



# *Associations of Social Indicators and Health Outcomes: A Review of Systematic Reviews*

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## Objective

The objective of this report is to summarize the evidence on the relationships between social factors (homelessness, low educational attainment, English language learner, immigration, mental illness, race/ethnicity, substance use disorder/chemical dependency, and neighborhood poverty) and health outcomes (asthma, obesity, mental illness, substance use disorder, oral health, and type 2 diabetes) among adults.

## Key Findings

### *Search Results and Quality of Systematic Reviews*

- 17 systematic reviews were eligible for this review. The majority were either of good or fair quality (good = 7; fair = 5; poor = 5)
- Most of the good- and fair-quality reviews focused on mental health outcomes (including depression, anxiety disorder, suicidal ideation [i.e., thinking about suicide], psychosis, schizophrenia, and post-traumatic stress disorder [PTSD]) (5 reviews)
- There was limited evidence on asthma, oral health outcomes beyond periodontitis (i.e., a serious gum infection that damages gums and can destroy the jawbone), and type 2 diabetes
- No reviews were found that focused on health outcomes associated with being homeless, living in a neighborhood characterized by poverty, or being an English language learner (Table 1)

**Table 1. Frequency of Systematic Reviews by Social Indicator and Health Outcome**

	Asthma	Obesity	Type 2 Diabetes	Oral Health	Mental Health	Substance Use Disorder
Low educational attainment	-	1	1	1	-	-
Neighborhood poverty	-	-	-	-	-	-
Homelessness	-	-	-	-	-	-
Race/ethnicity	-	1	-	-	3	-
English language learner	-	-	-	-	-	-
Immigration status	1	2	1	-	2	-
Mental illness	-	2	-	-	-	1
Substance use disorder	-	-	-	1	4	-

### *Systematic Review Findings*

- Most good- and fair-quality studies reported small to medium adjusted or pooled measures of association (6 studies, range: adjusted odds ratios [ORs] 1.41 to 2.70)

- Good- and fair-quality reviews found the following associations:
  - Both low educational attainment and alcohol use were associated with an increased risk of periodontitis
  - Both depression and low educational attainment were associated with an increased risk of obesity
  - Black African and black Caribbean racial/ethnicity groups were found to have an increased risk of obesity
  - Conversely, Chinese race/ethnicity groups were found to have a decreased risk of obesity
  - Low educational attainment was associated with an increased risk of type 2 diabetes
  - Depression was associated with an increased risk of non-fatal overdoses among drug users
  - Cannabis use was associated with an increased risk of depression
  - Alcohol use disorder during adolescence was associated with an increased risk for alcohol use disorder in adulthood
  - Black African, black Caribbean, and South Asian race/ethnicity groups were found to have an increased risk for schizophrenia
  - Among individuals exposed to trauma, Latinos were found to have an increased risk for PTSD
- The largest magnitudes of association were found on:
  - The relationship between alcohol dependence at age 18 and alcohol abuse (adjusted OR 3.5) and dependence (adjusted OR 15.5) at age 21 (Wells, Horwood, & Fergusson, 2006)
  - The relationship between black Caribbean ethnicity and schizophrenia (crude incidence rate ratio [IRR]: 5.6; 95% confidence interval [CI]: 3.4 to 9.2;  $I^2 = 77%$ ) and black African ethnicity and schizophrenia (crude RR: 4.7; 95% CI: 3.3 to 6.8;  $I^2 = 47%$ ) compared with whites
- No or little evidence was found for the following associations:
  - Adolescent alcohol problems/dependence and mental health disorders
  - Substance use and transition to psychosis
  - Ante- or postnatal depression and obesity

## Background

There is a growing recognition that social determinants have a large impact on health. Social determinants of health are the “structural determinants and conditions in which people are born, grow, live, work, and age” (World Health Organization, 2016). Healthy People 2020 categorizes the social determinants of health into five key areas: economic stability, education,

health/health care, neighborhood/built environment, and social/community context. Health disparities occur when groups of people systematically experience more obstacles to achieving a good health status due to characteristics historically linked to discrimination or exclusion, such as: race/ethnicity, socioeconomic status (SES), mental health, gender, age, religion, sexual orientation and gender identity, geographic location, and disability (Heiman & Artiga, 2015).

## Methods

Center for Evidence-based Policy (Center) staff searched Ovid MEDLINE® and PsycINFO for systematic reviews on selected social factors and health outcomes (Figure 1). Center staff also conducted targeted searches in Google and Google Scholar, selected electronic databases, and bibliographies. The full search strategy can be found in Appendix A. Searches were limited to systematic reviews published in English in the last 10 years (January 1, 2006 to December 4, 2015).

### *Exclusion Criteria*

The following exclusion criteria were applied when reviewing search results. We excluded the study if:

- I. It was not a systematic review
- II. Studies in the review included a treatment or intervention
- III. It did not include both a social indicator and outcome of interest (Figure 1)
- IV. The specific population that was studied was not of interest
  - a. Studies only included children (under age 18)
  - b. Studies only included older adults (age 65+)
  - c. Studies conducted only in low- to middle-income countries
  - d. Studies were among a specialized population that was not of interest to Medicaid (e.g., doctors)
- V. Studies included in the review did not have a comparison group
- VI. Individual studies in the systematic review overlapped with another, more recently published review with the same focus

Some systematic reviews included individual studies that did and did not meet inclusion criteria. These reviews included studies that had:

- Adults and children
- High and low/middle-income countries
- Relevant and not relevant social indicators and outcomes

We applied further exclusion criteria for reviews that included these characteristics:

- I. The review meta-analyzed results from studies with mixed populations, social indicators, or outcomes, and it did not include specific analyses of the population, social indicator, or outcome of interest
- II. The review qualitatively synthesized evidence and did not include an evidence table that clearly abstracted all of the following information:
  - a. Study author and year or link to citation
  - b. Country, location, and age (if study is mixed by these characteristics)
  - c. Study design
  - d. Explanation of social indicator and outcome measure
  - e. Effect size with p-value and/or confidence interval

Two staff reviewers independently evaluated the quality of the included systematic reviews for this report using a quality assessment process highlighted in Appendix B. The two reviewers compared and discussed the quality assessments, and when consensus was not reached, a third reviewer was involved until agreement was achieved. It is important to note that Center staff only quality assessed the systematic review methods and did not assess the quality of the individual studies included in each review.

**Figure 1. Social Indicators and Health Outcomes of Interest**

Social factors	Health Outcomes
Homelessness	Asthma
Low educational attainment	Obesity
English language learner	Mental illness <sup>1</sup>
Immigration	Substance use disorder <sup>2</sup>
Mental illness	Oral health <sup>3</sup>
Race/ethnicity	Type 2 diabetes
Substance use disorder/chemical dependency	
Neighborhood poverty	

<sup>1</sup> Excluding intellectual disabilities, sleep disorders, dementia, and attention-deficit/hyperactivity disorder (ADHD)

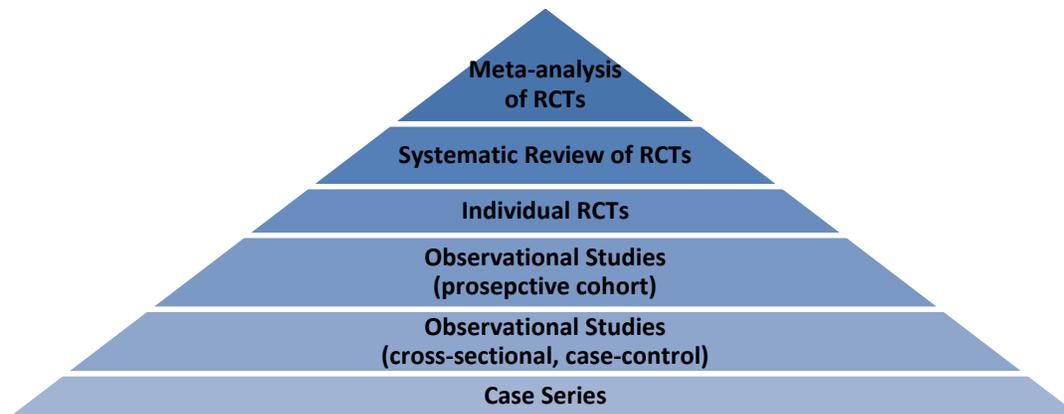
<sup>2</sup> Excluding tobacco

<sup>3</sup> Including dental caries, missing teeth, abscessed teeth, periodontitis, and oral health-related quality of life measure; excluding malocclusion, congenitally missing teeth, cleft palate, and various syndromes like Downs,

All included studies were observational (non-experimental). Within the evidence-based medicine hierarchy of evidence (Figure 2), observational studies are considered to be lower quality because of reduced internal validity (i.e., how well a study avoids bias). However, in general, observational studies have higher external validity (i.e., generalizability) than do randomized controlled trials (RCTs), because the results are more applicable to the real-world setting. Furthermore, it is not ethical or practical to randomize individuals to social indicators

and follow them forward in time for poor health outcomes. Therefore, observational studies, particularly prospective cohort studies, are the highest quality of evidence for these topics.

**Figure 2. Evidence-based Medicine Hierarchy of Evidence**



Center staff distinguishes whether associations are crude or adjusted. A crude association is the raw association between the social indicator and health outcome. An adjusted association is an association that has been statistically adjusted for confounding variables (i.e., a third factor that is distorting the association between an exposure and outcome).

Center staff assessed the strength of associations within included reviews using Cohen’s guidelines (Cohen, 1988).

Relative risks (i.e., odds ratios, prevalence, risk, rate, and hazard ratios):

- Small = 1.50
- Medium = 2.50
- Large = 4.30

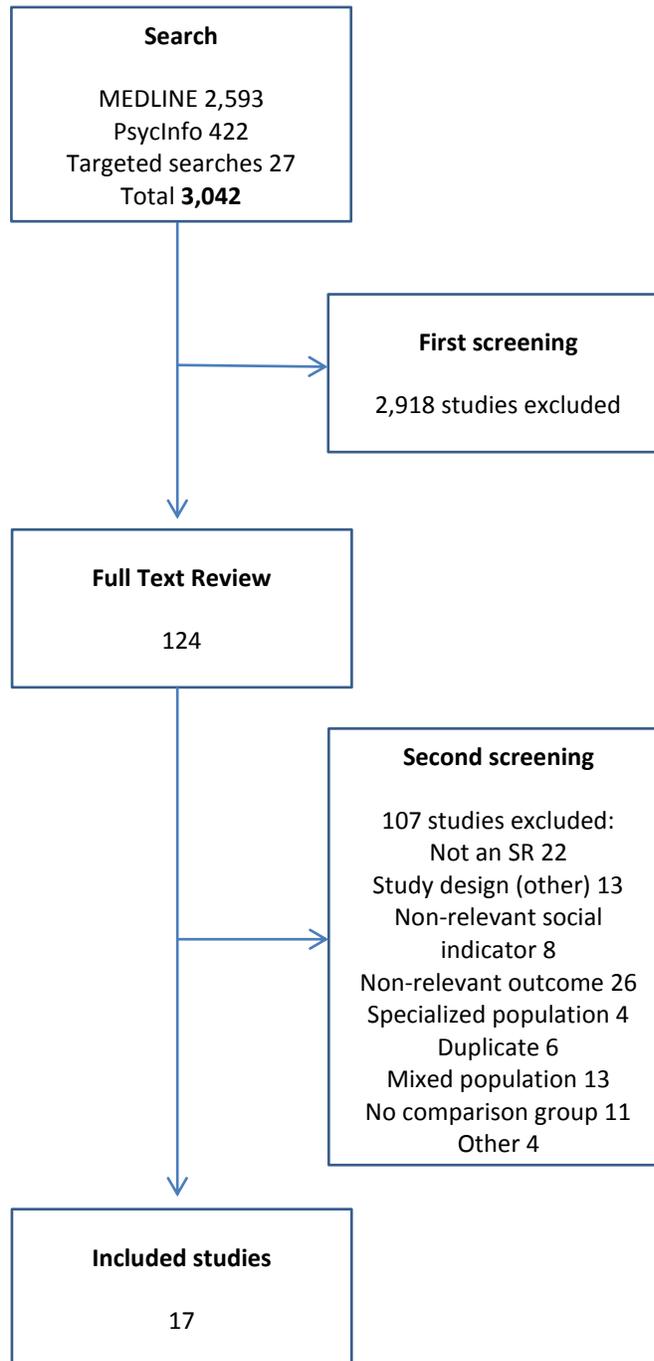
Staff also used the following thresholds when interpreting  $I^2$  statistics in meta-analyses (Deeks, Higgins, & Altman, 2011). The presence of statistical heterogeneity in a meta-analysis, as indicated by  $I^2$ , will indicate that combining studies for an overall or pooled estimate may not be appropriate:

- 0% to 40%: might not be important
- 30% to 60%: may represent moderate heterogeneity<sup>1</sup>
- 50% to 90%: may represent substantial heterogeneity<sup>1</sup>
- 75% to 100%: represent considerable heterogeneity<sup>1</sup>

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<sup>1</sup> The importance of the observed value of  $I^2$  depends on (i) magnitude and direction of effects and (ii) strength of evidence for heterogeneity (e.g., p-value from the chi-squared test, or a confidence interval for  $I^2$ ).

**Figure 3. Flow Chart of Screening**



## Findings

### *Search Results*

Our search strategy identified 3,042 documents. After a title and abstract screening and a subsequent full-text review of documents of interest, 17 systematic reviews were determined to be eligible for this report (Figure 2). There was considerable variation in how the studies reported results. Six studies conducted a quantitative synthesis (i.e., meta-analysis). Three of the meta-analyses only reported pooled results (measures of association were not reported for individual studies). Two meta-analyses reported pooled results and displayed fully abstracted results from individual studies. One meta-analysis focused on the incidence of schizophrenia and psychoses among different race/ethnicity groups in England and only reported the incidence rate ratio (with 95% CIs) graphically. The remaining 11 reviews combined results qualitatively. Only one of these reviews fully abstracted individual study results, including measures of association and statistical significance. Five reviews inconsistently abstracted measures of association and statistical significance. Six reviews did not abstract quantitative results from individual studies into evidence tables.

### *Summary of Findings*

The findings section is stratified by health outcome and then by social indicator. Study characteristics and results are summarized within an evidence table for each health outcome (Tables 2 to 13).

#### Asthma

Center staff found one poor-quality review on asthma (Vang, Sigouin, Flenon, & Gagnon, 2015), which assessed the association between immigration and asthma.

#### *Immigration*

Vang and colleagues (2015) explored the “healthy immigrant effect” in Canada, looking at several health outcomes. In this poor-quality review of 77 studies, three studies explored the effect of immigration on asthma (Table 2). Vang and colleagues (2015) reported that immigrants were less likely than were Canadian-born adults to have asthma; however, no measures of association were reported (Table 3). Vang and colleagues (2015) did not quality assess individual studies within their review.

**Table 2. Asthma Study Characteristics**

Author (Year)	Meta-Analysis	Exposure	Outcome	Population	Study Design	No. Studies	Center Quality Rating
Vang 2015	No	Immigration	Asthma	General (Canada)	Did not specify	3	Poor

**Table 3. Asthma Study Results**

Review Author (Year)	Measure of Association	Association (Range)	Statistically Different From Reference Group	Key Findings
Vang 2015	Review did not abstract results			3 out of 3 studies found immigrants were less likely than Canadian-born adults to have asthma.

### Mental Health

Eight reviews on mental health were found: Three were good quality (Alcantara, Casement, & Lewis-Fernandez, 2013; Lev-Ran et al., 2014; McCambridge, McAlaney, & Rowe, 2011), one was fair quality (Addington et al., 2014), and four were poor quality (De Maio, 2010; Minozzi et al., 2010; Simpson, Krishnan, Kunik, & Ruiz, 2007; Vang et al., 2015).

### *Immigration*

De Maio (2010) conducted a poor-quality review on the association between immigration and depression in Canada (Table 4). Two of the reviewed studies found that the prevalence of depression was about twice as high in Canadian-born residents than in recent immigrants (8% vs. 4.2% and 10.1% vs. 5.2%, respectively; all crude prevalence rates). This advantage diminished with the duration of residence. One study within the review found that immigrant women (especially those from minority groups) may have a higher risk for postpartum depression than Canadian-born mothers (24.7% vs. 11.22%; all crude prevalence rates). De Maio (2010) did not quality assess individual studies in their review.

Vang and colleagues (2015) included 10 studies in their poor-quality review on the effect of immigration on depression, anxiety, and other psychosocial distress disorders in Canada (Table 4). They reported that half of the included studies showed immigrants were statistically significantly less likely than Canadian-born adults to report symptoms of depression, anxiety, and other psychosocial distress. One study conducted among homeless patients in Ottawa showed worse mental health outcomes among Canadian-born adults than among immigrants. The remaining studies showed similar or mixed results when comparing mental health among immigrants and Canadian-born adults. Vang and colleagues (2015) did not report measures of association or quality assess individual studies in their review.

## *Race/ethnicity*

Alcantara and colleagues (2013) investigated whether the risk of PTSD differed among Latino versus non-Latino groups who had experienced trauma (Table 4). In this good-quality review, 6 out of 11 studies showed that Latinos compared to non-Latinos (white and black) who were exposed to trauma had an increased risk for developing PTSD. Alcantara and colleagues (2013) reported that these results were statistically significantly different, but they did not report measures of association. Studies that showed a statistically significantly increased risk assessed the rate of PTSD during the first one to six months of the study, whereas non-significant studies assessed the risk of PTSD over 12 months or a participant's lifetime. All included studies were assessed for methodological quality using the Cochrane Risk of Bias assessment tool. Seven out of 28 included studies were determined to have a low risk of bias.

Kirkbride and colleagues (2012) conducted a good-quality systematic review and meta-analysis on the incidence of schizophrenia among different race/ethnicity groups in England from 1950-2009 (Table 4). Compared to whites, black Caribbean migrants and their descendants had a large, statistically significant positive association with schizophrenia (5 studies; crude incidence rate ratio [IRR]: 5.6; 95% CI: 3.4 to 9.2;  $I^2 = 77\%$ ). Because there is considerable statistical heterogeneity among studies on the black Caribbean population, combining the studies in a meta-analysis may have not been appropriate, and the results should be interpreted with caution. A large, statistically significant positive association was also found between black African migrants and their descendants and schizophrenia (5 studies; crude RR: 4.7; 95% CI: 3.3 to 6.8;  $I^2 = 47\%$ ) compared with whites. A medium, statistically significant positive association was found between Asian ethnicities (Indian, Pakistani, and other Asian groups) and schizophrenia in comparison to whites (crude RR 2.4; 95% CI 1.3 to 4.5,  $I^2 = 42\%$ ). Moderate statistical heterogeneity was detected in both meta-analyses involving black African and Asian ethnicities (Table 5). The mean study quality score was 4.8 out of an 8-point scale; however, quality assessment methods were not detailed.

Simpson and colleagues (2007) conducted a poor-quality review on depression diagnosis among individuals from African-American, Hispanic, and Caucasian race/ethnicity groups (Table 4). All reviewed studies found small associations. One of the four reviewed studies showed that African-Americans, when compared to Caucasians, were statistically significantly less likely to receive a depression diagnosis (OR 0.63,  $p < 0.05$ ). Two additional studies also showed that African-Americans were less likely to receive a depression diagnosis than were Caucasians, but the difference was either marginally statistically significant (OR 0.72; 95% CI 0.51 to 1.01) or not reported (OR 0.42). One study showed no statistical difference between African-Americans and Caucasians (OR 0.99, 95% CI 0.91 to 1.08), and another study did not report a measure of association. Two out of four reviewed studies showed that Hispanic subjects were significantly

less likely to receive a depression diagnosis than were Caucasians (OR 0.94,  $p < 0.05$ ; OR 0.29,  $p < 0.05$ ). Although OR 0.94 was statistically significant, a 6% reduction may not be meaningful. One additional study showed that Hispanic participants were less likely to receive a depression diagnosis than Caucasians, but results were not statistically significant (OR 0.72, 95% CI 0.48 to 1.08). Another study showed that Hispanic participants were more likely to receive a depression diagnosis than Caucasians (OR 1.74, 95% CI 1.56 to 1.93) (Table 5). It is important to note that Simpson and colleagues' (2007) review focused on depression diagnosis, not depression prevalence, which may have influenced the findings. Individual studies within the review were not quality assessed.

### *Substance use*

Addington and colleagues (2014) conducted a fair-quality review exploring the role of substance use in the transition to psychosis among individuals at high risk for psychosis (Table 4). Substance use is broadly defined in individual studies within the review as the use of alcohol, nicotine, cannabis, and other street drugs. Two out of 10 reviewed studies found that substance use statistically significantly increased the transition rate to psychosis. One longitudinal cohort study showed that substance use was a statistically significant predictor of psychosis. The other study reported that cannabis and nicotine use was associated with transition to psychosis. Addington and colleagues (2014) did not report measures of association or quality assess individual studies in the review.

Lev-Ran and colleagues (2014) conducted a good-quality review and meta-analysis on cannabis use and depression (Table 4). A meta-analysis of 10 studies showed a small, statistically significant association between cannabis users and depression compared with non-users (adjusted OR 1.17; 95% CI 1.05 to 1.30,  $I^2 = 2.1\%$ ). When restricting the meta-analysis to only high-quality studies, the association between cannabis users and depression did not vary (OR 1.12, 95% CI 1.03 to 1.37,  $I^2 = 20.2\%$ ). All included studies were assessed for methodological quality. Eight of 14 included studies were rated as high quality using the Newcastle-Ottawa Scale. A small, statistically significant positive association was also found between heavy cannabis use and depression (7 studies, adjusted OR 1.62, 95% CI 1.21 to 2.16,  $I^2 = 47.3\%$ ). However, moderate statistical heterogeneity was found among studies on heavy cannabis use (Table 5).

McCambridge and colleagues (2011) reviewed cohort studies on adolescent alcohol consumption and mental health outcomes (major depression, anxiety disorder, and suicidal ideation) in a good-quality systematic review (Table 4). Only cohort studies with a "stronger capacity for causal inference" (i.e., those that had follow-up rates of  $>80\%$  and sample sizes  $\geq 1,000$ ) were summarized in the narrative synthesis. Two of the 10 included cohort studies met these criteria. These studies showed no evidence of an association between alcohol

consumption at ages 15 to 16 and mental health outcomes at ages 21 to 25 (all  $p > 0.05$  after statistical adjustment, no measures of association reported).

Minozzi and colleagues (2010) conducted a poor-quality systematic review of reviews on the effect of cannabis on psychosis (Table 4). Four out of five reviews conducted meta-analyses. All four meta-analyses showed that cannabis use was associated with a statically significant increase in psychosis. Associations were small to medium: OR 1.41 (7 studies; ever use cannabis; 95% CI 1.20 to 1.65), OR 2.09 (7 studies; 95% CI 1.54 to 2.84), OR 2.1 (112,218 participants; ever use and dependence combined; 95% CI 1.7 to 2.5), to OR 2.93, (51,688 participants; crude association; ever use and dependence combined; 95% CI 2.36 to 3.64). The one review that did not conduct a meta-analysis found inconsistent associations between cannabis use and psychological problems (Table 5). The mean quality score on the Overview Quality Assessment Questionnaire (OQAQ) scale was 3.6 on a 1 (extensive flaws) to 7 (minimal flaws) scale.

**Table 4. Mental Health Study Characteristics**

Author (Year)	Meta-Analysis	Exposure	Outcome	Population	Study Design	No. Studies	Center Quality Rating
Addington (2014)	No	Substance use disorder	Psychosis	Clinically high risk for psychosis	Did not specify	10	Fair
Alcantara (2011)	No	Race/ethnicity	PTSD	Individuals exposed to trauma	Did not specify	28	Good
De Maio (2010)	No	Immigration	Depression	General (Canada)	Cross-sectional	51	Poor
Kirkbride (2012)	Yes	Race/ethnicity	Schizophrenia	General (England)	Cross-sectional <sup>1</sup> and cohort	10	Good
Lev-Ran (2014)	Yes	Cannabis use, heavy cannabis use	Depression	General	Longitudinal	14	Good
McCambridge (2011)	No	Adolescent alcohol use	Major depression, anxiety disorder, suicidal ideation	General	Cohort	54	Good

Author (Year)	Meta-	Exposure	Outcome	Population	Study	No.	Center
Minozzi (2010)	No	Cannabis use (ever use, dependence, and heavy use)	Psychosis	General	Cross-sectional, longitudinal, cohort	5	Poor
Simpson (2007)	No	Race/ethnicity	Depression diagnosis	General	Cross-sectional	14	Poor
Vang 2015	No	Immigration	Depression, anxiety, other psychosocial distress	General (Canada)	Did not specify	10	Poor

Abbreviations: PTSD = post-traumatic stress disorder

<sup>1</sup>Does not explicitly report study design of all included studies; however, a section on methodological considerations says “studies are predominantly cross-sectional in design.” The flow diagram of included studies shows that 5 of the included studies were birth cohorts.

**Table 5. Mental Health Study Results**

Review Author (Year)	Measure of Association	Association (Range)	Statistically different from reference group	Key Findings
Addington (2014)	Not reported	Not reported	2 out of 10 studies (20%)	2 out of 10 studies found a significant association between substance use and subsequent transition to psychosis.
Alcantara (2011)	Not reported	Not reported	6 out of 11 studies (54.5%)	6 out of 11 studies showed a statistically significant increased risk of PTSD prevalence among Latinos versus non-Latino whites and non-Latino blacks exposed to trauma.
De Maio (2010)	Review did not abstract results			The reviewed evidence suggests that immigrants may have lower rates of depression than the Canadian-born population at time of their arrival in the country, but that this advantage diminishes over time. Immigrant women may have a higher risk for postpartum depression.
Kirkbride (2012)	IRR (crude)	5.6	5 out of 5 studies (100%)	Compared to whites, black Caribbean migrants and their descendants had a large, statistically significant positive association with schizophrenia (IRR 5.6; 95% CI: 3.4 to 9.2; $I^2 = 77\%$ ).
	RR (crude)	4.7	4 out of 5 studies (80%)	A large, statistically significant positive association was also found between

Review Author (Year)	Measure of Association	Association (Range)	Statistically different from reference group	Key Findings
				black African migrants and their descendants and schizophrenia (crude IRR 4.7; 95% CI: 3.3 to 6.8; $I^2 = 47%$ ; $n = 5$ ) compared with whites.
	RR (crude)	2.4	Not reported	A medium, statistically significant positive association was found between Asian ethnicities (Indian, Pakistani, and other Asian groups) and schizophrenia in comparison to whites (crude RR 2.4; 95% CI 1.3 to 4.5, $I^2 = 42%$ ).
Lev-Ran (2014)	OR (adjusted)	1.17	Yes	A meta-analysis of 10 studies showed a small association between cannabis users and depression compared with non-users (adjusted OR 1.17; 95% CI 1.05 to 1.30, $I^2 = 2.1%$ ).
	OR (adjusted)	1.62	Yes	A small, statistically significant positive association was also found between heavy cannabis use and depression (7 studies, adjusted OR 1.62, 95% CI 1.21 to 2.16, $I^2 = 47.3%$ ).
McCambridge (2011)	Review did not abstract results			The review did not find associations between adolescent drinking and depressed mood, major depression, anxiety disorder, suicidal ideation, and suicide attempt (all $p > 0.05$ after statistical adjustment).
Minozzi (2010)	OR (adjusted and crude)	1.41 - 2.93	4 out of 5 studies (80%)	All 4 meta-analyses showed that cannabis use was associated with a statically significant increase in psychosis.
Simpson (2007)	OR	0.42 - 0.99	2 out of 4 studies (50%)	2 out of 4 studies showed that African-Americans were statistically significantly less likely to receive a depression diagnosis versus whites.
	OR	0.29 to 1.74	3 out of 4 studies (75%)	2 out of 4 studies showed that Hispanics were statistically significantly less likely to receive a depression diagnosis versus whites. 1 study showed that Hispanics were statistically significantly more likely to receive a depression diagnosis.
Vang (2015)	Review did not abstract results			5 out of 10 studies showed that immigrants were significantly less

Review Author (Year)	Measure of Association	Association (Range)	Statistically different from reference group	Key Findings
				likely than Canadian-born adults to report symptoms of depression, anxiety, and other psychosocial distress. 2 of those results were based on unadjusted analyses. 1 study showed worse mental health outcomes, 1 study showed similar mental health outcomes, and 3 studies showed mixed results among immigrants versus Canadian-born adults.

Abbreviations: PTSD = post-traumatic stress disorder

### Obesity

Six reviews on obesity were found: One was good quality (Luppino et al., 2010), two were fair quality (El-Sayed, Scarborough, & Galea, 2011, 2012), and three were poor quality (De Maio, 2010; Milgrom, Skouteris, Worotniuk, Henwood, & Bruce, 2012; Vang et al., 2015).

### *Education*

El Sayed and colleagues (2012) evaluated the relationship between education and obesity in a fair-quality review of studies in the United Kingdom (Table 6). One out of four reviewed studies found that low educational attainment increased the risk for obesity. One study reported that education explained the relationship between occupational social class and obesity. The remaining two studies either focused on children or included a non-relevant social indicator (age of mother at time of completing education). El Sayed and colleagues (2012) did not report measures of association or quality assess individual studies in the review.

### *Immigration*

De Maio (2010) conducted a poor-quality review on the effect of immigration on obesity in Canada (Table 6). The author concluded that immigrants, at the time of their arrival, were less likely to be obese or overweight than the Canadian-born population. De Maio (2010) also concluded that this advantage may be lost over time and varies by ethnicity. One study (Zunzunegui, Forster, Gauvin, Raynault, & Douglas Willms, 2006) deviated from De Maio's (2010) review conclusion and showed no evidence of a statistically significant difference in obesity (body mass index [BMI]  $\geq 30$  kg/m<sup>2</sup>) by immigrant status (measures of association not reported). Results from other individual studies in De Maio's (2010) review were not reported and the authors did not quality assess individual studies in the review.

Vang and colleagues (2015) included four studies in their poor-quality review on the effect of immigration on overweight/obesity in Canada (Table 6). One study showed a small, statistically significant association, in which immigrants were less likely to be overweight/obese than native-born Canadians (adjusted OR 0.70, 95% CI 0.70 to 0.80,  $p < 0.05$ ). Another study also showed that immigrants were less likely to be classified as obese; however, the difference was not statistically significant. In comparison to non-native-born North Americans, native-born North Americans showed a small non-statistically significant association with obesity (Adjusted OR 1.29, 95% CI 0.97 to 1.70,  $p > 0.05$ ). The other two cited studies on immigration and obesity were not reported (Table 7). Vang and colleagues (2015) did not quality assess individual studies in their review.

### *Mental health*

Luppino and colleagues (2010) evaluated the relationship between depression and obesity in a good-quality systematic review and meta-analysis of longitudinal studies (Table 6). A meta-analysis of nine studies showed a small, statically significant positive association between depression at baseline and risk of obesity at follow-up (5 to 22 years) (crude OR 1.58, 95% CI 1.33 to 1.87,  $I^2 = 0\%$ ). A sensitivity analysis showed that the effect did not differ between studies conducted in the United States and those conducted elsewhere (U.S. OR 1.61 vs. Europe OR 1.49 vs. New Zealand OR 1.77; Europe results were non-significant). When restricting the meta-analysis to studies that adjusted for confounding variables ( $n = 4$ ), the effect was smaller but remained statistically significant (adjusted OR, 1.40; 95% CI 1.15 to 1.71,  $I^2 = 28.5\%$ ). Heterogeneity among studies was minimal in both meta-analyses (Table 7). Studies in the review were quality assessed using a 15-point checklist, with a score of nine or more representing a “high-quality” study. Three studies were rated of high quality.

Milgrom and colleagues (2012) investigated the relationship between maternal ante- and postnatal depressive symptoms and maternal obesity in a poor-quality review (Table 6). Three cross-sectional and six longitudinal studies were included in the review. Three of the six reviews that included longitudinal studies found an association between maternal depressive symptoms and BMI. One study reported that the mean Center for Epidemiological Studies-Depression (CES-D) score was statistically significantly higher among overweight versus non-overweight participants (19.5 vs. 15.6;  $p < 0.008$ ). A score of 16 or more indicates that the patient is at high risk for clinical depression (Radloff, 1977). Milgrom and colleagues (2012) rated the overall quality of evidence for maternal obesity as low (i.e., further research is likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate) using GRADE guidelines.

### *Race/ethnicity*

El-Sayed and colleagues (2011) evaluated the relationship between race/ethnicity and obesity in the United Kingdom in a fair-quality review (Table 6). In the included studies, several measures of obesity were used, including BMI, hip-to-waist ratios, abdominal diameter, and mean hip circumference. They reported mixed results on the relationship between adult obesity among South Asians versus Caucasians. Six studies showed that South Asian adults had a higher likelihood of obesity than did Caucasians, six studies showed a lower risk, and one study showed no statistically significant differences. In comparison, black adults showed higher prevalence of metrics of obesity in comparison to Caucasians in 4 out of 5 reviewed studies. The one study that deviated from this trend found that African-Caribbean men compared to Caucasian men had a statistically significantly lower mean waist circumference (Vyas et al., 2003). Three out of three studies found that Chinese adults had a lower risk for obesity than Caucasians. El Sayed and colleagues (2011) did not report measures of association or quality assess individual studies in the review.

**Table 6. Obesity Study Characteristics**

Author (Year)	Meta-Analysis	Exposure	Outcome	Population	Study Design	No. Studies	Center Quality Rating
De Maio (2010)	No	Immigration	Obesity	General (Canada)	Cross-sectional	51	Poor
El-Sayed (2011)	No	Race/ethnicity	Obesity	General (U.K.)	Cross-sectional and longitudinal	15	Fair
El-Sayed (2012)	No	Education	Obesity	General (U.K.)	Cross-sectional and longitudinal	4	Fair
Luppino (2010)	Yes	Depression	Obesity	General	Longitudinal	9	Good
Milgrom (2012)	No	Ante/postnatal depression	Obesity	Antenatal or postnatal women	Cross-sectional, longitudinal, cohort, RCT <sup>1</sup>	9	Poor
Vang 2015	No	Immigration	Obesity	General (Canada)	Did not specify	4-	Poor

<sup>1</sup>Only one study in the SR was a RCT. This study was excluded from our analysis because it included an intervention.

**Table 7. Obesity Study Results**

Review Author (Year)	Measure of Association	Association (Range)	Statistically Different From Reference Ggroup	Key Findings
De Maio (2010)	Review did not abstract results			On average, immigrants are less likely to be overweight or obese than the Canadian-born population at the time of their arrival. This advantage may be lost over time and varies by ethnicity.
El-Sayed (2011)	Review did not abstract results			The relationship between adult obesity among South Asians versus Caucasians in the U.K. showed mixed results. Black adults showed higher obesity prevalence in comparison to Caucasians. Chinese adults had lower risk for obesity than Caucasians.
El-Sayed (2012)	Review did not abstract results			2 reviewed studies found that low education increased the risk for obesity. 1 study reported that education explained the relationship between occupational social class and obesity; the other found that low education increased the odds of having high hip/waist ratios only among South Asian women.
Luppino (2010)	OR (crude)	1.58	4 out of 9 studies (44.4%)	A meta-analysis of 9 studies showed a small, statically significant positive association between depression at baseline and risk of obesity at follow-up (5 to 22 years) (crude OR 1.58, 95% CI 1.33 to 1.87, $I^2 = 0\%$ ).
	OR (adjusted)	1.4	Not reported	A meta-analysis of 4 studies showed a small, statically significant positive association between depression at baseline and risk of obesity at follow-up (5 to 22 years) (adjusted OR, 1.40; 95% CI 1.15 to 1.71, $I^2 = 28.5\%$ ).
Milgrom (2012)	RR	1.12	Yes	3 longitudinal studies out of 9 studies (6 longitudinal, 3 cross-sectional) found an association between maternal BMI and depressive symptoms.
Vang 2015	OR (adjusted)	0.70 - 1.21 <sup>1</sup>	1 out of 2 studies (50%)	2 studies showed that immigrants were less likely to be overweight/obese than native-born North Americans.

Abbreviations: BMI = body mass index

<sup>1</sup>This study used immigrants as the reference group. Study showed that odds of obesity is higher in native-born population, therefore immigrants are less likely to be obese.

## Oral Health

Two studies on oral health were found: One was good quality (Amaral Cda, Vettore, & Leao, 2009) ; the other was fair quality (Boillot et al., 2011).

### *Education*

Boillot and colleagues (2011) conducted a fair-quality systematic review and meta-analysis on the relationship between education and periodontitis (Table 8). They found a small, statistically significant positive association between low educational attainment and chronic periodontitis in comparison to having a higher level of education (16 studies, crude OR 1.86, 95% CI 1.66 to 2.10,  $I^2$  55%; 7 studies, adjusted 1.55, 95% CI 1.30 to 1.86,  $I^2$  = 38%). A sensitivity analysis of crude results showed that the association did not vary between studies conducted in the United States and those conducted elsewhere (U.S. OR 1.89 vs. non-U.S. OR 1.83, both  $p < 0.0001$ ). Because moderate statistical heterogeneity was detected among studies in both meta-analyses, the results should be interpreted with caution (Table 9). Boillot and colleagues (2011) did not quality assess individual studies in their review.

### *Substance use*

Amaral and colleagues (2009) investigated the relationship between alcohol use and periodontitis in a good-quality systematic review (Table 8). Eight of the 12 studies on alcohol consumption reported small to medium statistically significant positive associations between alcohol intake and periodontitis. Adjusted odds ratios ranged from 1.27 to 2.70. There was considerable variation in how alcohol consumption was measured, the variables that were adjusted for in the analyses, and the diagnostic criteria for periodontitis. All four studies on alcohol dependence reported positive associations between alcohol intake and periodontitis. However, Amaral and colleagues (2009) considered two of the studies inadequate because of the methods they used to assess alcohol consumption/dependence and how periodontitis was diagnosed. Regardless, a majority of the alcohol consumption studies as well as all of the studies analyzing alcohol dependence were positively associated with periodontitis (Table 9). Measures of association were not reported for alcohol dependence studies.

**Table 8. Oral Health Study Characteristics**

Author (year)	Meta-Analysis?	Exposure	Outcome	Population	Study Design	No. Studies	Center Quality Rating
Amaral (2009)	No	Alcohol use	Periodontitis	General	Cross-sectional and longitudinal	16	Good
Boillot (2011)	Yes	Education	Periodontitis	General	Cross-sectional and longitudinal	16	Fair

**Table 9. Oral Health Study Results**

Review Author (Year)	Measure of Association	Association (Range)	Statistically Different From Reference Group	Key Findings
Amaral (2009)	OR (adjusted)	1.27 - 2.70	8 out of 12 studies (66.7%)	8 of the 12 studies on alcohol consumption reported small to medium statistically significant positive associations between alcohol intake and periodontitis. Adjusted odds ratios ranged from 1.27 to 2.70.
	Not reported	Not reported	4 out of 4 studies (100%)	4 of the 4 studies on alcohol dependence reported positive associations between alcohol intake and periodontitis.
Boillot (2011)	OR (crude)	1.86	10 out of 16 studies (62.5%)	A meta-analysis of 16 studies showed a small, statistically significant positive association between low educational attainment and chronic periodontitis in comparison to having a higher level of education (crude OR 1.86, 95% CI 1.66 to 2.10, $I^2 = 55\%$ ).
	OR (adjusted)	1.55	6 out of 7 studies (85.7%)	A meta-analysis of 7 studies showed a small, statistically significant positive association between low educational attainment and chronic periodontitis in comparison to having a higher level of education (adjusted OR 1.55, 95% CI 1.30 to 1.86, $I^2 = 38\%$ ).

### Substance use disorder

Three good quality reviews were found on substance use disorder (Bartoli et al., 2014; Kirkbride et al., 2012; McCambridge et al., 2011).

### *Mental health*

Bartoli and colleagues (2014) conducted a good-quality systematic review and meta-analysis in which they evaluated the relationship between depression and non-fatal overdoses among drug users (Table 10). A meta-analysis of seven studies showed a small, positive association between depression and non-fatal overdose among drug-users versus drug-users that were not depressed (OR 1.45, 95% CI 1.17 to 1.79,  $I^2 = 79.2\%$ ). Because there is considerable heterogeneity among studies, meta-analyzed results should be interpreted with caution (Table 11). Furthermore, a sensitivity analysis appears to show differences between North American and non-North American studies (North American OR 1.93 [ $p < 0.001$ ], Northern Europe OR 1.35 [ $p < 0.001$ ], Australia OR 1.10 [non-significant]). Bartoli and colleagues (2014) reported that four studies provided valid exposure and outcome assessment. An overall quality assessment of included studies was not reported.

### *Substance use*

McCambridge and colleagues (2011) reviewed cohort studies on adolescent alcohol consumption and adult alcohol consumption in a good-quality systematic review (Table 10). Only cohort studies with a “stronger capacity for causal inference” (i.e., had follow-up rates of  $\leq 80\%$  and/or sample of size of  $\leq 1,000$ ) are summarized in the narrative synthesis. Five out of 10 included cohort studies met these criteria. Four of five studies found small to large statistically significant associations between adolescent alcohol problems/dependence and adult alcohol dependence/problems versus adolescents who did not have alcohol problems/dependence (OR range: 1.12 to 15.5). The largest associations came from a study on the relationship between diagnosis of alcohol dependence at age 18 and diagnosis of alcohol abuse (adjusted OR 3.5) and dependence (adjusted OR 15.5) at age 21 (Wells et al., 2006). There is considerable variation in alcohol consumption measurement and follow-up time between exposure and outcome measurement among studies, which could explain the wide range in reported odds ratios (Table 11).

**Table 10. Substance Use Disorder Study Characteristics**

Author (Year)	Meta-Analysis	Exposure	Outcome	Population	Study Design	No. Studies	Center Quality Rating
Bartoli (2014)	Yes	Depression	Non-fatal overdoses	Drug users	Cross-sectional	7	Good
McCambridge (2011)	No	Adolescent alcohol use and dependence	Adult alcohol use and dependence	General	Cohort	54	Good

**Table 11. Substance Use Disorder Study Results**

Review Author (Year)	Measure of Association	Association (Range)	Statistically Different From Reference Group	Key Findings
Bartoli (2014)	OR	1.45	4 out of 7 studies (57.1%)	A meta-analysis of 7 studies showed a small, statistically significant association between depression and non-fatal overdose among drug users versus drug users that were not depressed (OR 1.45, 95% CI 1.17 to 1.79, $I^2 = 79.2\%$ ).
McCambridge (2011)	OR (adjusted)	1.12-15.5	4 out of 5 (80%)	4 of 5 studies found small to large statistically significant associations between adolescent alcohol problems/dependence and adult alcohol dependence/problems versus adolescents who did not have alcohol problems/dependence (OR range: 1.12 to 15.5).

### Type 2 Diabetes

Two reviews on type 2 diabetes were identified: One was fair quality (Agardh, Allebeck, Hallqvist, Moradi, & Sidorchuk, 2011), and the other was poor quality (Vang et al., 2015).

### *Education*

Agardth and colleagues (2011) evaluated the relationship between education and type 2 diabetes incidence in a fair-quality systematic review and meta-analysis (Table 12). They found a small, statistically significant positive association between having a low educational level and type 2 diabetes (Relative risk [RR] = 1.41, 95% CI: 1.28 to 1.51,  $I^2 = 65.5\%$ ). Geographical area of the included studies did not appear to affect results (eleven studies, U.S. RR 1.41, 95% CI 1.24

to 1.62,  $I^2 = 79.2\%$ ; six studies, Europe RR 1.45, 95% CI 1.20 to 1.76,  $I^2 = 3.5\%$ ; two studies, Asia/Middle East RR 1.43, 95% CI 1.08 to 1.89,  $I^2 = 50.3\%$ ; one study, Latin America RR 1.43, 95% CI 1.20 to 1.76,  $I^2$  not reported; two studies, Africa RR 1.40, 95% CI 1.15 to 1.75,  $I^2 = 26.8\%$ ). Results from the U.S. studies should be interpreted with caution due to the detection of substantial statistical heterogeneity among studies (Table 13). Agardh and colleagues (2011) did not quality assess individual studies within their review.

### *Immigration*

Vang and colleagues (2015) included three studies on the effect of immigration on type 2 diabetes in Canada (Table 12). Two of the included studies showed that immigrants were more likely to have diabetes than were Canadian-born adults; the other showed that immigrants and Canadian-born adults had a similar risk of diabetes. Vang and colleagues (2015) did not report measures of association or quality assess individual studies in their review.

**Table 12. Type 2 Diabetes Study Characteristics**

Author (Year)	Meta-Analysis	Exposure	Outcome	Population	Study Design	No. Studies	Center Quality Rating
Agardh (2011)	Yes	Education	Type 2 diabetes	General	Cohort, nested case-control, case-cohort	23	Fair
Vang 2015	No	Immigration	Type 2 diabetes	General (Canada)	Did not specify	3	Poor

**Table 13. Type 2 Diabetes Study Results**

Review Author (year)	Measure of association	Association range	Statistically Different From Reference Group	Key Findings
Agardth (2011)	RR	1.41	13 out of 23 studies (56.5%)	A meta-analysis of 23 studies found a small, statistically significant positive association between having a low educational level and type 2 diabetes (RR = 1.41, 95% CI: 1.28 to 1.51, $I^2 = 65.5\%$ ).
Vang 2015	Review did not abstract results			2 out of 3 studies showed that immigrants were more likely to have diabetes versus Canadian-born adults. 1 study showed that immigrants and Canadian-born adults had a similar risk of diabetes.

### Summary and Limitations

This report assessed the relationship between a select set of social indicators and health outcomes in systematic reviews published in the past 10 years. Seventeen systematic reviews were included in this report, and the majority were either of good or fair quality (Good = 7; Fair = 5; Poor = 5). Most of the good- and fair-quality reviews focused on mental health outcomes (including depression, anxiety disorder, suicidal ideation [i.e., thinking about suicide], psychosis, schizophrenia, and post-traumatic stress disorder [PTSD]) (5 reviews). There was limited evidence on asthma, oral health outcomes beyond periodontitis, and type 2 diabetes. No reviews were found that assessed the relationship between health outcomes and homelessness, neighborhood poverty, or being an English language learner. Most of the good- and fair-quality studies reported measures of association that were small and medium in size (OR 1.41 to 2.49).

There are several limitations within the body of evidence that warrant discussion. First, several reviews gave incomplete information on search and quality assessment methods, social indicators, health outcomes, and measures of association (including 95% CI or p-value) for the individual studies within the review. Second, there was considerable variation in how social indicators and health outcomes were measured. This is especially true for alcohol use disorder, depression, and obesity measures.

Third, the body of literature summarized for this review includes only observational studies. Although randomized studies were not appropriate for this review, there are several methodological qualities of observational studies that could introduce bias into the results.

These include the possibility of selection bias (e.g., the two groups being compared in the study are systematically different), confounding, measurement error or misclassification of exposure and/or outcome variables, and reverse causality (only an issue in cross-sectional and case-control studies). Some reviews only included prospective cohort studies (Lev-Ran et al., 2014; Luppino et al., 2010; McCambridge et al., 2011), which have a lower risk of bias than cross-sectional studies. However, the majority of individual studies within reviews were either cross-sectional or cohort designs.

## **Conclusion**

The largest magnitudes of associations were found on the relationships between adolescent alcohol problems/dependence and adult alcohol problems/dependence (McCambridge et al., 2011) and the relationship between black Caribbean and black African ethnicity and schizophrenia (Kirkbride et al., 2012). Four reviews provided the highest-quality evidence (i.e., associations derived from prospective cohort studies) on the following social indicators and health outcomes: education and type 2 diabetes (Agardh et al., 2011), cannabis use and depression (Lev-Ran et al., 2014), depression and obesity (Luppino et al., 2010), and adolescent alcohol problems/dependence and adult alcohol problems/dependence (McCambridge et al., 2011).

## **Appendix A: Search Strategy**

### *Ovid MEDLINE® and PsycINFO Search Strategy*

- 1 exp Obesity/
- 2 exp Diabetes Mellitus, Type 2/
- 3 exp Asthma/
- 4 exp Dental Caries Susceptibility/
- 5 exp dental caries/
- 6 exp Tooth Loss/
- 7 exp Toothache/
- 8 exp mouth, edentulous/
- 9 4 or 5 or 6 or 7 or 8
- 10 Substance-Related Disorders/
- 11 exp Alcohol-Related Disorders/
- 12 exp Amphetamine-Related Disorders/
- 13 exp Cocaine-Related Disorders/
- 14 exp Inhalant Abuse/
- 15 exp Marijuana Abuse/
- 16 exp Opioid-Related Disorders/
- 17 exp Phencyclidine Abuse/
- 18 exp substance abuse, intravenous/
- 19 exp Substance Withdrawal Syndrome/
- 20 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19
- 21 exp Street Drugs/
- 22 exp Alcohol Drinking/
- 23 exp Drug-Seeking Behavior/
- 24 exp Cannabis/
- 25 exp Ethanol/
- 26 exp Alcoholic Beverages/
- 27 exp Cocaine/
- 28 exp Methamphetamine/
- 29 exp Hallucinogens/
- 30 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29
- 31 exp mental disorders/
- 32 1 or 2 or 3 or 9 or 20 or 30 or 31
- 33 homeless\$.mp.
- 34 exp Socioeconomic Factors/
- 35 exp "emigration and immigration"/

36 exp Refugees/  
37 ((english adj3 ((2nd or second) adj languag\$)) or esl or ((non or "not") adj nativ\$ adj3 english)).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier]  
38 (multilingual\$ or bilingual\$ or trilingual\$).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier]  
39 exp Educational Status/  
40 ((social\$ or socio\$ or ethnic\$ or econom\$ or race or racial\$ or cultur\$ or neighbor\$ or residen\$) adj5 (determin\$ or factor\$ or impact\$ or influen\$ or predict\$ or result\$ or outcom\$)).mp.  
41 33 or 34 or 35 or 36 or 37 or 38 or 39 or 40  
42 32 and 41  
43 limit 42 to systematic reviews  
44 limit 43 to (english language and yr="2006 -Current")  
45 Substance-Related Disorders/ep, et  
46 exp Alcohol-Related Disorders/ep, et  
47 exp Amphetamine-Related Disorders/ep, et  
48 exp Cocaine-Related Disorders/ep, et  
49 exp Inhalant Abuse/ep, et  
50 exp Marijuana Abuse/ep, et  
51 exp Opioid-Related Disorders/ep, et  
52 exp Phencyclidine Abuse/ep, et  
53 exp substance abuse, intravenous/ep, et  
54 exp Substance Withdrawal Syndrome/ep, et  
55 45 or 46 or 47 or 48 or 49 or 50 or 51 or 52 or 53 or 54  
56 exp mental disorders/ep, et  
57 1 or 2 or 3 or 9 or 55 or 56 or 30  
58 exp mental disorders/co, px  
59 exp substance related disorders/co, px  
60 58 or 59  
61 57 and 60  
62 limit 61 to systematic reviews  
63 limit 62 to (english language and yr="2006 -Current")  
64 44 or 63  
65 ((social\$ or socio\$ or ethnic\$ or econom\$ or race or racial\$ or cultur\$ or neighbor\$ or residen\$) adj5 (determin\$ or factor\$ or impact\$ or influen\$ or outcom\$) adj10 (obes\$ or

overweig\$)).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier]

66 ((social\$ or socio\$ or ethnic\$ or econom\$ or race or racial\$ or cultur\$ or neighbor\$ or residen\$) adj5 (determin\$ or factor\$ or impact\$ or influen\$ or outcom\$) adj10 (prediabet\$ or diabet\$)).mp.

67 ((social\$ or socio\$ or ethnic\$ or econom\$ or race or racial\$ or cultur\$ or neighbor\$ or residen\$) adj5 (determin\$ or factor\$ or impact\$ or influen\$ or outcom\$) adj10 asthm\$).mp.

68 ((social\$ or socio\$ or ethnic\$ or econom\$ or race or racial\$ or cultur\$ or neighbor\$ or residen\$) adj5 (determin\$ or factor\$ or impact\$ or influen\$ or outcom\$) adj10 (dental\$ or dentist\$ or caries or cariogen\$ or cavity or cavities or edentulous\$ or gingiv\$ or periodont\$ or ((tooth or teeth) adj3 (decay\$ or abscess\$ or infect\$ or brok\$ or break\$ or crack\$ or loss\$ or lose\$ or losing))))).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier]

69 ((social\$ or socio\$ or ethnic\$ or econom\$ or race or racial\$ or cultur\$ or neighbor\$ or residen\$) adj5 (determin\$ or factor\$ or impact\$ or influen\$ or outcom\$) adj10 ((oral\$ or mouth\$ or dent\$ or tooth or teeth\$) adj2 health\$)).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier]

70 68 or 69

71 ((social\$ or socio\$ or ethnic\$ or econom\$ or race or racial\$ or cultur\$ or neighbor\$ or residen\$) adj5 (determin\$ or factor\$ or impact\$ or influen\$ or outcom\$) adj10 (marijuan\$ or cannabis or cocain\$ or crack or heroin or alcohol\$ or ethanol\$ or amphetam\$ or methamphetam\$ or lsd or hallucinogen\$)).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier]

72 ((social\$ or socio\$ or ethnic\$ or econom\$ or race or racial\$ or cultur\$ or neighbor\$ or residen\$) adj5 (determin\$ or factor\$ or impact\$ or influen\$ or outcom\$) adj10 (substance\$ or drug\$ or chemical\$ or prescription\$) adj2 (dependenc\$ or illicit\$ or illegal\$ or addict\$ or abus\$)).mp.

73 71 or 72

74 ((social\$ or socio\$ or ethnic\$ or econom\$ or race or racial\$ or cultur\$ or neighbor\$ or residen\$) adj5 (determin\$ or factor\$ or impact\$ or influen\$ or outcom\$) adj10 ((mental\$ or psycholog\$ or psychiatr\$ or emotional\$ or behavior\$ or affective or mood) adj3 (diseas\$ or disorder\$ or condition\$ or problem\$ or suffer\$ or afflict\$))))).mp.

75 ((social\$ or socio\$ or ethnic\$ or econom\$ or race or racial\$ or cultur\$ or neighbor\$ or residen\$) adj5 (determin\$ or factor\$ or impact\$ or influen\$ or outcom\$) adj10 (psychotic\$ or

psychoses or neuroses or neurotic\$ or schizophren\$ or bipolar\$ or depress\$)).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier]

76 74 or 75

77 65 or 66 or 67 or 70 or 73 or 76

78 limit 77 to systematic reviews

79 limit 78 to (english language and yr="2006 -Current")

80 64 or 79

## **Appendix B: Quality Assessment**

### Methodological Quality of Included Studies

Staff assessed the methodological quality of the included systematic reviews using standard instruments developed and adapted by the Medicaid Evidence-based Decisions Project (MED) that are modifications of the systems in use by the National Institute for Health and Care Excellence (NICE) and the Scottish Intercollegiate Guidelines Network (SIGN) (Guyatt et al., 2008; NICE, 2009; SIGN, 2009). Two experienced staff raters independently assessed all studies. In cases where there was not agreement about the quality of a study, a third rater resolved the disagreement.

Each rater assigned the study a rating of good, fair, or poor, based on its adherence to recommended methods and potential for biases. In brief, good-quality systematic reviews include a clearly-focused question, a literature search sufficiently rigorous to identify all relevant studies, criteria used to select studies for inclusion (e.g., randomized controlled trials) and assess study quality, and assessment of similarities between studies to determine if combining them is appropriate for evidence synthesis. Fair-quality systematic reviews have incomplete information about methods that might mask important limitations or a meaningful conflict of interest. Poor-quality systematic reviews have clear flaws that could introduce significant bias.

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## About the Center for Evidence-based Policy and the Medicaid Evidence-based Decisions Project

The Center for Evidence-based Policy (Center) is recognized as a national leader in evidence-based decision making and policy design. The Center understands the needs of policymakers and supports public organizations by providing reliable information to guide decisions, maximize existing resources, improve health outcomes, and reduce unnecessary costs. The Center specializes in ensuring diverse and relevant perspectives are considered, and appropriate resources are leveraged to strategically address complex policy issues with high-quality evidence and collaboration. The Center is based at Oregon Health & Science University in Portland, Oregon.

The Medicaid Evidence-based Decisions Project (MED) is housed at the Center. Its mission is to create an effective collaboration among Medicaid programs and their state partners for the purpose of making high-quality evidence analysis available to support benefit design and coverage decisions made by state programs. Further information about the MED Project and the Center is available at [www.ohsu.edu/policycenter](http://www.ohsu.edu/policycenter).

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