations, tobacco screening and referral, or ischemic heart disease.
- One study with 2 separately published analyses assessed mental health disparities in hypertension and diabetes process of care indicators and assessed the differential impact of geographic location (urban vs rural) and race/ethnicity (black vs non-black) on these disparities. No significant differences were noted for either subgroup. Both studies were conducted with VA users.

Description of Included Studies

We identified one cross-sectional study with 2 separately published analyses[45,53] that met inclusion criteria and assessed interaction effects of mental health status and key subgroups *(ie,* race/ethnicity, Veteran status, geographic location, sex, or sexual orientation). These analyses addressed interaction effects of mental health by race/ethnicity or by geographic setting only. No studies assessed interaction effects of interest between those with and without mental illness for preventive care *(ie,* tobacco screening and referral, cancer screening, immunizations) or process of care indicators for ischemic heart disease.

Synthesis of Findings: Key Question 2

We did not have enough studies to perform meta-analyses; therefore, we synthesize the findings qualitatively. The subgroup analyses in the identified studies were limited. The studies reported only interactions by race/ethnicity and by geographic setting. While sex, sexual orientation, and Veteran status were subgroups of interest, no identified comparative study conducted subgroup analyses by these groups.

Diabetes Care

One analysis using VA 2005 EPRP data[45] examined the association between race/ethnicity (black vs non-black) and differences in HbA1c testing, LDL-C control, sensory foot exams, eye exams, or nephropathy screening in diabetic VA users with mental illness (either SMI or depression) or without mental illness. The study found no significant differences in any of these processes of diabetes care indicators when testing the interaction effect of race/ethnicity by mental health status.

A second analysis using the data from the same study population[53] assessed the association between geographic location (rural vs urban) and differences in HbA1c testing, blood pressure

control, LDL-C control, sensory foot exams, eye exams, or nephropathy screening in diabetic VA users with SMI or without mental illness. The interaction effect of geographic setting by mental health was not significant for any of the diabetes process of care indicators assessed.

Hypertension

One study using data from the VA 2005 EPRP[45] examined the association between race/ethnicity (black vs non-black) and differences in blood pressure control in VA users with mental or without mental illness. The study found no significant differences in blood pressure control for black individuals with mental illness versus non-black individuals with mental illness. A second analysis using this same dataset [53] also assessed the association between geographic location (rural vs urban) and differences in blood pressure control for hypertensive VA patients with SMI and hypertensive VA patients without any mental illness. The interaction effect of geographic setting by SMI status on blood pressure control was not significant.

Summary of Findings: Key Question 2

We identified only one study that assessed the interaction of mental health status and key subgroups of interest (race/ethnicity, geographic setting) for process of care indicators for diabetes and hypertension. No significant differences were noted for either subgroup. There were no analyses for the subgroups of interest in the eligible studies for cancer screening, immunizations, tobacco screening and referral, and ischemic heart disease. No identified studies conducted subgroup analyses by sex, sexual orientation, or Veteran status.

Quality of Evidence for Key Question 2

The included study received 6 of a possible 9 points for quality as assessed via the NOS, suggesting a fair quality study (Appendix E). It received 4 points for selection, indicating a high level of representativeness of the selected population and fidelity in ascertainment of the exposure of interest *(eg,* ICD-9 codes for mental illness). However, it received 0 points for comparability, indicating inadequacy of controls for potential confounders. It received 2 points for outcome assessment, indicating moderate quality choices for outcome assessment and adequacy of follow-up times.

SUMMARY AND DISCUSSION

Disparities in health between people with and without mental illness are common.[20,28] The burden of medical illnesses, such as diabetes and cardiovascular disease, disproportionately affect people with mental illness.[1-3] We identified 26 articles describing 23 unique studies that examined whether disparities in care exist for patients with mental health disorders regarding 3 preventive services—cancer screening (n=7), receipt of immunizations (n=3), and screening for tobacco use and referral for treatment (n=2)—and the management of 3 chronic diseases—type 2 diabetes mellitus (n=14), hypertension (n=2), and ischemic heart disease (n=1). The mental health conditions examined were those of most interest to our stakeholders due to their prevalence in Veterans or cost to the VA healthcare system; however, the majority of studies described the subjects with composite mental health disorders vs those without mental health disorders (n=17). Most of these studies used cross-sectional (n=11) or retrospective cohort (n=10) designs; 2 were prospective cohort studies. Approximately half of all included studies (n=12) studies were conducted within the VA healthcare system. Participants were typically midlife, the majority of whom were white. The composition of the included studies varied widely due to inclusion of studies of sex-specific outcomes *(eg,* breast cancer) or predominantly male populations (VA healthcare databases).

For observational studies, the strength of the evidence (SOE) is set initially at "low" and upgraded only for methodologically strong studies with large effects, or a strong dose-response pattern. The SOE rating may be decreased to "very low" for important risk of bias, inconsistent results, imprecise results, indirect evidence, or evidence of reporting bias. Since none of the outcomes met the upgrade criteria, the SOE for all outcomes was low or very low. Thus, our confidence in the effect estimates is limited: the true effect may be substantially different from the estimates presented here. Further research is very likely to have an important impact on our confidence in the estimates of effect and is likely to change those estimates.

SUMMARY OF EVIDENCE BY KEY QUESTION

Overall, we found weak signals to support disparities in quality of care; however, results were inconsistent, and beyond diabetes care, the existing literature was sparse. Below we summarize the major findings for each outcome organized by condition and by type of outcome. We highlight key differences in findings between studies conducted inside the VA with VA users and those conducted outside the VA in community healthcare settings or with population-level datasets.

Key Question 1a: Disparities by Mental Health Status for Receipt of Appropriate Preventive Care Services and Indicated Screenings

A table summarizing our findings for receipt of appropriate preventive services is provided in Appendix F.

Cancer Screening

We identified one prospective cohort, 3 retrospective cohort, and 3 cross-sectional studies that addressed cancer screening among individuals with mental illness compared to those without

mental illness.[22-24,34-37] Most studies (n=4) addressed all 3 types of cancer screening.[22,23,34,37] Total NOS scores ranged from 5 to 7, suggesting that studies were of fair quality. While we had sufficiently homogeneous studies to conduct meta-analyses for studies addressing disparities in breast, cervical, or colorectal cancer screening among those with depressive disorders compared to those without depression but, cervical cancer screening was the only area where the meta-analysis displayed low to moderate heterogeneity. Meta-analysis of 3 studies demonstrated that women with a diagnosis of depression were less likely to have cervical cancer screenings (OR 0.87; 95% CI, 0.77 to 0.98; I^2=6.3%).

Existing evidence suggests small to moderate disparities in cancer screening for people with mental illness. Nearly all studies displayed a similar pattern of a negative association between having a mental health diagnosis and receipt of cancer screenings; however, several comparisons were not statically significant. The studies conducted that assessed the odds of breast, cervical, and colorectal cancer screening among VA users with and without mental illness displayed a similar pattern of negative associations. Results, however, were inconsistent. Two studies with VA users addressed all 3 cancers of interest among individuals with broadly defined mental illness compared to those without mental illness,[23,37] and one assessed disparities in colorectal cancer screening only.[24] The first VA study used national data on 113,495 VA users[23] and reported significantly lower odds of mammography, Pap smears, and colorectal cancer screening among Veterans with mental illness. Yet, a second smaller VA study using only state-level data on 606 Veterans in the New Mexico VA healthcare system database[37] reported no significant difference for mammography, Pap smears, or colorectal cancer screening among Veterans with mental illness. The last VA study provided estimates for receipt of colorectal cancer screening for those with PTSD, psychotic disorders, depression, or any mental health diagnosis.[24] There was a significant and negative association between mental health diagnosis and receipt of colorectal cancer screening for all groups except those with PTSD.

Immunizations

We identified a total of 3 cross-sectional studies that compared vaccination use of those with mental illness and those without. Total NOS scores ranged from 5 to 7, suggesting that studies were of fair quality. All 3 studies addressed influenza vaccination, while 2 studies also addressed pneumococcal vaccination. Limited evidence existence to support small to moderate disparities in vaccination; however, results are inconsistent and the existing U.S.-based literature is small. The 2 studies of older adult and high risk sub-populations[22,23] found evidence to support disparities in receipt of influenza vaccinations, while another study found no significant differences in self-reported receipt of influenza vaccinations[38] among a general population of adults. Of the 2 studies that assessed ever receiving pneumococcal vaccinations, one medical chart based study among VA users reported that patient with a psychiatric diagnoses had a lower probability of receiving a pneumococcal vaccine than patients without a psychiatric diagnosis.[23] In contrast, another study conducted outside the VA reported that those with depression were no less likely to report receiving a pneumococcal vaccine than those without depression but this study did not control of the presence of other mental illnesses in the comparator.[22]

Screening and Referral for Tobacco Use

Overall, there is limited comparative evidence to describe disparities in tobacco use processes of care indicators between those with mental illness and those without mental illness. We identified only 2 comparative studies that assessed screening for tobacco use and referral for smoking cessation treatment[23,39]; no identified study directly reported on prescriptions for smoking cessation pharmacotherapy. Both studies received total NOS scores of 5, suggesting studies of fair quality. Both identified studies were conducted with VA users. The available evidence suggests those with mental illness are more likely to be screened for tobacco use and referred for counseling than those without mental illness. This result is based on a single cross-sectional study. One cross-sectional study suggests that smokers with PTSD and depressive disorders are more likely to receive a physician's recommendation for smoking cessation medications than those without mental illness; smokers with PTSD were also more likely to report that a physician had discussed quitting methods with them. Smokers with schizophrenia report that they may be less likely to receive advice to quit from physicians compared to smokers without a mental health diagnosis; however, no significant differences were found for having a physician discuss quitting methods or having a physician recommend medication for smoking cessation. No differences were found between smokers with a diagnosis of bipolar disorder and those without a mental health diagnosis for receipt of smoking cessation services.

Key Question 1b: Disparities by Mental Health Status in Management of Chronic Conditions

A table summarizing our findings for management of chronic conditions is provided in Appendix F.

Diabetes Care

We identified 14 studies (1 prospective cohort, 6 retrospective cohort, 7 cross-sectional) described in 16 papers that met inclusion criteria and compared diabetes process of care outcomes *(eg,* HbA1c testing, LDL-C at goal) among those with mental illness and those without mental illness.[38,40-54] All studies were of fair (n=11) to high (n=3) quality (NOS scores ≥5). Seven studies were conducted exclusively with patients who seek care in the VA healthcare system.[41,44,45,47-49,51] Most studies addressed multiple quality indicators of diabetes. While several studies addressed depressive disorders, SMI, or composite groups of diabetic patients with mental illness, only one study[47] assessed the specific impact of PTSD on diabetes quality of care indicators. Half of the studies were of fair to high quality (NOS scores ≥7). We had sufficiently homogeneous studies to conduct 8 meta-analyses; however, all but one pooled analysis displayed high heterogeneity (I^2 ≥75%).

For most outcomes, results were inconsistent and suggest small to modest disparities in diabetes care for people with mental illness. We observed some qualitative differences in care patterns for studies conducted inside the VA healthcare system versus outside the VA healthcare system. For composite indicators of diabetes care, the one study conducted outside the VA reported a statistically significant and negative association, while 2 studies conducted with VA users reported mixed results for patients diagnosed with mental illnesses. There was a positive trend of more HbA1c monitoring for VA users with SMI compared to VA users without SMI,[45,48] but results were inconsistent in the non-VA studies.[42,50] The trend was reversed for diabetic eye

exams. The one VA study that assessed receipt of eye exams among diabetic VA users with SMI[45] compared to those without mental illness reported that patients with SMI were statistically significantly less likely to received eye exams than VA users without mental illness. In contrast, the 2 studies that assessed receipt of eye exams outside the VA[42,50] found that diabetic patients with SMI were more likely to received eye exams than those without mental illness diagnoses, but only one estimate was statistically significant. Patterns for receipt of diabetic foot exams were similar inside and outside the VA; patients with mental illnesses were less likely to received foot exams compared to those without mental illness, but estimates were only significant for those patients seeking care inside the VA. Three VA studies[41,45,48] assessed the adequacy of LDL-C control among patients with SMI and found no significant differences between VA users with and without SMI. Yet, the one study that provided comparative estimates outside the VA[46] reported significant and negative effects of SMI on achieving adequate LDL-C control. Patterns for receipt of diabetic foot exams were similar inside and outside the VA; patients with mental illness were less likely to receive foot exams compared to those without mental illness, but estimates were statistically significant only for those patients seeking care inside the VA.

Hypertension Care

There is limited comparative evidence to describe disparities in hypertension process of care indicators between those with mental illness and those without mental illness. We identified only 2 studies (1 retrospective cohort, 1 cross-sectional) that met inclusion criteria that compared the adequacy of blood pressure control for hypertensive persons among those with mental illness and those without mental illness.[45,55] Quality ratings were 7 points[55] and 6 points.[45], suggesting fair quality studies. Both studies were conducted with VA healthcare users. These studies examined a set threshold *(ie,* BP <140/90) to determine adequacy of blood pressure control. No statistically significant differences in adequacy of blood pressure control between individuals with and without mental illness diagnoses were reported in either study.

Ischemic Heart Disease Care

We identified only one study the met inclusion criteria and compared receipt of care post myocardial infarction between individuals with and without SMI.[57] The included study received a total of 7 points on the NOS suggesting fair quality. This study of a Medicaid population in one eastern state (Maryland) from 1994-2004 found no differences in receipt of appropriate pharmacotherapy or rate of invasive intervention procedures post myocardial infarction between individuals with and without SMI.

Key Question 2: Interaction Effect of Mental Health Status by Race/Ethnicity, Veteran Status, Geographic Location, Sex, or Sexual Orientation

We identified one cross-sectional study of fair quality with 2 separately published analyses assessing the interaction of mental health status and key subgroups of interest (race/ethnicity, geographic setting) for process of care indicators for diabetes and hypertension. No significant differences were noted for either subgroup. There were no analyses for the subgroups of interest in the eligible studies for cancer screening, immunizations, tobacco screening and referral, and ischemic heart disease. No identified studies conducted subgroup analyses by sex, sexual orientation, or Veteran status.

CLINICAL AND POLICY IMPLICATIONS

Overall, the current state of the evidence regarding quality indicators of healthcare among individuals with mental illness is limited, due both to relatively few studies meeting our study criteria and the inconsistency of the results of the included studies. Our inconsistent findings are generally consistent with findings of prior comparative systematic reviews on the quality of medical care for people with and without mental illness.[20,21] The relative lack of robust evidence supporting diminished quality of care delivered to individuals with mental illness should be interpreted cautiously. The tracer conditions (diabetes, ischemic heart disease, hypertension) and preventive services (cancer screening, screening for tobacco use and treatment referrals, immunizations) chosen for this study represent a very small proportion of the overall quality of healthcare indicators. Tracer conditions are chosen due to, among other factors, the ease with which adherence to standards of care can be documented and measured. New interventions designed to mitigate disparities in quality of care identified by these tracer conditions may not be generalizable to other conditions for which quality of care is more difficult to measure.

Variables potentially affecting the study results are the variety of different mental disorders studied, the complexity of the interventions evaluated, and the degree of involvement required by various healthcare providers and patients in completing the range of screening and treatment procedures. Groups of individuals with various types of mental illnesses, while clearly not homogeneous, may have different needs for interaction with the healthcare system. For example, individuals with depression may need increased motivation to complete recommended tests, while those with disorders of thought and perception *(eg,* schizophrenia) may need more detailed explanations of health conditions and instructions for follow up. In contrast, persons with SMI, once identified, may need to be followed more closely. Enhanced monitoring may influence how often they see a healthcare provider, possibly increasing opportunity for preventive intervention. With regard to intervention complexity, some of the interventions studied *(eg,* documentation of screening for smoking, prescription of a guideline concordant medication) can be completed in one step, whereas others *(eg,* completing a mammogram or colonoscopy) require more steps, including steps that occur outside of the initial clinical visit. Related to this point is the variation in the number and type of individuals involved with completion of the various interventions. For example, while completing a colonoscopy typically requires a primary care provider to order the test, a gastroenterologist to administer and interpret the test, and the patient to complete a bowel regimen in preparation for the test, an intervention like a recommendation to quit smoking can be completed by a wider variety of different healthcare providers *(eg,* primary care providers, psychiatrists or other mental health providers, nurses) and requires no action on the part of the patient *(ie,* when the outcome measured is simply receipt of the recommendation).

Implementation of the findings of this review should be pursued in concert with operational leaders and policy makers, including Primary Care and Mental Health Services within the Office of Patient Care Services, the Office of Mental Health Operations, National Center for Health Promotion and Prevention, and the newly established Office of Health Equity, as well as Veteran end-users. Developing best practices for the effective and sensitive care of patients with complex medical and behavioral health risks and comorbidities will require cross-disciplinary collaboration and problem-solving and, in many cases, cultural shifts within care environments.[58] Diverse and flexible treatment models may be necessary to accommodate different care settings *(eg,* rural) within the VA healthcare system and individual patient preferences.

LIMITATIONS

Our review has a number of strengths, including a protocol-driven design, a comprehensive search, and a careful quality assessment. We conducted both quantitative and qualitative synthesis when possible. Prior reviews on this topic have only used qualitative synthesis.

Our review, and the literature, also have limitations. First, we selected studies that included adults with bipolar disorder, schizophrenia, schizoaffective disorder, major depressive disorder (or depressive disorders), and PTSD. We selected these mental health conditions either because they are common in *(eg,* depressive disorders) or costly for *(eg,* schizophrenia) the VA healthcare system. For mixed study populations, ≥65% of the total population with mental health diagnoses was required to have a diagnosis of primary interest. The majority of studies combined mental health diagnoses *(ie,* evaluated a comparison of mental illness present vs absent). Unfortunately, such analyses do not provide adequate granularity to inform practice or policy. It is also important to note that we only included studies that recruited insured populations. If studies included mixed populations of insured and uninsured individuals, the study could only be included if the analysis controlled for insurance status, results were reported separately by insurance status, or ≥80% of total population had insurance. These eligibility requirements may have excluded some studies; however, we sought to include studies that were of greatest applicability to the VA healthcare system. Second, as expected, we identified only observational studies. Even the highest quality observational studies are susceptible to multiple forms of bias. Third, confounding is another major limitation of observational studies. Most included studies adjusted for multiple likely sources of confounding, but the majority of studies did not control for our *a priori* set of minimal covariates *(ie,* age, race/ethnicity, sex, and socioeconomic status or reasonable proxy for socioeconomic status like educational attainment). When possible, we used the most adjusted point estimates in our meta-analyses. However, these covariates were not consistent between studies. Fourth, we found significant heterogeneity in many of the planned meta-analyses we conducted. There are multiple potential sources of this heterogeneity. Variability in pooled effects is likely due to a combination of factors, and the limited number of studies precluded meta-regression. Fifth, we found limited data on certain populations (patients with PTSD) and outcomes (quality indicators for ischemic heart disease). Next, the poor/fair/high descriptors for the NOS scores, while reasonable, have not been validated. Finally, the lack of subgroup or interaction analyses for key subgroups of interest limits interpretation for these groups.

RESEARCH GAPS/FUTURE RESEARCH

This comprehensive review of the literature identified several gaps in the current state of the evidence that warrant future investigation. We used the framework recommended by Robinson et al[59] to identify gaps in evidence and classify why these gaps exist (Table 8). This approach considers PICOTS (population, intervention, comparator, outcomes, timing, and setting) to identify gaps and classifies them as due to (1) low strength of evidence or imprecise information, (2) biased information, (3) inconsistency or unknown consistency, and (4) not the right information. VA and other healthcare systems should consider their clinical and policy needs when deciding whether to invest in research to address gaps in evidence.

Table 8. Evidence Gaps and Future Research

Evidence Gap	Reason	Type of Studies to Consider
Limited to no comparative evidence for these populations: • People with PTSD • People with bipolar disorder • Lesbian, gay, and transgender patients with mental illness	Low strength of evidence Limited information	High-quality cross-sectional or cohort studies in broad populations Observational comparative effectiveness studies
Limited or inconsistent comparative evidence for those with and without mental illness for these interventions or outcomes: • Ischemic heart disease care • Screening and treatment for smoking cessation • Immunizations • Hypertension	Low strength of evidence Inconsistency	High-quality cross-sectional or cohort studies in broad populations Observational comparative effectiveness studies
Comparative studies that explore interaction effects of, or subgroup analyses by sex, race/ethnicity, Veteran status, sexual orientation, or geography with mental illness on process of healthcare indicators	Low strength of evidence	Observational comparative effectiveness studies

Abbreviation: PTSD=posttraumatic stress disorder

Although several of the included studies were conducted in VA user populations, there is still a notable gap between the type and amount of relevant research that has been conducted in the VA system and the variety of analyses with large samples that are possible given the VA's wealth of clinical and administrative data. With the VA's national electronic medical record, single-payer system, and network of health services research centers, the VA is well-positioned to conduct the needed research.

CONCLUSIONS

In this review, we found weak signals to support disparities in selected process of care indicators for those with mental illness compared to adults without mental illness; however, results were inconsistent, and beyond diabetes care, the existing literature was sparse. All identified studies used observational designs and were of at least fair quality (NOS score ≥5). For observational studies, the SOE is set initially at "low" and upgraded only for methodologically strong studies with large effects or a strong dose-response pattern, or decreased to "very low" for important risk of bias, inconsistent results, imprecise results, indirect evidence, or evidence of reporting bias. Since none of the outcomes met the upgrade criteria, the SOE for all outcomes are rated low or very low. While the majority of studies displayed negative associations between mental illness and quality indicators, only one meta-analysis—that of disparities in receiving cervical cancer screening—was statistically significant. Most meta-analyses displayed high heterogeneity in the summary estimates, likely due to small number of studies, differences in populations *(eg,* identification of those with current vs lifetime mental illness), and assessment of outcomes *(eg,* self-report vs claims data), and study design issues *(eg,* which covariates were used in adjusted analyses). We observed some qualitative differences in care patterns for studies conducted inside the VA healthcare system versus outside the VA healthcare system that may highlight areas for further research or quality improvement activities. Although several of the included studies were conducted in VA user populations, there are notable gaps in research that researchers with access to VA data may be well-positioned to address.

REFERENCES

1. Koranyi EK, Potoczny WM. Physical illnesses underlying psychiatric symptoms. *Psychother Psychosom.* 1992;58(3-4):155-160.

2. Wells KB, Rogers W, Burnam A, Greenfield S, Ware JE, Jr. How the medical comorbidity of depressed patients differs across health care settings: results from the Medical Outcomes Study. *Am J Psychiatry.* 1991;148(12):1688-1696.

3. Yates WR, Mitchell J, Rush AJ, et al. Clinical features of depressed outpatients with and without co-occurring general medical conditions in STAR*D. *Gen Hosp Psychiatry.* 2004;26(6):421-429.

4. Nasrallah HA, Meyer JM, Goff DC, et al. Low rates of treatment for hypertension, dyslipidemia and diabetes in schizophrenia: data from the CATIE schizophrenia trial sample at baseline. *Schizophr Res.* 2006;86(1-3):15-22.

5. Boyd C, Leff B, Weiss C, Wolff J, Clark R, Richards T. Clarifying Multimorbidity to Improve Targeting and Delivery of Clinical Services for Medicaid Population. Faces of Medicaid Data Series. Center for Health Care Strategies, Inc.; 2010. http://www.chcs.org/media/Clarifying_Multimorbidity_for_Medicaid_report-FINAL.pdf. Accessed August 20, 2014.

6. Hennekens CH, Hennekens AR, Hollar D, Casey DE. Schizophrenia and increased risks of cardiovascular disease. *Am Heart J.* 2005;150(6):1115-1121.

7. Wang PS, Lane M, Olfson M, Pincus HA, Wells KB, Kessler RC. Twelve-month use of mental health services in the United States: results from the National Comorbidity Survey Replication. *Arch Gen Psychiatry.* 2005;62(6):629-640.

8. Osborn DP. The poor physical health of people with mental illness. *West J Med.* 2001;175(5):329-332.

9. Parks J, Svedsen D, Singer P, Foti M. Morbidity and Mortality in People with Serious Mental Illness. Alexandria, VA: National Association of State Mental Health Program Directors; October 2006. http://www.nasmhpd.org/docs/publications/MDCdocs/Mortality%20and%20Morbidity%20Final%20Report%208.18.08.pdf. Accessed August 20, 2014.

10. Lasser K, Boyd JW, Woolhandler S, Himmelstein DU, McCormick D, Bor DH. Smoking and mental illness: a population-based prevalence study. *JAMA.* 2000;284(20):2606-2610.

11. McElroy SL. Obesity in patients with severe mental illness: overview and management. *J Clin Psychiatry.* 2009;70 Suppl 3:12-21.

12. Fountoulakis KN, Siamouli M, Panagiotidis P, et al. Obesity and smoking in patients with schizophrenia and normal controls: a case-control study. *Psychiatry Res.* 2010;176(1):13-16.

13. de Wit L, Luppino F, van Straten A, Penninx B, Zitman F, Cuijpers P. Depression and obesity: a meta-analysis of community-based studies. *Psychiatry Res.* 2010;178(2):230-235.

14. Janney CA, Fagiolini A, Swartz HA, Jakicic JM, Holleman RG, Richardson CR. Are adults with bipolar disorder active? Objectively measured physical activity and sedentary behavior using accelerometry. *J Affect Disord.* 2014;152-154:498-504.

15. Janney CA, Ganguli R, Richardson CR, et al. Sedentary behavior and psychiatric symptoms in overweight and obese adults with schizophrenia and schizoaffective disorders (WAIST Study). *Schizophr Res.* 2013;145(1-3):63-68.

16. Brown S, Birtwistle J, Roe L, Thompson C. The unhealthy lifestyle of people with schizophrenia. *Psychol Med.* 1999;29(3):697-701.

17. Newcomer JW. Metabolic considerations in the use of antipsychotic medications: a review of recent evidence. *J Clin Psychiatry.* 2007;68 Suppl 1:20-27.

18. Levinson Miller C, Druss BG, Dombrowski EA, Rosenheck RA. Barriers to primary medical care among patients at a community mental health center. *Psychiatr Serv.* 2003;54(8):1158-1160.

19. Kaufman EA, McDonell MG, Cristofalo MA, Ries RK. Exploring barriers to primary care for patients with severe mental illness: frontline patient and provider accounts. *Issues Ment Health Nurs.* 2012;33(3):172-180.

20. Mitchell AJ, Malone D, Doebbeling CC. Quality of medical care for people with and without comorbid mental illness and substance misuse: systematic review of comparative studies. *Br J Psychiatry.* 2009;194(6):491-499.

21. Lord O, Malone D, Mitchell AJ. Receipt of preventive medical care and medical screening for patients with mental illness: a comparative analysis. *Gen Hosp Psychiatry.* 2010;32(5):519-543.

22. Druss BG, Rask K, Katon WJ. Major depression, depression treatment and quality of primary medical care. *Gen Hosp Psychiatry.* 2008;30(1):20-25.

23. Druss BG, Rosenheck RA, Desai MM, Perlin JB. Quality of preventive medical care for patients with mental disorders. *Med Care.* 2002;40(2):129-136.

24. Kodl MM, Powell AA, Noorbaloochi S, Grill JP, Bangerter AK, Partin MR. Mental health, frequency of healthcare visits, and colorectal cancer screening. *Med Care.* 2010;48(10):934-939.

25. Kessner DM, Kalk CE, Singer J. Assessing health quality--the case for tracers. *N Engl J Med.* 1973;288(4):189-194.

26. Nolte E, Bain C, McKee M. Diabetes as a tracer condition in international benchmarking of health systems. *Diabetes Care.* 2006;29(5):1007-1011.

27. Yu W, Ravelo A, Wagner TH, et al. Prevalence and costs of chronic conditions in the VA health care system. *Med Care Res Rev.* 2003;60(3 Suppl):146S-167S.

28. Bresee LC, Majumdar SR, Patten SB, Johnson JA. Prevalence of cardiovascular risk factors and disease in people with schizophrenia: a population-based study. *Schizophr Res.* 2010;117(1):75-82.

29. Wells GA, Shea B, O'Connell D, et al. The Newcastle-Ottawa Scale (NOS) for Assessing the Quality of Nonrandomised Studies in Meta-analyses. Ottawa Hospital Research Institute (OHRI); 2009. http://www.ohri.ca/programs/clinical_epidemiology/oxford.asp. Accessed August 20, 2014.

30. DerSimonian R, Laird N. Meta-analysis in clinical trials. *Control Clin Trials.* 1986;7(3):177-188.

31. Knapp G, Hartung J. Improved tests for a random effects meta-regression with a single covariate. *Stat Med.* 2003;22(17):2693-2710.

32. R Core Team. R: A Language and Environment for Statistical Computing. Vienna: R Foundation for Statistical Computing. http://www.R-project.org/. Accessed August 20, 2014.

33. Viechtbauer W. Conducting meta-analyses in R with the metafor package. *Journal of Statistical Software.* 2010;36(3):1-48.

34. Egede LE, Grubaugh AL, Ellis C. The effect of major depression on preventive care and quality of life among adults with diabetes. *Gen Hosp Psychiatry.* 2010;32(6):563-569.

35. Lasser KE, Zeytinoglu H, Miller E, Becker AE, Hermann RC, Bor DH. Do women who screen positive for mental disorders in primary care have lower mammography rates? *Gen Hosp Psychiatry.* 2003;25(3):214-216.

36. Pirraglia PA, Sanyal P, Singer DE, Ferris TG. Depressive symptom burden as a barrier to screening for breast and cervical cancers. *J Womens Health (Larchmt).* 2004;13(6):731-738.

37. Yee EF, White R, Lee SJ, et al. Mental illness: is there an association with cancer screening among women veterans? *Womens Health Issues.* 2011;21(4 Suppl):S195-202.

38. Egede LE, Ellis C, Grubaugh AL. The effect of depression on self-care behaviors and quality of care in a national sample of adults with diabetes. *Gen Hosp Psychiatry.* 2009;31(5):422-427.

39. Duffy SA, Kilbourne AM, Austin KL, et al. Risk of smoking and receipt of cessation services among veterans with mental disorders. *Psychiatr Serv.* 2012;63(4):325-332.

40. Druss BG, Zhao L, Cummings JR, Shim RS, Rust GS, Marcus SC. Mental comorbidity and quality of diabetes care under Medicaid: a 50-state analysis. *Med Care.* 2012;50(5):428-433.

41. Nelson LA, Graham MR, Lindsey CC, Rasu RS. Adherence to antihyperlipidemic medication and lipid control in diabetic Veterans Affairs patients with psychotic disorders. *Psychosomatics.* 2011;52(4):310-318.

42. Leung GY, Zhang J, Lin WC, Clark RE. Behavioral health disorders and adherence to measures of diabetes care quality. *Am J Manag Care.* 2011;17(2):144-150.

43. Green JL, Gazmararian JA, Rask KJ, Druss BG. Quality of diabetes care for underserved patients with and without mental illness: site of care matters. *Psychiatr Serv.* 2010;61(12):1204-1210.

44. Taveira TH, Pirraglia PA, Cohen LB, Wu WC. Efficacy of a pharmacist-led cardiovascular risk reduction clinic for diabetic patients with and without mental health conditions. *Prev Cardiol.* 2008;11(4):195-200.

45. Kilbourne AM, Welsh D, McCarthy JF, Post EP, Blow FC. Quality of care for cardiovascular disease-related conditions in patients with and without mental disorders. *J Gen Intern Med.* 2008;23(10):1628-1633.

46. Weiss AP, Henderson DC, Weilburg JB, et al. Treatment of cardiac risk factors among patients with schizophrenia and diabetes. *Psychiatr Serv.* 2006;57(8):1145-1152.

47. Trief PM, Ouimette P, Wade M, Shanahan P, Weinstock RS. Post-traumatic stress disorder and diabetes: co-morbidity and outcomes in a male veterans sample. *J Behav Med.* 2006;29(5):411-418.

48. Krein SL, Bingham CR, McCarthy JF, Mitchinson A, Payes J, Valenstein M. Diabetes treatment among VA patients with comorbid serious mental illness. *Psychiatr Serv.* 2006;57(7):1016-1021.

49. Frayne SM, Halanych JH, Miller DR, et al. Disparities in diabetes care: impact of mental illness. *Arch Intern Med.* 2005;165(22):2631-2638.

50. Jones LE, Clarke W, Carney CP. Receipt of diabetes services by insured adults with and without claims for mental disorders. *Med Care.* 2004;42(12):1167-1175.

51. Desai MM, Rosenheck RA, Druss BG, Perlin JB. Mental disorders and quality of diabetes care in the veterans health administration. *Am J Psychiatry.* 2002;159(9):1584-1590.

52. Lin EH, Katon W, Von Korff M, et al. Relationship of depression and diabetes self-care, medication adherence, and preventive care. *Diabetes Care.* 2004;27(9):2154-2160.

53. Morden NE, Berke EM, Welsh DE, McCarthy JF, Mackenzie TA, Kilbourne AM. Quality of care for cardiometabolic disease: associations with mental disorder and rurality. *Med Care.* 2010;48(1):72-78.

54. Cohen LB, Taveira TH, Wu WC, Pirraglia PA. Maintenance of risk factor control in diabetic patients with and without mental health conditions after discharge from a cardiovascular risk reduction clinic. *Ann Pharmacother.* 2010;44(7-8):1164-1170.

55. Dolder CR, Furtek K, Lacro JP, Jeste DV. Antihypertensive medication adherence and blood pressure control in patients with psychotic disorders compared to persons without psychiatric illness. *Psychosomatics.* 2005;46(2):135-141.

56. Anonymous. The sixth report of the Joint National Committee on prevention, detection, evaluation, and treatment of high blood pressure.[Erratum appears in Arch Intern Med 1998 Mar 23;158(6):573]. *Arch Intern Med.* 1997;157(21):2413-2446.

57. McGinty EE, Blasco-Colmenares E, Zhang Y, et al. Post-myocardial-infarction quality of care among disabled Medicaid beneficiaries with and without serious mental illness. *Gen Hosp Psychiatry.* 2012;34(5):493-499.

58. Manderscheid R, Kathol R. Fostering sustainable, integrated medical and behavioral health services in medical settings. *Ann Intern Med.* 2014;160(1):61-65.

59. Robinson KA, Saldanha IJ, Mckoy NA. Frameworks for Determining Research Gaps During Systematic Reviews. Methods Future Research Needs Report No. 2. (Prepared by the Johns Hopkins University Evidence-based Practice Center under Contract No. HHSA 290-2007-10061-I.) AHRQ Publication No. 11-EHC043-EF. Rockville, MD: Agency for Healthcare Research and Quality. June 2011. www.effectivehealthcare.ahrq.gov/reports/final.cfm. .

APPENDIX A. SEARCH STRATEGIES

Database: PubMed

Search date: February 17, 2014

Set #	Search String	Results
#1	"Mental Disorders"[Mesh:noexp] OR "Bipolar Disorder"[Mesh] OR "Schizophrenia"[Mesh] OR "Stress Disorders, Post-Traumatic"[Mesh] OR "Depressive Disorder, Major"[Mesh] OR "Psychotic Disorders"[Mesh] OR bipolar[tiab] OR schizophrenia[tiab] OR schizophrenic[tiab] OR schizoaffective[tiab] OR mdd[tiab] OR "major depressive disorder"[tiab] OR ptsd[tiab] OR "post traumatic stress disorder"[tiab] OR "posttraumatic stress disorder"[tiab] OR "psychotic disorder"[tiab] OR "psychotic disorders"[tiab] OR "substance abuse"[tiab] OR "drug abuse"[tiab] OR "alcohol abuse"[tiab] OR alcoholism[tiab] OR "alcohol misuse"[tiab] OR "alcohol dependence"[tiab] OR ((heavy[tiab] OR hazardous[tiab] OR harmful[tiab] OR excessive[tiab] OR problem[tiab] OR binge[tiab] OR controlled[tiab] OR risky[tiab] OR "at risk"[tiab] OR "at-risk"[tiab] OR use[tiab]) AND drink*[tiab] AND (Alcohol[tiab] OR "Alcoholic Beverages"[Mesh]))	393,361
#2	"Diabetes Mellitus"[Mesh] OR "diabetes"[tiab] OR "Hemoglobin A, Glycosylated"[Mesh] OR "Diagnostic Techniques, Ophthalmological"[Mesh] OR "Blood Glucose"[Mesh] OR "Blood Pressure"[Mesh] OR "Hypertension/prevention and control"[Mesh] OR "diabetes care"[tiab] OR "diabetes control"[tiab] OR hbaic[tiab] OR "hemoglobin a1c"[tiab]OR ldl[tiab] OR "Cholesterol, LDL"[Mesh]OR ldl-c[tiab] OR "glucose control"[tiab] OR "glycemic control"[tiab] OR "foot exam"[tiab] OR "foot exams"[tiab] OR "foot examination"[tiab] OR "foot examinations"[tiab] OR "eye exam"[tiab] OR "eye exams"[tiab] OR "eye examination"[tiab] OR "eye examinations"[tiab] OR retinopathy[tiab] OR retinopathies[tiab] OR nephropathy[tiab] OR nephropathies[tiab] OR "Hypertension"[Mesh] OR "hypertension"[tiab] OR "Myocardial Ischemia"[Mesh] OR "Ischemic heart disease"[tiab]	1,432,903
#3	(("Breast Neoplasms"[Mesh] OR "breast cancer"[tiab] OR "Colorectal Neoplasms"[Mesh] OR "colorectal cancer"[tiab] OR "colon cancer"[tiab] OR "Uterine Cervical Neoplasms"[Mesh] OR "cervical cancer"[tiab]) AND ("Early Detection of Cancer"[Mesh] OR "Mass Screening"[MeSH] OR "Risk Assessment"[Mesh] OR screening[tiab] OR screened[tiab])) OR "Mammography"[Mesh] OR "Sigmoidoscopy"[Mesh] OR "Colonoscopy"[Mesh] OR "Vaginal Smears"[Mesh] OR "Human Papillomavirus DNA Tests"[Mesh] OR mammogram[tiab] OR mammograms[tiab] OR mammography[tiab] OR sigmoidoscopy[tiab] OR "Occult Blood"[Mesh] OR "fecal occult blood test"[tiab] OR FOBT[tiab] OR colonoscopy[tiab] OR "pap smear"[tiab] OR "pap smears"[tiab] OR hpv[tiab]	127,557
#4	"Immunization"[Mesh] OR immunization[tiab] OR immunizations[tiab] OR immunize[tiab] OR immunized[tiab] OR vaccinate[tiab] OR vaccinated[tiab] OR vaccination[tiab] OR vaccinations[tiab]	243,734
#5	("Tobacco Use"[Mesh] OR tobacco[tiab])AND (screening[tiab] OR screened[tiab] OR mass screening[mesh]) OR "Tobacco Use Cessation"[Mesh]	25,163
#6	#2 OR #3 OR #4 OR #5	1,815,682
#7	#1 AND #6	14,200

Set #	Search String	Results
#8	"delivery of health care"[MeSH Terms:noexp] OR "healthcare disparities"[MeSH Terms] OR "health behavior"[MeSH Terms] OR "health knowledge, attitudes, practice"[MeSH Terms] OR "health services accessibility"[MeSH Terms] OR "Health Status"[MeSH] OR "health services needs and demand"[MeSH] OR "patient acceptance of health care"[MeSH Terms] OR "patient selection"[MeSH Terms] OR "quality of health care"[MeSH:noexp] OR "Outcome and Process Assessment (Health Care)"[Mesh] OR "Quality Indicators, Health Care"[Mesh] OR "Quality Assurance, Health Care"[Mesh] OR "socioeconomic factors"[MeSH] OR socioeconomic factor[TIAB] OR socioeconomic factors[TIAB] OR disparity[tiab] OR disparities[tiab] OR inequity[tiab] OR inequities[tiab] OR inequitable[tiab] OR inequality[tiab] OR inequalities[tiab]OR undertreat[tiab] OR undertreated[tiab] OR undertreatment[tiab]	1,673,781
#9	#7 AND #8	2,480
#10	#9 NOT (animals[mh] NOT humans[mh]) NOT (Editorial[ptyp] OR Letter[ptyp] OR Case Reports[ptyp] OR Comment[ptyp])	2,294
#11	#10, Limits: 1994 – present, English	1,923

Database: Embase

Search date: February 19, 2014

Set #	Search String	Results
#1	'mental disease'/de OR 'bipolar disorder'/exp OR 'posttraumatic stress disorder'/exp OR 'major depression'/exp OR 'psychosis'/exp OR bipolar:ab,ti OR schizophrenia:ab,ti OR schizophrenic:ab,ti OR schizoaffective:ab,ti OR mdd:ab,ti OR 'major depressive disorder':ab,ti OR ptsd:ab,ti OR 'post traumatic stress disorder':ab,ti OR 'posttraumatic stress disorder':ab,ti OR 'psychotic disorder':ab,ti OR 'psychotic disorders':ab,ti OR 'substance abuse':ab,ti OR 'drug abuse':ab,ti OR 'alcohol abuse':ab,ti OR alcoholism:ab,ti OR 'alcohol misuse':ab,ti OR 'alcohol dependence':ab,ti OR ((heavy:ab,ti OR hazardous:ab,ti OR harmful:ab,ti OR excessive:ab,ti OR problem:ab,ti OR binge:ab,ti OR controlled:ab,ti OR risky:ab,ti OR 'at risk':ab,ti OR 'at-risk':ab,ti OR use:ab,ti) AND drink*:ab,ti AND (Alcohol:ab,ti OR 'alcoholic beverage'/exp))	576,664
#2	'diabetes mellitus'/exp OR 'diabetes':ab,ti OR 'hemoglobin A1c'/exp OR 'eye examination'/exp OR 'glucose blood level'/exp OR 'blood glucose monitoring'/exp OR 'blood pressure'/exp OR 'blood pressure monitoring'/exp OR 'diabetes care':ab,ti OR 'diabetes control':ab,ti OR hbaic:ab,ti OR 'hemoglobin a1c':ab,ti OR ldl:ab,ti OR 'low density lipoprotein cholesterol'/exp OR ldl-c:ab,ti OR 'glucose control':ab,ti OR 'glycemic control':ab,ti OR 'foot exam':ab,ti OR 'foot exams':ab,ti OR 'foot examination':ab,ti OR 'foot examinations':ab,ti OR 'eye exam':ab,ti OR 'eye exams':ab,ti OR 'eye examination':ab,ti OR 'eye examinations':ab,ti OR retinopathy:ab,ti OR retinopathies:ab,ti OR nephropathy:ab,ti OR nephropathies:ab,ti OR 'hypertension'/exp OR 'hypertension':ab,ti OR 'heart muscle ischemia'/exp OR 'Ischemic heart disease':ab,ti	1,655,117

Set #	Search String	Results
#3	((‘breast cancer’/exp OR ‘breast cancer’:ab,ti OR ‘colon tumor’/exp OR ‘colorectal cancer’:ab,ti OR ‘colon cancer’:ab,ti OR ‘uterine cervix cancer’/exp OR ‘cervical cancer’:ab,ti) AND (‘early diagnosis’/exp OR ‘mass screening’/exp OR ‘risk assessment’/exp OR screening:ab,ti OR screened:ab,ti)) OR ‘mammography’/exp OR ‘sigmoidoscopy’/exp OR ‘colonoscopy’/exp OR ‘Papanicolaou test’/exp OR ‘Human papillomavirus DNA test’/exp OR mammogram:ab,ti OR mammograms:ab,ti OR mammography:ab,ti OR sigmoidoscopy:ab,ti OR ‘occult blood’/exp OR ‘fecal occult blood test’:ab,ti OR FOBT:ab,ti OR colonoscopy:ab,ti OR ‘pap smear’:ab,ti OR ‘pap smears’:ab,ti OR hpv:ab,ti	183,910
#4	‘immunization’/exp OR immunization:ab,ti OR immunizations:ab,ti OR immunize:ab,ti OR immunized:ab,ti OR vaccinate:ab,ti OR vaccinated:ab,ti OR vaccination:ab,ti OR vaccinations:ab,ti	311,311
#5	((‘tobacco use’/exp OR tobacco:ab,ti) AND (screening:ab,ti OR screened:ab,ti OR ‘screening’/exp)) OR ‘smoking cessation’/exp	48,342
#6	#2 OR #3 OR #4 OR #5	2,168,928
#7	#1 AND #6	34,010
#8	‘health care delivery’/de OR ‘health status’/exp OR ‘health behavior’/exp OR ‘patient abandonment’/exp OR ‘health service’/de OR ‘patient attitude’/exp OR ‘patient selection’/exp OR ‘health care quality’/de OR ‘clinical indicator’/exp OR ‘outcome assessment’/exp OR ‘socioeconomics’/exp OR ‘socioeconomic factor’:ab,ti OR ‘socioeconomic factors’:ab,ti OR disparity:ab,ti OR disparities:ab,ti OR inequity:ab,ti OR inequities:ab,ti OR inequitable:ab,ti OR inequality:ab,ti OR inequalities:ab,ti OR undertreat:ab,ti OR undertreated:ab,ti OR undertreatment:ab,ti	1,323,993
#9	#7 AND #8	7,479
#10	#9 AND [humans]/lim AND [english]/lim NOT (‘case report’/exp OR ‘case study’/exp OR ‘editorial’/exp OR ‘letter’/exp OR ‘note’/exp)	5,932
#11	#10 AND [embase]/lim NOT [medline]/lim	1,642
#11	#10, Limits: 1994 – present	1,635

Database: PsycINFO

Search date: February 21, 2014

Set #	Search String	Results
S1	MM “Mental Disorders” OR DE “Affective Disorders” OR DE “Bipolar Disorder” OR DE “Schizophrenia” OR DE “Schizoaffective Disorder” OR DE “Posttraumatic Stress Disorder” OR DE “Major Depression” OR DE “Psychosis” OR bipolar OR schizophrenia OR schizophrenic OR schizoaffective OR mdd OR “major depressive disorder” OR ptsd OR “post traumatic stress disorder” OR “posttraumatic stress disorder” OR “psychotic disorder” OR “psychotic disorders”	286,723
S2	DE “Drug Abuse” OR DE “Drug Dependency” OR DE “Inhalant Abuse” OR DE “Polydrug Abuse” OR DE “Drug Addiction” OR DE “Heroin Addiction” OR DE “Alcoholism” OR DE “Alcoholic Psychosis” OR DE “Alcoholic Beverages” OR DE “Alcohol Drinking Patterns” OR DE “Alcohol Abuse” OR DE “Alcohol Intoxication” OR DE “Social Drinking” OR “substance abuse” OR “drug abuse” OR “alcohol abuse” OR alcoholism OR “alcohol misuse” OR “alcohol dependence”	137,933
S3	S1 OR S2	406,813

Set #	Search String	Results
S4	DE "Diabetes" OR DE "Diabetes Insipidus" OR DE "Diabetes Mellitus" OR diabetes OR DE "Glucose" OR DE "Blood Sugar" OR DE "Blood Pressure" OR DE "Diastolic Pressure" OR DE "Systolic Pressure" OR "diabetes care" OR "diabetes control" OR hbaic OR "hemoglobin a1c" OR "glucose control" OR "glycemic control" OR "foot exam" OR "foot exams" OR "foot examination" OR "foot examinations" OR "eye exam" OR "eye exams" OR "eye examination" OR "eye examinations" OR retinopathy OR retinopathies OR nephropathy OR nephropathies	27,949
S5	S3 AND S4	3,936
S6	DE "Cardiovascular Disorders" OR "Hypertension" OR "Myocardial Ischemia" OR "Ischemic heart disease" OR ldl OR DE "Cholesterol" OR ldl-c	19,873
S7	S3 AND S6	3,177
S8	DE "Cancer Screening" OR DE "Mammography" OR mammogram OR mammograms OR mammography OR Colonoscopy OR Sigmoidoscopy OR FOBT OR "fecal occult blood test" OR "Vaginal Smears" OR "pap smear" OR "pap smears" OR hpv	4,631
S9	S3 AND S8	112
S10	DE "Immunization" immunization OR immunizations OR immunize OR immunized OR vaccinate OR vaccinated OR vaccination OR vaccinations	4,580
S11	S3 AND S10	265
S12	((DE "Nicotine" OR DE "Tobacco Smoking" OR DE "Smokeless Tobacco" OR cigarettes OR smoking) AND (DE "Screening" OR screening OR screened)) OR DE "Smoking Cessation"	9,781
S13	S3 AND S12	2,662
S14	S5 OR S7 OR S9 OR S11 OR S13	9,216
S15	DE "Health Disparities" OR DE "Health Care Delivery" OR DE "Health Care Seeking Behavior" OR DE "Health Care Utilization" OR DE "Health Service Needs" OR DE "Quality of Care" OR DE "Treatment Barriers" OR DE "Health Behavior" OR DE "Health Knowledge" OR DE "Health Literacy" OR DE "Health Care Services" OR DE "Continuum of Care" OR DE "Mental Health Services" OR DE "Primary Health Care" OR "socioeconomic factor" OR "socioeconomic factors" OR disparity OR disparities OR inequity OR inequities OR inequitable OR inequality OR inequalities OR undertreat OR undertreated OR "under treatment"	137,042
S16	S14 AND S15 Limiters - Publication Year: 1994-2014; English; Language: English; Age Groups: Adulthood (18 yrs & older); Population Group: Human; Exclude Dissertations Search modes - Find all my search terms	490

Database: The Cochrane Library

Search date: February 21, 2014

Set #	Search String	Results
#1	mental disease:ti,ab,kw (Word variations have been searched)	592
#2	mental illness:ti,ab,kw (Word variations have been searched)	952
#3	bipolar affective disorder:ti,ab,kw (Word variations have been searched)	83
#4	schizophrenia:ti,ab,kw (Word variations have been searched)	8,445
#5	schizophrenic disorder:ti,ab,kw (Word variations have been searched)	75

Set #	Search String	Results
#6	schizoaffective:ti,ab,kw (Word variations have been searched)	727
#7	major depressive disorder:ti,ab,kw (Word variations have been searched)	2,496
#8	post traumatic stress disorder:ti,ab,kw (Word variations have been searched)	373
#9	psychotic disorder:ti,ab,kw (Word variations have been searched)	1,534
#10	[mh “Mental Disorders” [mj]] or [mh “Bipolar Disorder”] or [mh Schizophrenia] or [mh “Stress Disorders, Post-Traumatic”] or [mh “Depressive Disorder, Major”] or [mh “Psychotic Disorders”]	10,344
#11	{or #1-#10} in Cochrane Reviews (Reviews only)	247
#12	[mh “health knowledge, attitudes, practice”] or [mh “health services accessibility”] or [mh “Health Status”] or [mh “health services needs and demand”] or [mh “patient acceptance of health care”] or [mh “patient selection”] or [mh “quality of health care” [mj]] or [mh “Outcome and Process Assessment (Health Care)”] or [mh “Quality Indicators, Health Care”] or [mh “Quality Assurance, Health Care”] or [mh “socioeconomic factors”] or “socioeconomic factor” or “socioeconomic factors” or disparity or disparities or inequity or inequities or inequitable or inequality or inequalities or undertreat or undertreated or “under treatment” or “health status”:ti,ab,kw or “health services research”:ti,ab,kw or “primary care”:ti,ab,kw	129,822
#13	#11 and #12	39
#14	[mh “Diabetes Mellitus”] or diabetes or [mh “Hemoglobin A, Glycosylated”] or [mh “Diagnostic Techniques, Ophthalmological”] or [mh “Blood Glucose”] or [mh “Blood Pressure”] or “diabetes care” or “diabetes control” or hbaic or “hemoglobin a1c” or ldl or [mh “Cholesterol, LDL”] or ldl-c or “glucose control” or “glycemic control” or “foot exam” or “foot exams” or “foot examination” or “foot examinations” or “eye exam” or “eye exams” or “eye examination” or “eye examinations” or retinopathy or retinopathies or nephropathy or nephropathies or [mh Hypertension] or “hypertension” or [mh “Myocardial Ischemia”] or “Ischemic heart disease”	104,682
#15	[mh “Breast Neoplasms”] or “breast cancer” or [mh “Colorectal Neoplasms”] or “colorectal cancer” or “colon cancer” or [mh “Uterine Cervical Neoplasms”] or “cervical cancer” or [mh “Early Detection of Cancer”] or [mh Mammography] or [mh Sigmoidoscopy] or [mh Colonoscopy] or [mh “Vaginal Smears”] or [mh “Human Papillomavirus DNA Tests”] or mammogram or mammograms or mammography or sigmoidoscopy or [mh “Occult Blood”] or “fecal occult blood test” or FOBT or colonoscopy or “pap smear” or “pap smears” or hpv	27,880
#16	[mh Immunization] or immunization or immunizations or immunize or immunized or vaccinate or vaccinated or vaccination or vaccinations	9,917
#17	[mh “Tobacco Use”] or tobacco or [mh “Tobacco Use Cessation”] or cigarette or cigarettes or smoking or nicotine	17,248
#18	#13 and {or #14-#17} from 1994 to 2014	22

APPENDIX B. NEWCASTLE-OTTAWA SCALE CODING MANUAL FOR COHORT STUDIES

The Newcastle-Ottawa Scale quality instrument is scored by awarding a point for each answer that is marked with an asterisk below. Possible total points are 4 points for Selection, 2 points for Comparability, and 3 points for Outcomes.

SELECTION

1) Representativeness of the Exposed Cohort

a. Truly representative of the average patient with mental illness *(eg,* severity of illness, comorbidities) in the community*

b. Somewhat representative of the average *(eg,* severity of illness, comorbidities)in the community*

c. Selected group of users eg HIV+, pregnant, elderly, significant physical disabilities

d. No description of the derivation of the cohort

2) Selection of the Non-Exposed Cohort

a. Drawn from the same community as the exposed cohort*

b. Drawn from a different source

c. No description of the derivation of the non-exposed cohort

3) Ascertainment of Exposure

a. Secure record *(eg,* medical records)*

b. Structured interview *

c. Written self-report

d. No description

4) Demonstration that Outcome of Interest Was Not Present at Start of Study

a. Yes*

b. No

COMPARABILITY

1) Comparability of Cohorts on the Basis of the Design or Analysis

a. Study controls for SES (or some reasonable proxy of SES), age, race, gender*

b. Study controls for any additional factor* (this criteria could be modified to indicate specific control for a second important factor)

c. Inadequate degree of control

OUTCOME

1) Assessment of Outcome

a. Independent or blind assessment stated in the paper, or confirmation of the outcome by reference to secure records (x-rays, medical records, etc)*

b. Record linkage *(eg,* identified through ICD codes on database records)*

c. Self-report *(ie,* no reference to original medical records or x-rays to confirm the outcome)

d. No description

2) Was Follow-up Long Enough for Outcomes to Occur?

a. Yes (select an adequate follow up period for outcome of interest)*

b. No

3) Adequacy of Follow-up of Cohorts

a. Complete follow-up—all subjects accounted for*

b. Subjects lost to follow-up unlikely to introduce bias—small number lost (LESS than 20% follow-up, or description provided of those lost)*

c. Follow-up rate MORE than 20% and no description of those lost

d. No statement

APPENDIX C. PEER REVIEW COMMENTS/AUTHOR RESPONSES

Reviewer	Comment	Response
Question 1: Are the objectives, scope, and methods for this review clearly described?		
1	Yes. No comments.	Thank you.
2	Yes. No comments.	Thank you.
3	Yes. No comments.	Thank you.
4	Yes. No comments.	Thank you.
5	Yes. No comments.	Thank you.
6	Yes. No comments.	Thank you.
7	Yes. No comments	Thank you.
Question 2: Is there any indication of bias in our synthesis of the evidence?		
1	No. No comments.	Thank you.
2	No. No comments.	Thank you.
3	No. No comments.	Thank you.
4	No. No comments.	Thank you.
5	No. No comments.	Thank you.
6	No. No comments.	Thank you.
7	No. No comments.	Thank you.
Question 3: Are there any published or unpublished studies that we may have overlooked?		
1	No. No comments.	Thank you.
2	No. No comments.	Thank you.
3	No. No comments.	Thank you.
4	No. No comments.	Thank you.
5	No. No comments.	Thank you.
6	No. No comments.	Thank you.
7	No. No comments.	Thank you.

Reviewer	Comment	Response
Question 4: Additional suggestions or comments can be provided below. If applicable, please indicate the page and line numbers from the draft report		
1	Overall this is a good report, highlighting the need for more studies in this area. I do have two suggestions for improving the report: 1) In several places in the report (I will use the Summary section as an example) the section introduction indicates that there are health disparities for people with mental illness (page 73, lines 10-12). Yet, this is not consistent with the report findings (page 74, lines 11-14 and page 74, lines 21-22). Both of these statements note mixed results. 2) On page 40, line 29, the authors note that "Smokers with psychiatric disorders were "slightly" but significantly more likely to be referred to tobacco cessation programs..... The term slightly should be deleted given that it is not used consistently in the report when the OR is a difference of 0.1 above or below 1.0	Thank you. 1) We have addressed the inconsistences in language in the final report. 2) We have deleted "slightly" from this sentence.
2	This is an excellent report, clear and without bias. The design is excellent, focusing on evidence-based performance measures for chronic disease management and preventive care for individuals with mental illness. The only suggestions I have involve minor editorial issues. These would be probably discovered at some point, but I'm including them just in case. I noticed a number of these in the Executive Summary, and stopped noting them - the errors seem to be replicated in the main text of the report. P. 3 line 16 should mental diagnosis be diagnoses? Line 33 is there a word missing - should it be: focus ON key differences? Line 42 should read "After applyING eligibility criteria..."	Thank you. We have addressed these editorial issues in the final report.
2	P 4 line 41 should be "...patients with psychiatric..." Line 51 extra "in" at end of line Line 55 is 'outcomes' supposed to be after 'pharmacotherapies'? I think it would work without that word.	We have addressed these editorial issues in the final report.
2	P 5 line 36 'patient' should be patients Line 58 fragment: 'All studies with VA health care users.' Huh?	We have addressed these editorial issues in the final report.
2	P 6 line 42 patient should be patients P 7 line 36 finding should be findings P 13 Table 1 líne 14 include should be included p. 16 line 53 - should be diagnoses instead of diagnosis ...and so on.	We have addressed these editorial issues in the final report.

Reviewer	Comment	Response
3	In this clearly written, comprehensive, and methodologically sound evidence-based synthesis, authors examine data related to disparities in quality of care for common medical illnesses among those with mental health disorders. Individuals suffering from mental illness frequently carry concurrent chronic medical diagnoses. In such individuals, the clinical and economic effects of these comorbid medical conditions tend to be more pronounced. In light of the relatively high prevalence of both chronic medical conditions and mental health illnesses in the VA population, quantifying disparities in quality of care and understanding the mechanism of such disparities is a topic of great importance to the health of the Veteran population.	Thank you.
3	The authors performed a systematic review of studies examining performance on process and outcome measures of quality for common preventive services and chronic medical conditions among individuals with and without mental illness. They also identified studies examining predictors of these disparities. Across 25 identified studies, they found relatively weak support for disparities in quality of care, though studies conducted in VA were more likely to show a negative effect of mental illness on quality indicators. Few studies were available to examine predictors of variation in quality of care. Overall, the literature was deemed to be of low methodological quality.	Thank you.
3	The work is timely, with clearly stated objectives, a well-defined scope, and appropriate methods. The review is comprehensive, and the data are clearly presented. I detect no evidence of bias. It is notable that VA studies were qualitatively more likely to report disparities than non-VA studies. One wonders if this might be due to differences in the severity of mental illness in VA versus non-VA population. Additionally, as the authors allude to in their discussion of policy implications (p. 75, line 56), the quality measures that were examined differ considerably in whether they assess simple processes of care (e.g., check hemoglobin A1C) versus relatively complex outcomes (completion of a screening colonoscopy). I have only minor comments for your consideration.	Thank you.
3	Methods: 1) Page 2, line 31 (and p. 12, line 35): The search strategy only included articles published between 1994-2014. Why were older articles not included? I suspect this has to do with the limited use of performance measures prior to the mid-1990s, but it would be valuable to clarify the reason here. 2) Why was the work limited to articles published in English?	1) We have clarified our rationale for restricting the search to articles published from 1994 onward (which does have to do with the limited use of performance measures before the mid-1990s). It is noteworthy that we did not identify any eligible studies published prior to 2002. 2) We limited the scope to U.S.-based studies to increase the applicability of the findings.

Reviewer	Comment	Response
3	Results: 3) The authors do not present results according to performance measure type (process, intermediate outcome, outcome, etc). If data in individual studies are available for such an analysis, it could shed light on the relative role of patient- versus provider-level factors in contributing to disparities. For instance, are disparities less apparent for process measures (such as prescription of anti-hypertensives, which is largely under the control of the provider) than for linked outcome measures (blood pressure control, which depends on the patient filling the prescription and regularly taking the medication)? The authors do allude to this on pp. 76 (line 56) when discussing how the complexity of care can affect performance on quality measures. The data on diabetes management also present these data, though it is not framed in terms of the type of quality measure.	3) We had too few studies to conduct such an analysis. We have, however, organized the (newly added) Summary of Findings tables (Appendix F in the final report) by type of outcome.
4	The review itself was fine. My comments are addressed to the summary of clinical and policy implications which I found to be rather generic. Perhaps this starts with the analytic framework (p12) which mentions some modifying factors but in only a very superficial way. In short, there is little attention to context at any of the multiple levels in the process. For example, the reviewed studies were conducted in an environment of changing performance measures, whether HEDIS or VA. It would help to have a timeline to put the studies into their own context. In discussing the evidence gaps, it is not clear how additional studies of the type already undertaken will help other than making us more certain about the modesty of the effects. I guess that the main policy implication at this point is that there shouldn't be effort given to this topic. Perhaps this is what they author means when she states on p78 "VA and other healthcare systems should consider their clinical and policy needs when deciding whether to invest in research to address gaps in evidence." I think that there are other research gaps that relate more to outcomes as well as how care is actually given. This might require very different kinds of studies.	Thank you for these comments. We agree that these studies were conducted in a changing environment. We limited our search to include those studies most relevant to the current context and did not identify any eligible studies before 2002. As all studies were clustered in the same timeframe, we did not have adequate studies to assess time trends.
5	It is impressive, and unfortunate, how few papers (N=26) on the subject met criteria for inclusion in this meta-analysis/review article. That is the first major finding of the paper - that much work remains simply to determine if there are health disparities in the populations of interest.	Thank you.
5	With the possible, limited, exception of diabetes, the body of literature on health disparities in mentally ill persons (screening, obtaining medical care, access to medical care, etc) is inadequate to make many definitive statements. This is an important contribution of this review article.	Thank you.

Reviewer	Comment	Response
5	In the entire set of papers reviewed, only 14 were conducted with Veterans. Again, this speaks volumes about how this area of inquiry has been understudied in VA.	Slightly more than half of the studies reviewed in the final report (12/23) were conducted by VA researchers using VA data. We think this is a strength of our review and enhances the applicability of our findings to the VA context.
5	75% of the selected studies utilized data on broad ranges of mental disorders collapsed into presence/absence data (i.e., mental illness present or absent). Unfortunately, this is not adequate granularity for many of the clinical questions of import. This is not the fault of the ESP review, but rather a problem of researchers looking at mental illnesses as monolithic. Imagine if we did the same for "medical illnesses" and collapsed terminal cancers with mild hypertension and acne rosacea. What sense could we make out of such collapsed data? The same applies for these studies, most of which excluded SMI (a group of diagnoses that have in common severity and persistence of one or more mental illnesses) or collapsed those conditions with depression and other disorders which share little in common with the SMI group of conditions.	We agree that this is a considerable limitation of the literature we identified and have now highlighted this in the Limitations section.
5	This paper demonstrates that even though there were 16 studies on diabetes and mental illnesses, many gaps remain and the results of the analyses may be clinically uninterpretable. For example, VA screens for HbA1c and LDL in those at risk, which includes patients treated with second generation antipsychotics, but what about the medical treatment for, and compliance with, treatment for those schizophrenic patients who screen positive? The literature is not illuminating in this regard, leaving open significant clinical research questions that should be pursued.	Thank you for this observation. While beyond the scope of this review, these are important clinical questions.
5	This paper does a fine job of pointing out the substantial weaknesses of the English literature to date on most of the questions posed for the review. An additional limitation that I don't believe I saw listed is that the least "connected" patients with one or more mental illnesses are not enrolled in primary care at VA facilities at all, and a majority of those are believed not to be seen by anyone outside VA for their basic medical care and screenings. The data reported in most of the 26 papers do not take this important issue into account, which may explain some of the conflicting or counterintuitive results.	This is an excellent point, but we are unable to explore it in the current review. We only included studies that recruited patients from non-mental health primary care settings and selected specialty medical care settings. We also limited the review to studies of insured populations. If a study included mixed populations of insured and uninsured individuals, it could still be included if the analysis controlled for insurance status, results were reported separately by insurance status, or ≥80% of the total population had insurance. These eligibility requirements may have excluded some studies; however, we sought to include studies that were of greatest applicability to the VA Health Care System.

Reviewer	Comment	Response
5	The authors are to be commended for their work on this difficult project and for shedding light on this important and understudied topic. Some believe that the basic step of identifying health disparities in patients with one or more mental illnesses is adequate to move on to "solving" the disparities problem for the 1/3 of patients in VA care who have at least one psychiatric diagnosis. The paragraph on gaps in the research on page 14 dispels this myth. This is coupled with the overall rating of the strength of the evidence (in either direction) as "low." I particularly appreciated the importance of the following statement in the review: "Though several of the included studies were conducted in VA user populations, there are notable gaps in research which the use of VA data may be well positioned to address."	Thank you.
5	Typos: Line 36, page 5; line 17, page 8	We have addressed these editorial issues in the final report.
5	I am pleased to see that the limitation on the data in all papers for sexual orientation and gender identity is specifically mentioned in this review. Our own work in OHE has demonstrated substantial disparities in both medical and psychiatric disorders (listed separately and not collapsed) for transgender Veterans. This is another potential confounder in the studies selected for review. This was part of "key question 2" and the authors appropriately note that various demographic parameters of import to the study of disparities in health care went unaddressed in the literature reviewed.	Thank you.
5	This article provides the basis to chart a course for the study of disparities in medical care in Veterans with one or more mental illnesses. It is an excellent synthesis of the overall weak existing literature on this important topic, and it should be the basis for developing projects that have not been done to fill the research gap in this heterogeneous, vulnerable population. A prime example is the lack of information on cancer screening in Veterans with SMI, case examples of which were drivers for the request to do this meta-analysis.	Thank you.
5	The authors note that there were no studies of immunization in the SMI population. The only study that may have included them was from 12 years ago and simply used a composite for all Veterans with any psychiatric diagnosis (excluding SUD), therefore this important area of health inequity has not been addressed for these Veterans.	Thank you. We have included this in the section on Research Gaps.

Reviewer	Comment	Response
5	The tobacco screening and referral information is unfortunately very sparse, given the national focus on smoking cessation. There were insufficient homogeneous studies to conduct a meta-analysis. No studies reported outcomes of treatments for any groups, a wide gap in the research on this important topic. With the limited data, it appears that a disparity may exist for those Veterans without mental illnesses in that they may be less likely to be screened, but screening may not result in referral for care as demonstrated in the only other study to examine this issue. Therefore, little can be said about a high profile program that has mandatory screenings and mandatory referral options for VA clinicians conducting such screenings, and nothing can be said about disparate health outcomes of these efforts (e.g., smoking cessation as an outcome) comparing Veterans with and without mental illnesses.	Thank you for this observation.
5	Typo on page 51, line 8; “for” should be “of” Typo on page 60, line 40; “a” should be “an” Page 62, end of line 32-33, does not seem complete; hard to make sense of the end of the sentence. Typo page 70, line 19	We have addressed these editorial issues in the final report.
5	The authors note that studies addressing the key question 2 regarding the interaction or moderation of health status, mental illness, and key subgroups of interest were virtually lacking. Only one study examined disparities in those with mental illness who lived in rural vs urban areas and that one study included only one health measure (HTN). It should be noted that VA has invested considerable funds into rural access for Veterans with and without mental illnesses, including a major telehealth initiative, and no outcomes papers on these issues in Veterans with mental illnesses were available or adequate for review in this analysis.	Thank you for this observation.
5	The authors appropriately advise caution with respect to the limited and conflicting results of this analysis. There is a good discussion on the potential limitations in the Clinical and Policy Implications. They are correct in assuming that once someone is identified as belonging to the “SMI” category in VA, that many additional opportunities for screening become available for those patients who remain engaged in care; what is missing in the studies across the board are patients with mental illnesses who are not engaged in, or minimally engaged in, primary and medical subspecialty care. These studies can be done in VA, at least for those who have accessed VA care, but for the most part, such studies are absent.	We agree. Please see the response above about limitations in our eligibility criteria to address people who are not able to access primary care for medical issues.

Reviewer	Comment	Response
5	Typo page 77, line 10. Typo page 77, line 38; “induced” should be “included”	We have addressed these editorial issues in the final report.
5	Table 9 is an excellent summary of the evidence/research gaps in understanding health disparities in Veterans with mental illnesses. Many of these gaps can be addressed by using existing VA databases to create retrospective cohort studies and cross-sectional studies as suggested in the table.	We agree and have suggested the use of VA data to address these pressing gaps in the literature.
6	The report is well written and its primary value is to pose further research activity to provide a more accurate reflection of disparities among individuals with mental illness. The problem with this area of research is that there is a broad spectrum of severity of illness in patients with the target conditions of Schizophrenia, BPAD and PTSD. The population is quite heterogeneous and within those diagnoses, disparities may be much more prominent only in the more severe illnesses. This report itself would be improved by making this distinction. It does mention Serious Mental Illness but does not distinguish it from mental illness.	We agree that severity of mental illness is likely an important moderator of effects; however, the existing literature did not provide the necessary granularity in reporting diagnosis or severity to facilitate such analysis.
7	Reviewer 7 did not have any comments for this section.	Noted

APPENDIX D. CHARACTERISTICS OF INCLUDED STUDIES

Article; Study Design	Targeted Preventive Service or Chronic Disease	Geographic Location; Data Source; Total N	Population: Age in Years; % Female; % White	Mental Health Diagnoses; Measurement	Data Sources	Outcomes
Desai, 2002[1] Retrospective cohort	Chronic disease: DM	National VA Healthcare System databases N=36,528	Age (mean [SD]): MI=62.2 (12.0) NMI=65.9 (10.6) % Female: MI=18.9 NMI=11.1 % White: MI=67.9 NMI=61.2	Composite of mental health conditions: psychiatric disorders (excluding SUD and dual diagnosis) ICD-9 codes	VA computerized medical records: 1999 VA EPRP; Patient encounter files; Patient treatment files (January 1998 to December 1999)	HbA1c testing; Diabetic foot exam; Eye exam
Dolder, 2005[2] Retrospective cohort	Chronic disease: HTN	San Diego, CA VAMC facility-level clinic database N=178	Age (mean [SD]): MI=57.1 (9.1) NMI=57.9 (9.0) % Female: MI=5.6 NMI=3.4 % White: MI=58.4 NMI=53.9	Composite SMI: psychotic disorders (schizophrenia, schizoaffective disorder, or psychosis not otherwise specified) ICD-9 codes	Chart review of VA healthcare system database, calendar year 2001	BP at goal
Druss, 2002[3] Cross-sectional	Preventive services: Cancer screening* Immunization Smoking cessation	National VA Healthcare systems (general and specialty) N=113,495	Age (mean [SD]): MI=60.8 (12.9) NMI=66 (11.5) % Female: MI=20.1 NMI=13.1 % White: MI=67.6 NMI=62.1	Composite of mental health conditions: psychiatric disorders (excluding substance abuse) ICD-9 codes	EPRP chart review, 1998-1999; Patient Encounter, OP, and Patient Treatment files	*Cancer screening:* Breast cancer screening; Cervical cancer screening; Colorectal cancer screening: FOBT, sigmoidoscopy, or colonoscopy *Immunization:* Influenza vaccine past year; Pneumococcal vaccine ever *Smoking cessation:* Proportion screened for tobacco use; Proportion referred for smoking cessation treatments

Article; Study Design	Targeted Preventive Service or Chronic Disease	Geographic Location; Data Source; Total N	Population: Age in Years; % Female; % White	Mental Health Diagnoses; Measurement	Data Sources	Outcomes
Druss, 2008[4] Cross-sectional	Preventive services: Cancer screening Immunization	National National-level survey data N=30,081	Age (mean [SD]): MI=42.2 (0.41) NMI=46.9 (0.18) % Female: MI=70 NMI=55 % White: MI=76 NMI=76	Major depression Score ≥3 on CIDI-SF	NHIS, 1999	*Cancer screening:* Breast cancer screening; Cervical cancer screening; Colorectal cancer screening: FOBT *Immunization:* Influenza vaccination in past year
Druss, 2012[5] Retrospective cohort	Chronic disease: DM	National National-level database N=657,628	Age (mean [SD]): MI=48.2 (0.4) NMI:=47.7 (0.6) % Female: MI=63.7 NMI=68.2 % White: MI=56.8 NMI=51.7	Composite of mental health conditions: any mental health diagnosis excluding dementia/ delirium ICD-9 codes	Medicaid eligibility, service utilization, and payment database (2003-2004)	HbA1c testing; Eye exam; Nephropathy screening; At least 2 HEDIS quality indicators completed in a year
Duffy, 2012[6] Cross-sectional	Preventive service: Smoking cessation	National National-level VHA outpatient survey N=224,193	Age (category): <45: 3.4% 45-64: 37.4% ≥65: 59.2% % Female: 3.5 % White: 83.1	Schizophrenia Bipolar disorder Depressive disorder PTSD ICD-9 codes	VHA Outpatient SHEP (fiscal year 2007)	Proportion prescribed tobacco cessation pharmacotherapies

Article; Study Design	Targeted Preventive Service or Chronic Disease	Geographic Location; Data Source; Total N	Population: Age in Years; % Female; % White	Mental Health Diagnoses; Measurement	Data Sources	Outcomes
Egede, 2010[7] (Companion: Egede, 2009[8]) Cross-sectional	Preventive services: Cancer screening Immunization Chronic disease: DM	National Randomized survey N=16,754	Age (category): MI: 18-34: 8.1% 35-49: 28.3% 50-64: 42.5% 65+: 21.1% NMI: 18-34: 4.6% 35-49: 17.4% 50-64: 38.4% 65+: 39.6% % Female: MI=61.6 NMI=46.3 % White: MI=63 NMI: 62	Major depression among those with diabetes PHQ-8	BRFSS 2006	*Cancer screening:* Breast cancer screening; Cervical cancer screening; Colorectal cancer screening: FOBT, sigmoidoscopy, or colonoscopy *Immunization:* Flu shot in past year; Pneumonia vaccine ever *DM:* HbA1c testing; Diabetic foot exam; Eye exam
Frayne, 2005[9] Cross-sectional	Chronic disease: DM	National VA databases and survey N=313,586	Age (category; n): MI: <55: 28,339 55-64: 16,051 65-74: 20,429 ≥75: 11,981 NMI: <55: 39,780 55-64: 47,357 65-74: 94,241 ≥75: 55,645 % Female: MI=3.3 NMI=1.8 % White: MI=73.4 NMI=74.5	Composite of mental health conditions: depressed mood, anxiety, psychosis, manic symptoms, SUD, personality disorders, dissociative symptoms, somatoform symptoms, impulse control disorders, eating disorders ICD-9 codes	6 sources (October 1997-September 1999): DEpiC; Medicare claims; VA National Patient Care Database; VHA Health Care Analysis Information Group (lab data); VHA Pharmacy Database; 1999 Large Health Survey of Veteran Enrollees	No HbA1c testing;† No eye exam;† LDL-C not at goal;† Composite diabetes outcome: no monitoring for diabetes (no HbA1c test done, no LDL-C-test done, and no eye exam done)†

Article; Study Design	Targeted Preventive Service or Chronic Disease	Geographic Location; Data Source; Total N	Population: Age in Years; % Female; % White	Mental Health Diagnoses; Measurement	Data Sources	Outcomes
Green, 2010[10] Retrospective cohort	Chronic disease: DM	Atlanta, GA Facility-level database N=8,817	Age (mean [SD]): MI=49.4 (10.2) NMI=55.6 (11.8) % Female: MI=61.4 NMI=64.3 % White: MI=11.7 NMI=4.3	Schizophrenia Mood disorders ICD-9 codes	ER, urgent care, and PC records (OP), 2004-2005, from urban, public hospital	HbA1c testing; Eye exam; Nephropathy screening
Jones, 2004[11] Retrospective cohort	Chronic disease: DM	Iowa State-level population-based database N=26,020	Age (mean [SD]): MI=47.1 (9.4) NMI=48.4 (10.2) % Female: MI=50.2 NMI=46.0 % White: NR	Mood disorders Psychotic disorders ICD-9 codes	Administrative claims data from BCBS of Iowa (January 1996 to December 2001)	HbA1c testing; Eye exam; Nephropathy screening
Kilbourne, 2008[12] (Companion: Morden, 2010[13]) Cross-sectional	Chronic diseases: DM HTN	National VA Healthcare system databases N=24,016 for HTN N=10,943 for DM	Age (mean [SD]): Total=67.0 (11.8) % Female: 3.2 % White: NR	Composite SMI: schizophrenia, bipolar disorder, other psychosis Depression: unipolar depression, depressive disorders ICD-9 codes	VA National Registries for (1) Psychosis; and (2) Depression; EPRP national quality of care databases, fiscal year 2005	*DM:* BP under control; LDL-C at goal; Diabetic foot exam; Eye exam; HbA1c testing not received† *HTN:* BP adequately controlled

Article; Study Design	Targeted Preventive Service or Chronic Disease	Geographic Location; Data Source; Total N	Population: Age in Years; % Female; % White	Mental Health Diagnoses; Measurement	Data Sources	Outcomes
Kodl, 2010[14] Retrospective cohort	Preventive service: Cancer screening (colorectal only)	Minneapolis, MN Facility-level VA Healthcare system N=855	Age (mean [SD]): MI=59.4 (6.6) NMI=63.8 (7.6) % Female: MI=20.3 NMI=35.6 % White: MI=48 NMI=68.7	PTSD Composite of mental health conditions: unipolar or bipolar depression, bipolar disorder, MDD, depressive disorders SMI composite: schizophrenia, delusional disorders, nonorganic psychoses ICD-9 codes	Electronic medical record (1996-2006)	Colorectal cancer screening: FOBT, sigmoidoscopy, or colonoscopy
Krein, 2006[15] Cross-sectional	Chronic disease: DM	National VA Healthcare System registries N=36,546	Age (mean [SD]): Total=58 (12) % Female: MI=4.0 NMI=: 14.0 % White: MI=64.0 NMI=69.0	Composite SMI: schizophrenia, schizoaffective disorder, bipolar disorder, other nonorganic psychoses, paranoid states, affective psychoses ICD-9-CM codes	VA National Psychosis Registry & Healthcare Analysis and Information Group/QUERI-DM (diabetes registry), October 1997 to September 1998	HbA1c testing; LDL-C at goal
Lasser, 2003[16] Retrospective cohort	Preventive service: Cancer screening (breast only)	Cambridge & Somerville, MA Local-level database from PC centers N=526	Age range: 40 to 70 % Female=100 % White=52.1	-PTSD -Composite of mental health Psychotic disorders Mood disorders (depressive disorders) PRIME-MD (modified)	PRIME-MD records, 1998 to “present” (precise year/ date not specified), from CHA administrative files	Breast cancer screening;
Leung, 2011[17] Cross-sectional	Chronic disease: DM	Massachusetts State-level database N=10,6174	Average age range: 52 to 65 yr % Female: MI=64.0 NMI=68.2 % White: MI=79.2 NMI=82.4	Schizophrenia Bipolar disorder Depression/ anxiety Other MI ICD-9 codes	Massachusetts Medicaid & Medicare, 2004-2005	HbA1c testing; Eye exam; Nephropathy screening

Article; Study Design	Targeted Preventive Service or Chronic Disease	Geographic Location; Data Source; Total N	Population: Age in Years; % Female; % White	Mental Health Diagnoses; Measurement	Data Sources	Outcomes
Lin, 2004[18] Prospective cohort	Chronic disease: DM	Seattle, WA HMO member survey N=4,385	Age (mean [SD]): Total=63.3 (13.4) % Female=48.7 % White=NR	Major depression Depressive disorders PHQ-9	GHC diabetes registry, 2001-2003	No HbA1c testing;† No eye exam;† No nephropathy screening within past year among patients not taking ACEI†
McGinty, 2012[19] Retrospective cohort	Chronic disease: IHD	Baltimore or eastern shore, MD State-level, population-based database N=633	Age (mean [SD]): MI=51.7 (NR) NMI=54.1 (NR) % Female: MI=63.5 NMI=61.5 % White: MI=46.7 NMI=41.9	Composite of mental health disorders: schizophrenia, bipolar disorder, MDD, other psychoses, organic psychosis, OCD, anxiety disorders ICD-9 codes	Maryland administrative claim files for disabled participants on Medicaid (fiscal years 1994-2004)	*30 days after hospitalization:* Cardiac catheterization rate; PTCA (includes catheterization); ACEI/ARB therapy % of patients on statin therapy *1 year after hospitalization:* ACEI/ARB therapy: % of patients on statin therapy
Nelson, 2011[20] Cross-sectional	Chronic disease: DM	Kansas City, KS Facility-level VAMC database N=124	Age (mean [SD]): MI=57.9 (7.0) NMI=57.9 (2.2) % Female=0 % White: MI=35.5 NMI=69.5	Composite SMI: schizophrenia, schizoaffective disorder, and psychosis NOS) ICD-9 codes	Computerized patient record system (CPRS) for 2008	LDL-C at goal
Pirraglia, 2004[21] Prospective cohort	Preventive service: Cancer screening (breast and cervical only)	Boston, MA; Chicago, IL; Detroit, MI; Los Angeles & Oakland, CA; Hudson County, NJ; Pittsburgh, PA Databases N=3,297	Age (category): >50 years: (10.2%) % Female=100 % White=47	Major depression (high ≥21) Depressive disorder (moderate 16-20) CES-D	SWAN longitudinal Cohort, 1996-1997	Breast cancer screening; Cervical cancer screening

Article; Study Design	Targeted Preventive Service or Chronic Disease	Geographic Location; Data Source; Total N	Population: Age in Years; % Female; % White	Mental Health Diagnoses; Measurement	Data Sources	Outcomes
Taveira, 2008[22] (Companion: Cohen, 2010[23]) Cross-sectional	Chronic disease: DM	Providence, RI VAMC facility-level database N=297	Age (mean [SD]): MI=59.9 (9.4) NMI=68.5 (9.3) % Female: MI=4.1 NMI=1.1 % White: MI=49.6 NMI=39.8	Schizophrenia Mood disorders (including depression and bipolar disorder) Depressive disorder Anxiety Dissociative and somatoform disorders PTSD ICD-9 codes	VAMC electronic medical records from CRRC January 2001-January 2002‡	Composite diabetes outcome: achieve at goal levels for at least 2 of these 3 values: SBP, LDL-C, or HbA1c
Trief, 2006[24] Retrospective cohort	Chronic disease: DM	New York (state) VA Healthcare Network Upstate New York facility-level database N=14,438	Average age range:§ MI: 59.6 to 64.3 NMI: 69.5 % Female: 0 % White: NR	PTSD with depression PTSD without depression Depression without PTSD ICD-9 codes	Veterans Health Information Systems and Technology Architecture (VistA) for PC visits (July 1, 2003 to October 4, 2004)	LDL-C at goal
Weiss, 2006[25] Cross-sectional	Chronic disease: DM	Boston, MA 5 internal medicine practices N=3,808	Age (mean [SD]): MI=62 (15) NMI=65 (13) % Female: MI=57.9 NMI=48.6 % White: MI=72.0 NMI=71.2	Schizophrenia and other psychotic disorders ICD-9 codes	Review of charts or electronic medical records (January 1, 2000 to July 31, 2003)	Proportion with hyperlipidemia prescribed a statin; LDL-C at goal; BP under control

Article; Study Design	Targeted Preventive Service or Chronic Disease	Geographic Location; Data Source; Total N	Population: Age in Years; % Female; % White	Mental Health Diagnoses; Measurement	Data Sources	Outcomes
Yee, 2011[26] Retrospective cohort	Preventive service: Cancer screening	New Mexico State-level VA Healthcare system N=606	Age (mean [SD]): MI=57.2 (5.1) NMI=57.7 (5.7) % Female=100 % White: MI=42 NMI=20	Composite of mental health conditions: anxiety, depressed mood, dissociative symptoms, eating disorders, impulse control or somatoform disorders, manic symptoms, personality disorders, psychosis, and SUD ICD-9 codes	NMVAHCS database (includes any clinic type), October 1, 2003 to September 30, 2006	Breast cancer screening; Cervical cancer screening; Colorectal cancer screening: FOBT, sigmoidoscopy, or colonoscopy

*Cancer screening implies breast, cervical, and colorectal unless otherwise indicated.

†Inversions for BP under control, HbA1c tested, eye exam received, nephropathy screen performed, and LDL-C at goal will be derived mathematically.

‡Range of years for data source differed in companion study, Cohen 2010,[23] where they were listed as 2001 to 2003.

§Age range given for MI because this represents several different categories (PTSD with and without depression, depression alone); age range NOT given for NMI because only one category.

Abbreviations: ACEI=angiotensin converting enzyme inhibitor; ARB=angiotensin receptor blocker; BCBS=Blue Cross Blue Shield; BP=blood pressure; BRFSS=Behavioral Risk Factor Surveillance Survey; CES-D=Center for Epidemiologic Studies Depression Scale; CHA=Cambridge Health Alliance; CIDI-SF=Composite International Diagnostic Interview-Short Form; CPRS=Computerized Patient Record System; CRRC=Community Resource and Referral Center; DEpiC=Diabetes Epidemiology Cohort; DM=diabetes mellitus; EPRP=External Peer Review Program; ER=emergency room; FOBT=fecal occult blood test; GHC=Group Health Cooperative; HbA1c=glycated hemoglobin; HEDIS=Healthcare Effectiveness Data and Information Set; HMO=health maintenance organization; HTN=hypertension; ICD-9=*International Classification of Diseases, 9th revision*; ICD-9-CM=*International Classification of Diseases, 9th Revision, Clinical Modification*; IHD=ischemic heart disease; LDL-C=low density lipoprotein cholesterol; MDD=major depressive disorder; MI=mental illness; N=number of participants; NHIS=National Health Interview Survey; NMI=no mental illness; NMVAHCS=New Mexico VA Health Care System; NR=not reported; OCD=obsessive-compulsive disorder; OP=outpatient; PC=primary care; PHQ-8=Patient Health Questionnaire-8; PHQ-9=Patient Health Questionnaire-9; PRIME-MD=Primary Care Evaluation of Mental Disorders; PTCA=percutaneous transluminal coronary angioplasty; PTSD=posttraumatic stress disorder; QUERI-DM=Diabetes Mellitus Quality Enhancement Research Initiative; SBP=systolic blood pressure; SD=standard deviation; SHEP=Survey of Healthcare Experiences of Patients; SMI=serious mental illness, usually schizophrenia, schizoaffective disorder, and bipolar disorder; SUD=substance use disorder; SWAN=Study of Women's Health Across the Nation; VA=Veterans Affairs; VAMC=Veteran Affairs Medical Center; VHA=Veterans Health Administration; VistA=Veterans Health Information Systems and Technology Architecture (electronic health record system)

References to Appendix D:

1. Desai MM, Rosenheck RA, Druss BG, Perlin JB. Mental disorders and quality of diabetes care in the veterans health administration. *Am J Psychiatry.* 2002;159(9):1584-1590.

2. Dolder CR, Furtek K, Lacro JP, Jeste DV. Antihypertensive medication adherence and blood pressure control in patients with psychotic disorders compared to persons without psychiatric illness. *Psychosomatics.* 2005;46(2):135-141.

3. Druss BG, Rosenheck RA, Desai MM, Perlin JB. Quality of preventive medical care for patients with mental disorders. *Med Care.* 2002;40(2):129-136.

4. Druss BG, Rask K, Katon WJ. Major depression, depression treatment and quality of primary medical care. *Gen Hosp Psychiatry.* 2008;30(1):20-25.

5. Druss BG, Zhao L, Cummings JR, Shim RS, Rust GS, Marcus SC. Mental comorbidity and quality of diabetes care under Medicaid: a 50-state analysis. *Med Care.* 2012;50(5):428-433.

6. Duffy SA, Kilbourne AM, Austin KL, et al. Risk of smoking and receipt of cessation services among veterans with mental disorders. *Psychiatr Serv.* 2012;63(4):325-332.

7. Egede LE, Grubaugh AL, Ellis C. The effect of major depression on preventive care and quality of life among adults with diabetes. *Gen Hosp Psychiatry.* 2010;32(6):563-569.

8. Egede LE, Ellis C, Grubaugh AL. The effect of depression on self-care behaviors and quality of care in a national sample of adults with diabetes. *Gen Hosp Psychiatry.* 2009;31(5):422-427.

9. Frayne SM, Halanych JH, Miller DR, et al. Disparities in diabetes care: impact of mental illness. *Arch Intern Med.* 2005;165(22):2631-2638.

10. Green JL, Gazmararian JA, Rask KJ, Druss BG. Quality of diabetes care for underserved patients with and without mental illness: site of care matters. *Psychiatr Serv.* 2010;61(12):1204-1210.

11. Jones LE, Clarke W, Carney CP. Receipt of diabetes services by insured adults with and without claims for mental disorders. *Med Care.* 2004;42(12):1167-1175.

12. Kilbourne AM, Welsh D, McCarthy JF, Post EP, Blow FC. Quality of care for cardiovascular disease-related conditions in patients with and without mental disorders. *J Gen Intern Med.* 2008;23(10):1628-1633.

13. Morden NE, Berke EM, Welsh DE, McCarthy JF, Mackenzie TA, Kilbourne AM. Quality of care for cardiometabolic disease: associations with mental disorder and rurality. *Med Care.* 2010;48(1):72-78.

14. Kodl MM, Powell AA, Noorbaloochi S, Grill JP, Bangerter AK, Partin MR. Mental health, frequency of healthcare visits, and colorectal cancer screening. *Med Care.* 2010;48(10):934-939.

15. Krein SL, Bingham CR, McCarthy JF, Mitchinson A, Payes J, Valenstein M. Diabetes treatment among VA patients with comorbid serious mental illness. *Psychiatr Serv.* 2006;57(7):1016-1021.

16. Lasser KE, Zeytinoglu H, Miller E, Becker AE, Hermann RC, Bor DH. Do women who screen positive for mental disorders in primary care have lower mammography rates? *Gen Hosp Psychiatry.* 2003;25(3):214-216.

17. Leung GY, Zhang J, Lin WC, Clark RE. Behavioral health disorders and adherence to measures of diabetes care quality. *Am J Manag Care.* 2011;17(2):144-150.

18. Lin EH, Katon W, Von Korff M, et al. Relationship of depression and diabetes self-care, medication adherence, and preventive care. *Diabetes Care.* 2004;27(9):2154-2160.

19. McGinty EE, Blasco-Colmenares E, Zhang Y, et al. Post-myocardial-infarction quality of care among disabled Medicaid beneficiaries with and without serious mental illness. *Gen Hosp Psychiatry.* 2012;34(5):493-499.

20. Nelson LA, Graham MR, Lindsey CC, Rasu RS. Adherence to antihyperlipidemic medication and lipid control in diabetic Veterans Affairs patients with psychotic disorders. *Psychosomatics.* 2011;52(4):310-318.

21. Pirraglia PA, Sanyal P, Singer DE, Ferris TG. Depressive symptom burden as a barrier to screening for breast and cervical cancers. *J Womens Health (Larchmt).* 2004;13(6):731-738.

22. Taveira TH, Pirraglia PA, Cohen LB, Wu WC. Efficacy of a pharmacist-led cardiovascular risk reduction clinic for diabetic patients with and without mental health conditions. *Prev Cardiol.* 2008;11(4):195-200.

23. Cohen LB, Taveira TH, Wu WC, Pirraglia PA. Maintenance of risk factor control in diabetic patients with and without mental health conditions after discharge from a cardiovascular risk reduction clinic. *Ann Pharmacother.* 2010;44(7-8):1164-1170.

24. Trief PM, Ouimette P, Wade M, Shanahan P, Weinstock RS. Post-traumatic stress disorder and diabetes: co-morbidity and outcomes in a male veterans sample. *J Behav Med.* 2006;29(5):411-418.

25. Weiss AP, Henderson DC, Weilburg JB, et al. Treatment of cardiac risk factors among patients with schizophrenia and diabetes. *Psychiatr Serv.* 2006;57(8):1145-1152.

26. Yee EF, White R, Lee SJ, et al. Mental illness: is there an association with cancer screening among women veterans? *Womens Health Issues.* 2011;21(4 Suppl):S195-202.

APPENDIX E. NEWCASTLE-OTTAWA SCALE COHORT RATINGS

Study	Selection	Comparability	Outcome	Targeted Preventive Service or Chronic Disease
Desai, 2002[1]	✓✓✓✓	–	✓✓✓	Chronic disease: DM
Dolder, 2005[2]	✓✓✓✓	–	✓✓✓	Chronic disease: HTN
Druss, 2002[3]	✓✓✓	–	✓✓	Preventive services: CA screening* Immunization Smoking cessation
Druss, 2008[4]	✓✓✓	✓✓	–	Preventive services: CA screening Immunization
Druss, 2012[5]	✓✓✓✓	✓✓	✓✓✓	Chronic disease: DM
Duffy, 2012[6]	✓✓✓	✓✓	–	Preventive service: Smoking cessation
Egede, 2010[7] (Companion: Egede, 2009[8])	✓✓✓	✓✓	✓✓	Preventive services: CA screening Immunization Chronic disease: DM
Frayne, 2005[9]	✓✓✓✓	✓✓	✓✓✓	Chronic disease: DM
Green, 2010[10]	✓✓✓✓	–	✓✓✓	Chronic disease: DM
Jones, 2004[11]	✓✓✓	–	✓✓	Chronic disease: DM
Kilbourne, 2008[12] (Companion: Morden, 2010[13])	✓✓✓✓	–	✓✓	Chronic diseases: DM, HTN
Kodl, 2010[14]	✓✓✓✓	–	✓✓✓	Preventive service: CA screening (colorectal only)
Krein, 2006[15]	✓✓✓✓	–	✓✓	Chronic disease: DM
Lasser, 2003[16]	✓✓✓	–	✓✓	Preventive service: CA screening (breast only)
Leung, 2011[17]	✓✓✓✓	–	✓✓✓	Chronic disease: DM
Lin, 2004[18]	✓✓✓	✓✓	✓✓✓	Chronic disease: DM
McGinty, 2012[19]	✓✓✓	–	✓✓✓	Chronic disease: IHD
Nelson, 2011[20]	✓✓✓✓	–	✓✓✓	Chronic disease: DM
Pirraglia, 2004[21]	✓✓✓	✓✓	✓	Preventive service: CA screening (breast and cervical only)
Taveira, 2008[22] (Companion: Cohen, 2010[23])	✓✓✓	–	✓✓✓	Chronic disease: DM
Trief, 2006[24]	✓✓✓	–	✓✓	Chronic disease: DM
Weiss, 2006[25]	✓✓✓	–	✓✓	Chronic disease: DM
Yee, 2011[26]	✓✓✓✓	–	✓✓✓	Preventive service: CA screening

*CA screening implies breast, cervical, and colorectal unless otherwise indicated.

Abbreviations: CA=cancer; DM=diabetes mellitus; HTN=hypertension; IHD=ischemic heart disease

References to Appendix E:

1. Desai MM, Rosenheck RA, Druss BG, Perlin JB. Mental disorders and quality of diabetes care in the veterans health administration. *Am J Psychiatry.* 2002;159(9):1584-1590.

2. Dolder CR, Furtek K, Lacro JP, Jeste DV. Antihypertensive medication adherence and blood pressure control in patients with psychotic disorders compared to persons without psychiatric illness. *Psychosomatics.* 2005;46(2):135-141.

3. Druss BG, Rosenheck RA, Desai MM, Perlin JB. Quality of preventive medical care for patients with mental disorders. *Med Care.* 2002;40(2):129-136.

4. Druss BG, Rask K, Katon WJ. Major depression, depression treatment and quality of primary medical care. *Gen Hosp Psychiatry.* 2008;30(1):20-25.

5. Druss BG, Zhao L, Cummings JR, Shim RS, Rust GS, Marcus SC. Mental comorbidity and quality of diabetes care under Medicaid: a 50-state analysis. *Med Care.* 2012;50(5):428-433.

6. Duffy SA, Kilbourne AM, Austin KL, et al. Risk of smoking and receipt of cessation services among veterans with mental disorders. *Psychiatr Serv.* 2012;63(4):325-332.

7. Egede LE, Grubaugh AL, Ellis C. The effect of major depression on preventive care and quality of life among adults with diabetes. *Gen Hosp Psychiatry.* 2010;32(6):563-569.

8. Egede LE, Ellis C, Grubaugh AL. The effect of depression on self-care behaviors and quality of care in a national sample of adults with diabetes. *Gen Hosp Psychiatry.* 2009;31(5):422-427.

9. Frayne SM, Halanych JH, Miller DR, et al. Disparities in diabetes care: impact of mental illness. *Arch Intern Med.* 2005;165(22):2631-2638.

10. Green JL, Gazmararian JA, Rask KJ, Druss BG. Quality of diabetes care for underserved patients with and without mental illness: site of care matters. *Psychiatr Serv.* 2010;61(12):1204-1210.

11. Jones LE, Clarke W, Carney CP. Receipt of diabetes services by insured adults with and without claims for mental disorders. *Med Care.* 2004;42(12):1167-1175.

12. Kilbourne AM, Welsh D, McCarthy JF, Post EP, Blow FC. Quality of care for cardiovascular disease-related conditions in patients with and without mental disorders. *J Gen Intern Med.* 2008;23(10):1628-1633.

13. Morden NE, Berke EM, Welsh DE, McCarthy JF, Mackenzie TA, Kilbourne AM. Quality of care for cardiometabolic disease: associations with mental disorder and rurality. *Med Care.* 2010;48(1):72-78.

14. Kodl MM, Powell AA, Noorbaloochi S, Grill JP, Bangerter AK, Partin MR. Mental health, frequency of healthcare visits, and colorectal cancer screening. *Med Care.* 2010;48(10):934-939.

15. Krein SL, Bingham CR, McCarthy JF, Mitchinson A, Payes J, Valenstein M. Diabetes treatment among VA patients with comorbid serious mental illness. *Psychiatr Serv.* 2006;57(7):1016-1021.

16. Lasser KE, Zeytinoglu H, Miller E, Becker AE, Hermann RC, Bor DH. Do women who screen positive for mental disorders in primary care have lower mammography rates? *Gen Hosp Psychiatry.* 2003;25(3):214-216.

17. Leung GY, Zhang J, Lin WC, Clark RE. Behavioral health disorders and adherence to measures of diabetes care quality. *Am J Manag Care.* 2011;17(2):144-150.

18. Lin EH, Katon W, Von Korff M, et al. Relationship of depression and diabetes self-care, medication adherence, and preventive care. *Diabetes Care.* 2004;27(9):2154-2160.

19. McGinty EE, Blasco-Colmenares E, Zhang Y, et al. Post-myocardial-infarction quality of care among disabled Medicaid beneficiaries with and without serious mental illness. *Gen Hosp Psychiatry.* 2012;34(5):493-499.

20. Nelson LA, Graham MR, Lindsey CC, Rasu RS. Adherence to antihyperlipidemic medication and lipid control in diabetic Veterans Affairs patients with psychotic disorders. *Psychosomatics.* 2011;52(4):310-318.

21. Pirraglia PA, Sanyal P, Singer DE, Ferris TG. Depressive symptom burden as a barrier to screening for breast and cervical cancers. *J Womens Health (Larchmt).* 2004;13(6):731-738.

22. Taveira TH, Pirraglia PA, Cohen LB, Wu WC. Efficacy of a pharmacist-led cardiovascular risk reduction clinic for diabetic patients with and without mental health conditions. *Prev Cardiol.* 2008;11(4):195-200.

23. Cohen LB, Taveira TH, Wu WC, Pirraglia PA. Maintenance of risk factor control in diabetic patients with and without mental health conditions after discharge from a cardiovascular risk reduction clinic. *Ann Pharmacother.* 2010;44(7-8):1164-1170.

24. Trief PM, Ouimette P, Wade M, Shanahan P, Weinstock RS. Post-traumatic stress disorder and diabetes: co-morbidity and outcomes in a male veterans sample. *J Behav Med.* 2006;29(5):411-418.

25. Weiss AP, Henderson DC, Weilburg JB, et al. Treatment of cardiac risk factors among patients with schizophrenia and diabetes. *Psychiatr Serv.* 2006;57(8):1145-1152.

26. Yee EF, White R, Lee SJ, et al. Mental illness: is there an association with cancer screening among women veterans? *Womens Health Issues.* 2011;21(4 Suppl):S195-202.