



Review Article

Systematic review and meta-analysis of the provision of preventive care for modifiable chronic disease risk behaviours by mental health services

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ABSTRACT

People with mental illness experience increased chronic disease burden, contributed to by a greater prevalence of modifiable chronic disease risk behaviours. Policies recommend mental health services provide preventive care for such risk behaviours. Provision of such care has not previously been synthesised. This review assessed the provision of preventive care for modifiable chronic disease risk behaviours by mental health services. Four databases were searched from 2006 to 2017. Eligible studies were observational quantitative study designs conducted in mental health services, where preventive care was provided to clients for tobacco smoking, harmful alcohol consumption, inadequate nutrition, or inadequate physical activity. Two reviewers independently screened studies, conducted data extraction and critical appraisal. Results were pooled as proportions of clients receiving or clinicians providing preventive care using random effects meta-analyses, by risk behaviour and preventive care element (ask/assess, advise, assist, arrange). Subgroup analyses were conducted by mental health service type (inpatient, outpatient, other/multiple). Narrative synthesis was used where meta-analysis was not possible. Thirty-eight studies were included with 26 amenable to meta-analyses. Analyses revealed that rates of assessment were highest for smoking (78%, 95% confidence interval [CI]:59%–96%) and lowest for nutrition (17%, 95% CI:1%–35%); with variable rates of care provision for all behaviours, care elements, and across service types, with substantial heterogeneity across analyses. Findings indicated suboptimal and variable provision of preventive care for modifiable chronic disease risk behaviours in mental health services, but should be considered with caution due to the very low quality of cumulative evidence.

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1. Introduction

People with a mental illness experience greater rates of preventable morbidity, mortality, and a reduced life expectancy up to 30 years compared to people without such an illness (Brown et al., 2010; Laursen et al., 2013; Wahlbeck et al., 2011; Chang et al., 2011; Lawrence et al., 2013; Walker et al., 2015; Olfson et al., 2015; Erlangsen et al., 2017). In high income countries, such disparities are primarily due to a greater prevalence of chronic disease (Brown et al., 2010; Walker et al., 2015;

Callaghan et al., 2014; Markkula et al., 2012). This inequitable disease burden is consistently reported to be associated with a greater prevalence of four leading modifiable chronic disease risk behaviours: tobacco smoking, harmful alcohol consumption, inadequate nutrition, and inadequate physical activity (Callaghan et al., 2014; Scott and Happell, 2011; Stanley and Laugharne, 2014; Australian Institute of Health and Welfare, 2012; World Health Organization, 2013).

Care to support and facilitate improvements or reductions in such modifiable chronic disease risk behaviours has been termed ‘preventive

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care' (Hensrud, 2000; Woolf et al., 2006; Hulscher et al., 1997). A recommended strategy for addressing such behaviours is the provision of preventive care by health care providers, (Australian Health Ministers' Advisory Council, 2017) with Cochrane systematic review evidence supporting provision of preventive care for such behaviours in general health care settings for risk behaviour improvement (Rees et al., 2013; Hillsdon et al., 2005; Rice et al., 2013; Rigotti et al., 2012; Brunner et al., 2007; Foster et al., 2005). Systematic review evidence demonstrates significant improvements in prevalence of such behaviours among people with a mental illness following the receipt of health promotion programs provided by mental health services (Verhaeghe et al., 2011; Cabassa et al., 2010; Naslund et al., 2017; Happell et al., 2012a). The provision of systematic preventive care is recommended in all health care settings, including mental health services, to all adult clients; (NSW Department of Health, 2017a; NSW Department of Health, 2017b; NSW Mental Health Commission, 2014; National Preventive Health Taskforce, 2008; Royal Australian College of General Practitioners, 2004; Agency for Healthcare Research and Quality, 2010; National Institute for Health and Care Excellence, 2010; National Institute for Health and Care Excellence, 2013; Glasgow et al., 2004; US Department of Health and Human Services, 2009) with tobacco smoking, harmful alcohol consumption, inadequate nutrition, and inadequate physical activity often addressed together in clinical guidelines and recommendations (Royal Australian College of General Practitioners, 2004). The '5As' framework is one recommended approach to facilitate the routine delivery of preventive care ('ask' about engagement in risk behaviours; 'assess' behaviour risk status and interest in change; 'advise' changing/reducing risk behaviours; provide behaviour change 'assistance'; and 'arrange' or refer to other services for behaviour change support (Glasgow et al., 2004).

Despite the effectiveness of preventive care provision in addressing chronic disease risk behaviours in health services, little research has focused on the extent to which any elements of preventive care are delivered by mental health settings. A review of the literature identified two previous reviews of the provision of preventive care within mental health services (Wye et al., 2011; Dickens et al., 2019). A narrative review exploring the provision of care to address smoking within psychiatric inpatient settings cited four studies from the USA and Australia, reported provision of care narratively (Wye et al., 2011). A more recent review (2019) explored mental health nurses' experiences of providing physical health care, with a focus on their attitudes rather than provision of care (Dickens et al., 2019). The review included 41 studies examining general physical health care, sexual health, smoking, physical activity, and nutrition. Six included studies reported advise on regular exercise was provided 'always or very often' by 50.4% to 79.7% of participants, advise on healthy diet was provided 'always or very often' by 43.4% to 86.7% of participants, and 30.6% to 66.7% of participants reported aiding smoking cessation 'always or very often' (Dickens et al., 2019). Whilst the review utilised a broad definition of physical healthcare, limitations included: only exploring mental health nurses' provision of care; outcomes not reported by service type; no meta-analysis due to the broad inclusion criteria and different study methodologies (Dickens et al., 2019). A number of additional individual observational studies have examined preventive care provision for all four risk behaviours in mental health services, utilising varied methodologies (client and clinician self-report, and cross-sectional, pre-post, and interrupted time series surveys; and retrospective medical record audits), however findings have not been quantitatively synthesised previously (Stanley and Laugharne, 2013; Bartlem et al., 2015; Bartlem et al., 2014a; Happell et al., 2013a; Howard and Gamble, 2011). As findings have not been synthesised by mental health service type, it is unknown whether rates of preventive care provision are consistent across service types or otherwise. A systematic synthesis of the extent to which preventive care is provided for all four health risk behaviours to clients of mental health services is lacking. An identification of risk behaviours that receive inadequate care provision, or identifying which

elements of care are provided least often could inform the tailoring of future interventions to increase the provision and benefits of preventive care by mental health services.

Given the limitations of previous research, a systematic review and meta-analysis was conducted of the prevalence of preventive care provision for four modifiable chronic disease risk behaviours (tobacco smoking, harmful alcohol consumption, inadequate nutrition, and inadequate physical activity) by mental health services. A secondary aim was to quantify pooled prevalence estimates of preventive care provision for each risk behaviour by care element and service type, and conduct a narrative synthesis where meta-analysis was not possible.

2. Methods

Review methods and protocol were prospectively registered with PROSPERO [reference number CRD42016049889]. The Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) and Meta-Analysis of Observational Studies in Epidemiology (MOOSE) informed the development of the review protocol (Moher et al., 2015) and reporting of findings (Moher et al., 2009; Stroup et al., 2000).

2.1. Search methods

Four databases were searched from January 2006 to August 2017: Medline, PsycINFO, EMBASE, and CINAHL. As clinical practice guidelines for the provision of preventive care have only been introduced recently, (Fiore et al., 2008; Department of Health N, 2009) the search commenced from 2006. Search terms pertained to mental illness and mental health service settings, eligible study designs, four chronic disease risk behaviours of interest, and preventive care practices. Search terms for preventive care practices used a variety of terms to capture care provided by the 5A care elements and any reports of individual care components to account for differences in terminology internationally (Appendix A). Additional sources searched for eligible studies included: first 200 articles from Google Scholar; hand searching of articles published between 2015 and 2017 from Preventive Medicine and Psychiatric Services; and reference lists of included studies. Authors of included studies were contacted and any related publications were requested and screened for eligibility. JBa developed and executed the search strategies with assistance from a research librarian.

2.2. Study eligibility criteria

Study type: Descriptive studies including: observational and cross-sectional surveys; retrospective medical record audits; and longitudinal repeated measures were included. Only baseline data from experimental study designs were included.

Setting: Eligible studies were conducted in services with the primary objective of delivering mental health care to adult clients (≥ 18 years), and could consist of: bed-based (inpatient) mental health services; specialised community (outpatient) mental health services; or community psychosocial support services (non-clinical mental health services). Dual diagnosis services (mental health and substance use treatment) were included if mental health care was a primary care objective. Studies were eligible if preventive care was provided by mental health service staff in the context of routine care delivery.

Outcome measures: Eligible measures included quantitative reporting of the provision or receipt of any elements of preventive care provision for any of four chronic disease risk behaviours (tobacco smoking, harmful alcohol consumption, inadequate nutrition, inadequate physical activity). The World Health Organisation (WHO) has released guidelines for each of the four modifiable risk behaviours, (World Health Organization, 2017; World Health Organization, 2018; World Health Organization, 2011; World Health Organization, 2003) and Australia, (National Health and Medical Research Council, 2009; National Health and Medical Research Council, 2013; Department of

Health, 2014; Ministerial Council on Drug Strategy, 2011) and other nations (Piercy et al., 2018; Her Majesty's Government, 2011; Canadian Society for Exercise Physiology, 2011; Ministry of Health, 2015; U.S. Department of Health and Human Services and U.S. Department of Agriculture, 2015; Public Health England, 2016; Health Canada, 2019; Centers for Disease Control and Prevention, 2014; Centers for Disease Control and Prevention, n.d.; Department of Health, 2016; Department of Health and Social Care, 2018; Health Canada, 2018; Ministry of Health, 2007; Butt et al., 2011) similarly have developed 'country specific' definitions or guidelines as to what constitutes risk. In the present review, eligible studies were not required to report the definition of risk used for each risk behaviour and variations were expected across countries and studies.

2.3. Study selection process

Identified citations were compiled in Endnote, (Anon, 2016) duplicates removed, and remaining citations and abstracts uploaded to Covidence (Anon, n.d.). Two independent reviewers screened titles and abstracts (any of JBa, TB, PW, ES, DT, JD, RC, KB, RH, TR) and relevant full texts (JBa and one of: TB, PW, KB, AM, TR, DT, JD, RH) against predetermined eligibility criteria. Disagreements regarding study eligibility were resolved via consensus or a third reviewer (PW or KB). Corresponding authors were contacted where reported study characteristics were insufficient to determine eligibility, or where outcome data were missing or insufficiently reported.

2.4. Data extraction

Data were extracted independently by two authors (JBa and one of: TB, AM, DT, KB, TR) using an Excel-based extraction form, with any inconsistencies resolved by a third reviewer (PW, KB, ES). Where reported, extracted data included study year, setting, sample size, data source (client report, clinician report, medical record audit), study eligibility criteria, clinical and demographic characteristics of mental health service clients and clinicians, clinician engagement in risk behaviours, policies of the mental health service related to preventive care provision, outcome measures, and information required to conduct assessment of methodological quality. Data were extracted separately for each relevant preventive care element and for each risk behaviour (smoking, alcohol, nutrition, physical activity). For intervention studies, only baseline data were extracted. For longitudinal studies, the most recent data were extracted as it was considered to most closely represent current practice.

2.5. Data analysis and synthesis

Outcome measures were grouped by data type: clinician reported; client reported; or medical record audit. Preventive care reported in any form/terminology was categorised into the relevant 5A care elements (ask, assess, advise, assist, arrange/refer), and findings were reported using the framework for ease of reporting. The 'ask' and 'assess' elements of care were combined for analysis. Client reported and audit data were combined for analysis as they represented care provided to individual clients, whereas clinician reported data was reported separately as they represent the proportion of clinicians providing care to an unknown number of clients, consistent with a previous review of smoking care provision in hospitals (Freund et al., 2008).

To facilitate meta-analyses clinician reported data were converted to a common variable of 'care provision to at least 50% of clients'. For instance, studies reporting care provision to a specific proportion of clients (such as 78%) (Price et al., 2007; Etter et al., 2008; Schacht et al., 2012; Zabeen et al., 2015) were combined with studies reporting care to 'more than 60% of clients', (Anderson et al., 2013) '50–100%', (Bartlem et al., 2014a; Chwastiak et al., 2013) and '80–100%' (Bartlem et al., 2014a). Clinician data utilising categorical responses to describe

the frequency of care provision (for example, 'always') were not pooled in meta-analysis due to the subjective and nonspecific nature. Where a study reported multiple data points for a single care element and behaviour (for instance, 0% of clients were referred to a smoking cessation quitline, and 12% were referred to smoking cessation group education or treatment) (Williams et al., 2015) both the highest and lowest proportions of care provided/received were utilised in separate meta-analyses to reflect the most and least optimistic estimations of care provision. If outcome data were incomplete (missing numerators, denominators, or proportions), data were calculated and backfilled using available data from the studies.

Pre-specified meta-analyses were conducted in RStudio, (RStudio Team, 2015) by JBa with the assistance of a statistician and guidance of ES and RH, where comparable outcome measures were pooled. Random-effects models were utilised to determine pooled prevalence estimates for each preventive care element by each risk behaviour; calculated as proportions and 95% confidence intervals (CIs). Random-effects models were selected as heterogeneity between studies was expected given the different contexts, settings, and delivery of preventive care reported (Deeks et al., 2017; Borenstien et al., 2009). Meta-analyses were conducted where at least two studies contributed data for an outcome measure (Deeks et al., 2017). Heterogeneity in the pooled estimates was assessed via visual inspection of forest plots and consideration of the I^2 statistic (Deeks et al., 2017). Where substantial, heterogeneity was explored via subgroup and sensitivity analyses. Where data could not be combined for meta-analysis, narrative summary was undertaken.

2.6. Assessment of methodological quality

The methodological quality of each study was assessed independently by two reviewers (JBa and one of: AM, TR, RC, DT, JD, KB) using the Joanna Briggs Institute Critical Appraisal tool: Checklist for Prevalence Studies (Appendix B) (Munn et al., 2015). The following nine domains were assessed: appropriateness of sample frame; appropriateness of participant recruitment; adequacy of sample size; sufficient description of subjects and setting; analysis conducted with sufficient coverage of subgroups; measurement or classification bias; reliable measurement of condition; appropriateness of statistical analysis; and adequacy of response rate. Disagreements were resolved through consensus via discussion or with a third reviewer (KB, JBo).

2.7. Subgroup and sensitivity analyses

Where possible, pre-specified subgroup analyses were conducted by: mental health service type: inpatient setting; outpatient setting; and other/multiple service settings. Where heterogeneity was substantial ($I^2 > 50\%$; chi-square $p < 0.1$) (Deeks et al., 2017) post-hoc subgroup analyses were conducted by data type, analysing client reported and medical record audit data separately to explore this. Post-hoc subgroup analyses were also conducted by country.

Pre-specified sensitivity analyses were conducted to exclude studies categorised as high risk of bias (scoring > 1 'no' response on methodological quality tool) (Munn et al., 2015). Additional sensitivity analyses were conducted to exclude any studies utilising data that were calculated by the reviewers for the purpose of the review. Furthermore, sensitivity analyses were conducted on clinician reported data to exclude studies reporting any data not in the form of an exact proportion of care provision (for example, '80–100%').

2.8. Assessment of confidence in cumulative evidence

Confidence in the cumulative evidence of the primary review outcomes (pre-specified meta-analyses of the provision of care elements for each risk behaviour) were assessed by JBa using the Grading of Recommendations, Assessment, Development, and Evaluation (GRADE)

approach (GRADE Working Group, 2004; Guyatt et al., 2008a; Guyatt et al., 2008b; Ryan and Hill, n.d.).

2.9. Differences between protocol and review

Studies published in languages other than English were originally excluded at full text screening due to inadequate funding for translation as stated in the protocol. However, those studies were subsequently translated to determine eligibility; with consultation from corresponding authors where requested. Data extraction was conducted by two reviewers independently rather than by one reviewer, with a second reviewer checking for consistency, as stated in the protocol. Additionally, the assessment of the cumulative evidence of the main outcomes through the GRADE approach was planned post protocol registration.

3. Results

3.1. Study selection

After duplicates were removed, 16,153 titles and abstracts were screened, 206 studies underwent full-text screening, with 38 studies eligible for inclusion in the review across 48 publications (Fig. 1).

Twenty-one studies reported data amenable to meta-analyses; data from 12 studies, which could not be combined for meta-analysis, were summarised narratively; and 5 studies contributed data to both meta-analyses and narrative summaries.

3.2. Characteristics of included studies

The majority of the 38 studies were conducted in either Australia (14)(Stanley and Laugharne, 2013; Bartlem et al., 2015; Bartlem et al., 2014a; Happell et al., 2013a; Anderson et al., 2013; Ashton et al., 2010; Siru et al., 2010; Stanton et al., 2015; Stockings et al., 2015; Stockings et al., 2014; Tso et al., 2017; Wye et al., 2010; Wye et al., 2009; Wye et al., 2017) or the USA (11) (Price et al., 2007; Schacht et al., 2012; Chwastiak et al., 2013; Williams et al., 2015; Bolton et al., 2016; Himelhoch et al., 2014; Kilbourne et al., 2011; Leyro et al., 2013; Maki and Bjorklund, 2013; Prochaska et al., 2006; Sarna et al., 2009). Eight described client reported receipt of preventive care, (Bartlem et al., 2015; Etter et al., 2008; Siru et al., 2010; Stockings et al., 2015; Stockings et al., 2014; Leyro et al., 2013; Prochaska et al., 2006; Etter and Etter, 2007) 21 described clinician reported provision of care, (Bartlem et al., 2014a; Happell et al., 2013a; Price et al., 2007; Etter et al., 2008; Schacht et al., 2012; Zabeen et al., 2015; Anderson et al., 2013; Chwastiak et al., 2013; Williams et al., 2015; Ashton et al., 2010;

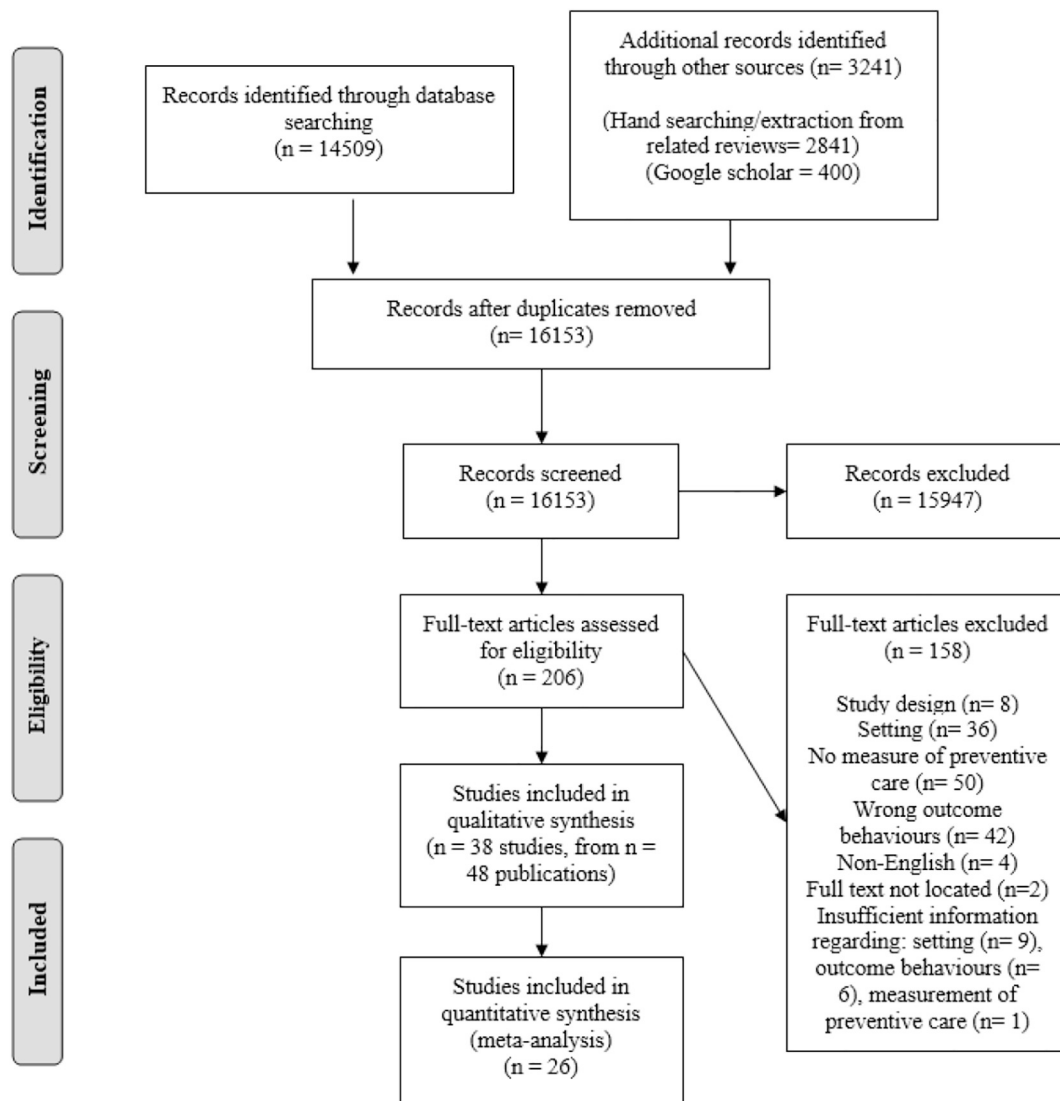


Fig. 1. PRISMA study flow diagram of studies published from 2006 to 2017.

Table 1 (continued)

Author/year published/country	Year undertaken/setting/sample size (participation rate)	Data source	Chronic disease risk behaviours/preventive care elements*																
			Smoking			Alcohol			Nutrition			Physical activity							
			As	Ad	Ar	As	Ad	Ar	As	Ad	Ar	As	Ad	Ar	As	Ad	Ar		
Eter ^b 2007 Switzerland	2003–2004 2 inpatient psychiatric units within a hospital 49 (86%) patients	Client report	✓	✓	✓	×	×	×	×	×	×	×	×	×	×	×	×	×	×
Leyro (Leyro et al., 2013) 2013 USA	2006–2010 2 psychiatric hospitals 324 (71% and 79% per hospital) patients	Client report	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
Prochaska (Prochaska et al., 2006) 2006 USA	nr University-based inpatient psychiatry unit 100 (87%) patients	Client report	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
Siru (Siru et al., 2010) 2010 Australia	100 records Department of Psychiatry in a major teaching hospital 64 (nr) patients	Medical record audit	✓	✓	✓	×	×	×	×	×	×	×	×	×	×	×	×	×	×
Stockings (Stockings et al., 2014) 2014 Australia	2010–2011 3 psychiatric inpatient units in a large, regional public hospital 205 (69%) patients	Client report	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
Stockings (Stockings et al., 2015) 2015 Australia	2009–2010 3 psychiatric inpatient units in a large, regional public hospital 181 (90.9%) patients	Client report	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
Haddad (Haddad et al., 2016) 2016 UK	nr 1 low secure forensic psychiatric inpatient unit 57 (90.5%) clinicians	Clinician report	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
Keizer (Keizer et al., 2014) 2014 Switzerland	2009 Department of Mental Health and Psychiatry in a large hospital 155 (72.4%) clinicians	Clinician report	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
Sarna (Sarna et al., 2009) 2009 USA	nr Adult psychiatric inpatient settings in a Magnet-designated health care facility 100 (100%) nurses	Clinician report	✓	✓	✓	×	×	×	×	×	×	×	×	×	×	×	×	×	×
Schacht (Schacht et al., 2012) 2012 USA	2011 206 state inpatient psychiatric facilities 165 (80%) facility directors	Clinician report	✓	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
Stanton (Stanton et al., 2015) 2015 Australia	nr inpatient psychiatric facilities in a regional city in QLD 34 (nr) nurses	Clinician report	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	✓
Wye (Wye et al., 2009) 2009 Australia	2006 All publicly funded psychiatric inpatient units in NSW 123 (94%) nurse unit managers	Clinician report	✓	✓	✓	×	×	×	×	×	×	×	×	×	×	×	×	×	×
Zabeen ^b 2015 UK	2010 Random sample of inpatient psychiatric units across England 147 (67%) unit managers	Clinician report	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
Howard (Howard and Gamble, 2011) 2011 UK	nr 2 acute wards from a large mental health trust 28 records	Medical record audit	✓	✓	×	✓	✓	✓	×	×	×	×	×	×	×	×	×	×	✓

(continued on next page)

Table 1 (continued)

Author/year published/country	Year undertaken/setting/sample size (participation rate)	Data source	Chronic disease risk behaviours/preventive care elements*															
			Smoking			Alcohol			Nutrition			Physical activity						
			As	Ad	Ar	As	Ad	Ar	As	Ad	Ar	As	Ad	Ar				
Wye (Wye et al., 2010) 2010 Australia	2005–2006 1 large adult psychiatric hospital 1000 (99%) records	Medical record audit	✓	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
Wye (Wye et al., 2017) 2017 Australia	2009–2010 2 general locked adult inpatient psychiatric facilities in one health district in NSW 1054 records	Medical record audit	✓	✓	×	×	×	×	×	×	×	×	×	×	×	×	×	×
Other settings Ashton (Ashton et al., 2010) 2010 Australia	2007 45 government and non-government mental health organisations in Adelaide, SA 324 (60%) team members	Clinician report	✓	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
Balbe (Balbe et al., 2012) 2012 Spain	2008–2009 186 inpatient and outpatient mental health services in Catalonia 186 (96.9%) Clinical managers	Clinician report	✓	✓	✓	×	×	×	×	×	×	×	×	×	×	×	×	×
Bolton ^a 2016 USA	2015 Members of the American Psychiatric Nurses Association 26 (nr) clinicians	Clinician report	×	✓	✓	×	×	×	×	×	×	✓	×	×	×	×	×	×
Guo (Guo et al., 2015) 2015 Taiwan	nr 2 community psychiatric hospitals providing inpatient and outpatient services 193 (96.9%) clinicians	Clinician report	×	✓	✓	×	×	×	×	×	×	×	×	×	×	×	×	×
Happell ^a 2013 Australia	2012 Members of the Australian College of Mental Health Nurses 559 (19.6%) mental health nurses	Clinician report	×	✓	✓	×	×	×	×	×	×	✓	×	×	×	×	×	×
Robson (Robson et al., 2013a) 2013 UK	2006–2007 Mental health nurses recruited from a large National Health Service Mental Health Trust in the UK 585 (52%) mental health nurses	Clinician report	×	✓	✓	×	×	×	×	×	×	✓	×	×	×	×	×	×
Williams (Williams et al., 2015) 2015 USA	2012 30 outpatient or partial-hospitalisation settings of state-wide behavioural health agency 18 (90%) clinicians 100 records	Clinician report	✓	✓	✓	×	×	×	×	×	×	×	×	×	×	×	×	×
Kilbourne (Kilbourne et al., 2011) 2011 USA	2006–2007 VA Mental Health Programs with and without colocated general medical services 7514 (7.1%) records	Medical record audit	✓	✓	✓	×	×	×	×	×	×	×	×	×	×	×	×	×
Parker (Parker et al., 2012) 2012 UK	2010–2011 Adult mental health treatment services in the United Kingdom's largest Mental Health Trust 85 inpatient records 2028 community patient records	Medical record audit	✓	✓	✓	×	×	×	×	×	×	×	×	×	×	×	×	×

(continued on next page)

Table 2
Summary of effects of all meta-analyses of included studies published from 2006 to 2017.

Outcome ^a	% (95% CI)	I ² (%)	p	n	n of studies
Meta-analysis results:					
Overall clinician reported data- highest estimates of care provision					
Ask/assess					
Smoking	78 (59%–96%)	97.7	< 0.01	515	4
Advise					
Smoking	46 (31%–61%)	88.5	< 0.01	384	3
Nutrition	54 (48%–59%)	0	0.78	305	2
Physical activity	72 (49%–95%)	95.4	< 0.01	304	2
Assist					
Smoking	52 (31%–73%)	94.2	< 0.01	339	4
Arrange					
Smoking	30 (1%–59%)	95.6	< 0.01	211	2
Overall clinician reported data- lowest estimates of care provision					
Ask/Assess					
Smoking	78 (59%–96%)	97.7	< 0.01	515	4
Advise					
Smoking	43 (32%–54%)	78.5	< 0.01	384	3
Nutrition	54 (48%–59%)	0	0.78	305	2
Physical activity	72 (49%–95%)	95.4	< 0.01	304	2
Assist					
Smoking	39 (12%–67%)	97.8	< 0.01	339	4
Arrange					
Smoking ^b	7 (0%–20%)	90.0	< 0.01	229	2
Overall client and audit reported data- highest estimates of care provision					
Ask/assess					
Smoking	54 (38%–71%)	99.7	< 0.01	10,574	12
Alcohol	62 (42%–81%)	99.0	< 0.01	3240	6
Nutrition ^b	17 (0%–35%)	98.6	< 0.01	813	3
Physical activity ^b	35 (0%–72%)	99.6	< 0.01	641	3
Advise					
Smoking	28 (14%–42%)	98.4	< 0.01	1880	10
Alcohol ^b	42 (0%–100%)	98.8	< 0.01	228	2
Nutrition	47 (5%–90%)	95.6	< 0.01	152	2
Physical activity ^b	46 (0%–100%)	99.5	< 0.01	190	2
Assist					
Smoking	37 (13%–61%)	99.7	< 0.01	3141	8
Arrange					
Smoking ^b	21 (0%–49%)	98.9	< 0.01	388	3
Physical activity	35 (10%–59%)	87.8	< 0.01	190	2
Overall client and audit reported data- lowest estimates of care provision					
Ask/Assess					
Smoking	41 (22%–61%)	99.6	< 0.01	10,574	12
Alcohol	62 (42%–81%)	99.0	< 0.01	3240	6
Nutrition ^b	17 (0%–35%)	98.6	< 0.01	813	3
Physical activity ^b	35 (0%–72%)	99.6	< 0.01	641	3
Advise					
Smoking	25 (10%–40%)	99.2	< 0.01	1880	10
Alcohol ^b	42 (0%–100%)	98.8	< 0.01	228	2
Nutrition	47 (5%–90%)	95.6	< 0.01	152	2
Physical activity ^b	46 (0%–100%)	99.5	< 0.01	190	2
Assist					
Smoking	31 (7%–56%)	99.8	< 0.01	3141	8
Arrange					
Smoking ^b	3 (0%–7%)	85.5	< 0.01	388	3
Physical activity ^b	10 (0%–29%)	84.0	0.01	190	2

^a Meta-analyses were not possible for all health behaviours by all care elements due to insufficient numbers of studies ($n < 2$) contributing data.

^b In some cases approximate confidence intervals for the proportion gave limits outside 0 and 1. These cases have been truncated to 0 or 1 as appropriate.

reflect the highest estimations of care provision across clinician, client and audit reported data. Refer to Table 2 for results of the lowest estimations, and Appendix E for all Forest plots.

Ask/Assess: Client and audit reported care data were available for meta-analysis for all four behaviours, however clinician reported data were only available for smoking. According to the combined client and audit reported data, assessment was most likely to occur for alcohol use

(62%, 95% CI: 42%–81%; I^2 99%; participants = 3240; studies = 6), followed by smoking (54%, 95% CI: 38%–71%; I^2 99.7%; participants = 10,574; studies = 12; Fig. 2), physical activity (35%, 95% CI: 1%–72%; I^2 99.6%; participants = 641; studies = 3), and nutrition (17%, 95% CI: 1%–35%; I^2 98.6%; participants = 813; studies = 3). Assessment of smoking via clinician report was somewhat higher (78%, 95% CI: 59%–96%; I^2 97.7%; participants = 515; studies = 4). Heterogeneity in pooled estimates was substantial ($I^2 > 50\%$; Appendices E, F).

Advise: Client and audit reported data for “advice” were available for meta-analyses for all behaviours, and clinician reported data for all behaviours except alcohol. The receipt of client and audit reported advice to change at risk behaviours was similar for nutrition (47%, 95% CI: 5%–90%; I^2 95.6%; participants = 152; studies = 2), physical activity (46%, 95% CI: 30%–123%; I^2 99.5%; participants = 190; studies = 2), and alcohol (42%, 95% CI: 19%–102%; I^2 98.8%; participants = 228; studies = 2), yet lower for smoking (28%, 95% CI: 14%–42%; I^2 98.4%; participants = 1880; studies = 10; Fig. 2). Similar proportions of advice were provided via clinician report for smoking (46%, 95% CI: 31%–61%; I^2 88.5%; participants = 384; studies = 3) and nutrition (54%, 95% CI: 48%–59%; I^2 0%; participants = 305; studies = 2), with advice for physical activity somewhat higher (72%, 95% CI: 49%–95%; I^2 95.4%; participants = 211; studies = 2). Heterogeneity was substantial, with the exception of clinician reported nutrition advice; however this value is a probable underestimation of heterogeneity due to the small number of data points (Appendices E, F) (von Hippel, 2015).

Assist: Meta-analyses were conducted for clinician and client/audit reported data and were possible for the provision of assistance for smoking only. The pooled prevalence of clinician reported provision of assistance for smoking was 52% (95% CI: 31%–73%; I^2 94.2%; participants = 339; studies = 4), whilst client and audit reported receipt was 37% (95% CI 13%–61%; I^2 99.7%; participants = 3141; studies = 8; Fig. 2). Heterogeneity was substantial (Appendices E, F).

Arrange: Client and audit reported data enabled meta-analysis for smoking and physical activity outcomes, whilst clinician reported data were available for meta-analysis of smoking only. The pooled prevalence of clinician reported arrangement of smoking cessation care was 30% (95% CI: 1%–59%; I^2 95.6%; participants = 211; studies = 2), whilst the client and audit reported receipt was 21% (95% CI: 7%–49%; I^2 98.9%; participants = 388; studies = 3; Fig. 2). Client and audit reported receipt of care arranged for physical activity was 35% (95% CI: 10%–59%; I^2 87.8%; participants = 190; studies = 2). Heterogeneity was substantial (Appendices E, F).

3.6. Assessment of confidence in cumulative evidence

GRADE ratings for outcome measures were initially classified as ‘low’ as the included data were observational (Guyatt et al., 2008b). The quality of evidence (GRADE) in all meta-analyses for all elements of care provision, across all four risk behaviours, was downgraded to ‘very low’ due to risk of bias, and/or inconsistency, and/or imprecision of results (Appendix F) (Ryan and Hill, n.d.).

3.7. Narrative synthesis

Seventeen studies reported data not conducive to meta-analysis. Thirteen of these studies reported data using categorical responses describing the frequency of clinician care provision (for example, ‘always’) (Happell et al., 2013a; Williams et al., 2015; Ashton et al., 2010; Stanton et al., 2015; Wye et al., 2009; Bolton et al., 2016; Himelhoch et al., 2014; Sarna et al., 2009; Johnson et al., 2009; Haddad et al., 2016; Keizer et al., 2014; Ballbe et al., 2012; Robson et al., 2013a). Two of the 17 studies, one utilising client reported data and one clinician report, were not included in the meta-analyses as no other studies reported data points for the same risk behaviour and care element

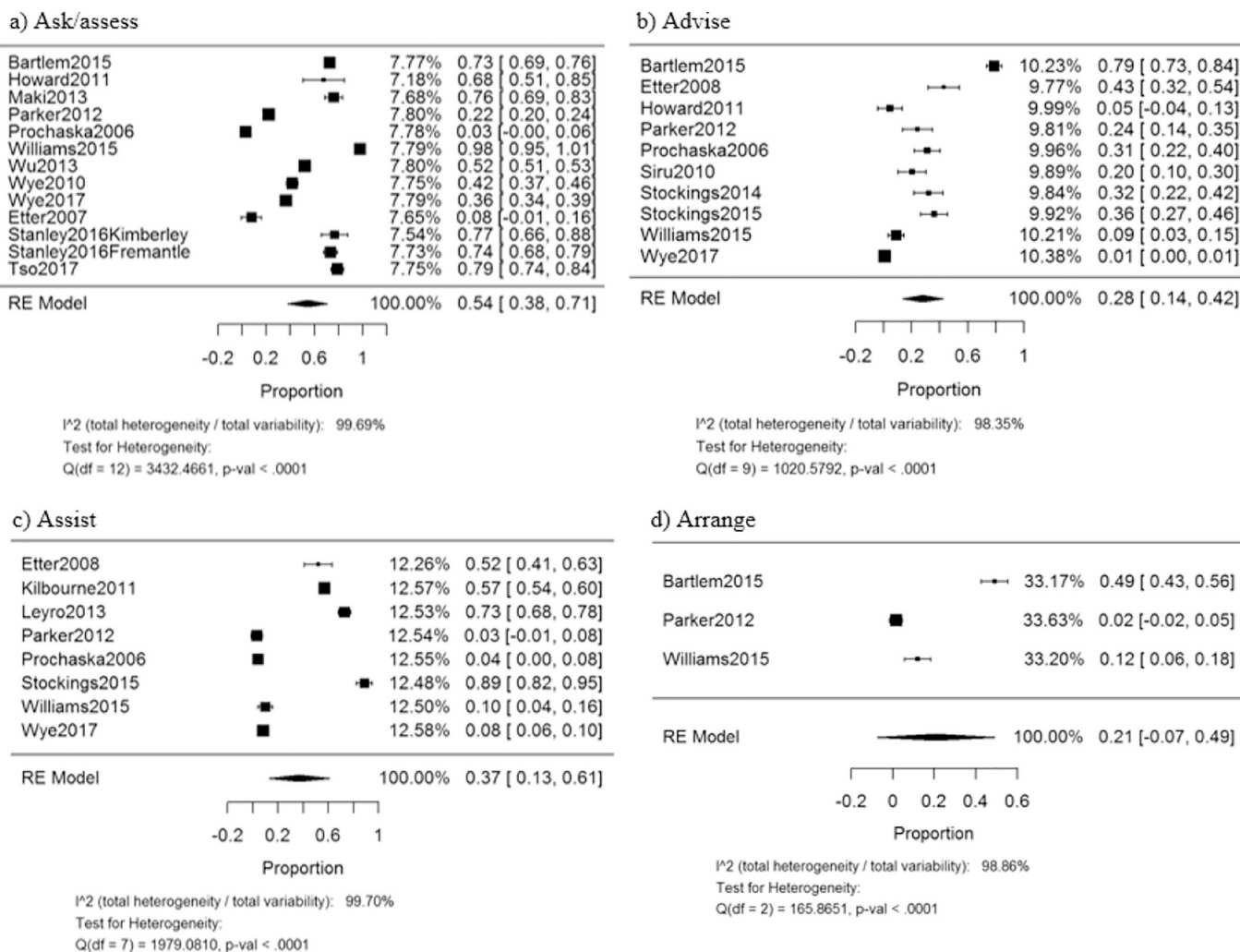


Fig. 2. Forest plots of the overall client and audit reported highest estimates of smoking cessation care provision by care element: a) ask/assess, b) advise, c) assist, and d) arrange.

Note: Error-bars represent 95% confidence intervals; included studies published from 2006 to 2017. At times, 95% confidence intervals exceeded the boundaries of the proportion (between 0 and 1), as the random effects binomial proportion interval (Wald interval) assumes a normal distribution.

(Bartlem et al., 2015; Bartlem et al., 2014a). Five of the 17 studies, also utilised categorical responses, reporting preventive care outcomes in mean scores rather than proportions: for smoking: ask/assess; (Price et al., 2007; Ashton et al., 2010) advise; (Price et al., 2007) assist; (Happell et al., 2013a; Price et al., 2007; Bolton et al., 2016; Guo et al., 2015) and arrange; (Price et al., 2007) and advice for nutrition and physical activity; (Bolton et al., 2016) and assistance for alcohol, nutrition, and physical activity (Appendix C) (Happell et al., 2013a).

Ask/Assess: The proportions of clinicians reporting ‘often’ or ‘always’ providing assessment care for smoking was 26.1–100% (Williams et al., 2015; Ashton et al., 2010; Himelhoch et al., 2014; Sarna et al., 2009; Johnson et al., 2009; Ballbe et al., 2012). Proportions of clinicians reporting providing 80–100% of clients with assessment was greatest for alcohol (89.4%), followed by physical activity (59.6%), and nutrition (13.2%) (Bartlem et al., 2014a).

Advise: The highest proportions of clinicians reporting ‘often’ or ‘always’ providing advice were found for nutrition (61–100%) (Happell et al., 2013a; Bolton et al., 2016; Haddad et al., 2016; Robson et al., 2013a) and physical activity (53–100%), (Happell et al., 2013a; Stanton et al., 2015; Bolton et al., 2016; Haddad et al., 2016; Robson et al., 2013a) with a more variable range for smoking (16–100%) (Williams et al., 2015; Wye et al., 2009; Himelhoch et al., 2014; Sarna et al., 2009; Johnson et al., 2009). Additionally, 80.1% of clinicians were reported

to provide advice to reduce alcohol consumption to 80–100% of clients (Bartlem et al., 2014a).

Assist: Between 5 and 92.9% of clinicians reported ‘often’ or ‘always’ providing clients with assistance for smoking, (Happell et al., 2013a; Williams et al., 2015; Wye et al., 2009; Bolton et al., 2016; Himelhoch et al., 2014; Sarna et al., 2009; Johnson et al., 2009; Haddad et al., 2016; Ballbe et al., 2012; Robson et al., 2013a) and 86.2% reported ‘often’ or ‘always’ providing assistance for alcohol consumption (Happell et al., 2013a). No studies reported on assistance for nutrition or physical activity.

Arrange: Between 8 and 94% of clinicians reported ‘often’ or ‘always’ arranging care for smoking for clients (Williams et al., 2015; Wye et al., 2009; Himelhoch et al., 2014; Sarna et al., 2009; Ballbe et al., 2012). Higher proportions of clinicians reported arranging care for 80–100% of clients for alcohol consumption (60.9%), compared to physical activity (40.1%) and nutrition (22.5%) (Bartlem et al., 2014a). Additionally, 38% of clients reported receiving care for alcohol, and 43% reported receiving care for nutrition (Appendix C) (Bartlem et al., 2015).

3.8. Subgroup and sensitivity analyses

Service type: Pre-specified subgroup analyses were conducted by

mental health service type: inpatient; outpatient; and other/multiple settings (Appendix E, F). With respect to subgroup analyses of clinician reported data, provision of care did not differ significantly in inpatient or outpatient settings relative to the overall pooled estimate.

Subgroup analyses of client and audit reported data of care provision by setting revealed non-significant trends of variability in pooled prevalence estimates between settings. Client and audit reported care for smoking ask/assessment was lower in inpatient settings (31%), and higher in outpatient (70%) and other settings (68%) relative to the overall pooled estimate (54%). Ask/assessment of alcohol consumption was lower in outpatient settings (49%) and higher in other settings (83%) compared to the pooled estimate (62%). Additionally, receipt for smoking cessation assistance was lower in other settings (23%) and higher in inpatient settings (45%) relative to the overall pooled estimate (37%; Appendix F).

Heterogeneity remained substantial for all individual subgroup analyses with the exception of: clinician reported provision of nutrition advice in outpatient settings (I^2 0%); and client receipt of alcohol ask/assessment in other settings (I^2 0%; Appendix F), however these values are likely an underestimation of heterogeneity due to small number of data points (von Hippel, 2015). To explore substantial heterogeneity, a further post-hoc subgroup analysis of client and audit data separately by setting type was conducted, however heterogeneity remained substantial with the exception of audit data of smoking advice in inpatient settings (I^2 0%; Appendix F).

Post-hoc subgroup analyses were conducted by country, where possible (Australia only for clinician reported data; and Australia, UK, and US for client and audit data). With respect to Australian clinician reported data, no significant differences were found compared to the overall meta-analyses. Moreover, subgroup analyses using client and audit reported data yielded no significant differences between the countries or the overall estimates (Appendix F).

Sensitivity analyses: Pre-specified sensitivity analyses were conducted to exclude studies at high risk of bias. All studies reporting clinician data were assessed at high risk of bias; therefore analysis was not possible. Sensitivity analyses of client and audit reported care excluding studies at high risk of bias revealed a similar pooled prevalence to all possible comparisons (within 6%) with the overall meta-analyses results (Appendix F).

Post-hoc sensitivity analyses were conducted to exclude any data calculated by the authors for the purpose of the review. This eliminated all clinician reported analyses bar one, where clinician reported ask/assess of smoking was similar to overall care provision estimates; as were all client and audit reported sensitivity analyses excluding calculated data (Appendix F).

Finally, sensitivity analyses utilising only exact proportions of clinician reported care provision estimates yielded just one analysis, where the pooled prevalence of provision of assistance for smoking did not differ from the overall estimate (Appendix F).

4. Discussion

This is the first review to comprehensively synthesise the international evidence on the provision of preventive care by mental health services for four modifiable chronic disease risk behaviours by individual preventive care elements and by service type. Meta-analysis revealed sub-optimal levels of care provision (defined as < 80% of clients in receipt of care in previous research)(Bartlem et al., 2014b; McElwaine et al., 2014; Freund et al., 2005) across clinician and client/audit reported data for each of the four risk behaviours and all analysed care elements. Relatively few of the included studies examined the provision of care for behaviours other than smoking and across all care elements. Estimations of care provision by care element varied across risk behaviours revealing no clear patterns. Similarly, subgroup analyses did not reveal any consistent trends across settings or country, likely due to the small number of studies available. Further research is

needed to explore the extent to which different mental health settings provide preventive care for harmful alcohol consumption, inadequate nutrition, and inadequate physical activity.

One of the key findings of the review was the wide variation in how care was measured across the included studies; hampering comparisons across studies. Moreover, the creation of the pooled clinician measure lacked specificity whereby estimates of care could only be calculated for 'at least 50% of clients'. Despite these constraints, pooled estimates of care provision suggest between one-third and three-quarters (36–78%) of clinicians are providing at least 50% of clients with preventive care for the behaviours and care elements analysed. Whilst these findings suggest overall sub-optimal levels of care provision, many clinicians are currently providing care to at least 50% of clients suggesting an attempt to incorporate preventive care into service practice where clinicians are aware of the requirement (NSW Department of Health, 2017a; NSW Department of Health, 2017b; NSW Mental Health Commission, 2014; National Preventive Health Taskforce, 2008; Agency for Healthcare Research and Quality, 2010; National Institute for Health and Care Excellence, 2010; National Institute for Health and Care Excellence, 2013; US Department of Health and Human Services, 2009). However, less than a third of studies reported any details on any policies or procedures operational within the settings studied regarding the requirements of preventive care provision (Stanley and Laugharne, 2013; Bartlem et al., 2015; Bartlem et al., 2014a; Stockings et al., 2015; Stockings et al., 2014; Wye et al., 2010; Leyro et al., 2013; Etter and Etter, 2007; Keizer et al., 2014; Parker et al., 2012).

Another key finding of the review was the dearth of previous research assessing the extent to which care is provided for behaviours other than smoking in mental health services. No included studies reported on the provision of assistance for improving nutrition or physical activity by clinician nor client, nor audit reported data. Similarly no studies reported provision of assistance for alcohol consumption by client or audit report, and only one study (in the narrative synthesis report)(Happell et al., 2013a) reported on the provision of assistance for alcohol consumption by clinician reported data. As such, the current provision of care in the form of assistance to address nutrition, physical activity, and alcohol consumption is largely unknown and requires further investigation in subsequent research.

The findings of this review confirm sub-optimal reports of the provision of preventive care reported in individual identified studies and the previous narrative review of smoking cessation care provision in inpatient settings; (Wye et al., 2011) suggesting a need for further research to address barriers to the provision of preventive care. Previous research conducted in mental health settings has identified multiple barriers to the provision preventive care at the clinician and service level (Price et al., 2007; Anderson et al., 2013; Chwastiak et al., 2013; Ashton et al., 2010; Johnson et al., 2009; Johnson and Fry, 2013; Robson et al., 2013b; Happell et al., 2012b; Hyland et al., 2003; Organ et al., 2010; Happell et al., 2013b; Dunbar et al., 2010; Nash, 2005). To address such barriers, various strategies have been tested and demonstrated to reduce clinician burden in providing preventive care and increase the provision of care such as: reduction of the '5As' model to '2As and R'; (Schroeder, 2005; Revell and Schroeder, 2005) incorporation of tools such as prompts, recording and arrange/referral protocols; (Shojania et al., 2009; Wolfenden et al., 2009; Krist et al., 2008) and training in the provision of care and referral options (Sheffer et al., 2012). Alternatively, the institution of a specialist preventive care provider embedded in mental health services, relieving mental health clinicians of the role of preventive care provision, has been trialled through limited research and found to increase care provision (Osborn et al., 2010; McKenna et al., 2014; Cunningham et al., 2013). Further research could focus on the design of practice change interventions to address identified barriers and increase the provision of care across mental health services. Additionally, the review investigated care provision for the four leading modifiable chronic disease risk behaviours.

Future research could examine the provision of care by mental health services for other modifiable risk behaviours, such as sleep; more recently recognised as a risk factor for chronic disease (von Ruesten et al., 2012; Liu et al., 2013).

4.1. Study limitations and strengths

This is the first review to comprehensively synthesise the international published evidence on the provision of preventive care by mental health services for four health risk behaviours by individual preventive care elements and by service type.

The review is limited by the variability and heterogeneity of included individual studies. Substantial heterogeneity remained throughout the majority of meta-analyses and subgroup analyses, contributing to the very low quality assessment of the cumulative evidence. As included studies were observational to reflect real-world practice and not conducted under strict controlled conditions, some heterogeneity is to be expected. Such heterogeneity might be explained by between-study differences in methodology including measurements and definitions of care elements used to assess care provision, or by population characteristics such as country; clinician qualification/profession; or psychiatric diagnosis of clients (Hippokratia, 2010; Glasziou and Sanders, 2002). Heterogeneity may also result from true differences in provision of care impacted by unknown characteristics, such as whether or not the settings studied operated under specific preventive care policies; as changes in smoke-free policies have resulted in changes in smoking cessation care provision (Etter et al., 2008). As mentioned above, limited studies provided information on whether or not a service operated under specific preventive care policies, and few studies that mentioned active policies or procedures provided any description of such procedures (Stanley and Laugharne, 2013; Bartlem et al., 2015; Bartlem et al., 2014a; Stockings et al., 2015; Stockings et al., 2014; Keizer et al., 2014). Future research on preventive care provision in mental health settings could seek to utilise uniformed measurements of preventive care provision and elucidate the preventive care policy and procedural contexts in which services operate.

Review findings should be considered with caution due to the very low quality of cumulative evidence, suggesting future studies are likely to change the estimates; and in light of the following limitations. The majority of studies were categorised as high risk of bias. Data relied on self-report measures and medical record audit; where clinician self-report may over-estimate care provision, whilst audit data may reflect an underestimation of care provision; (Hrisos et al., 2009) suggesting client reported data may be a useful additional measure in future research where feasible (Hrisos et al., 2009). However, client report may also be susceptible to recall bias (Hrisos et al., 2009). Future research could seek to compare the accuracy of such measures in the context of preventive care in mental health services.

The variability in assessment and reporting of outcome measures by included studies limited comparability and resulted in many meta-analysis outcomes being based on a limited number of studies. Clinician reported data could not be pooled to create an estimate of care provision to all clients, rather the more conservative estimate of care provision to at least 50% of clients was analysed. Finally, heterogeneity remained substantial despite subgroup and sensitivity analyses suggesting between-study differences that could not be explored due to inconsistencies or insufficient reporting of study measures and characteristics.

5. Conclusion

This review found suboptimal provision of preventive care for tobacco smoking, harmful alcohol consumption, inadequate nutrition, and inadequate physical activity in mental health settings across all analysed care elements. These findings are important to mental health service clinicians and managers as they suggest current preventive care

is suboptimal across risk behaviours and service types; suggesting a need to improve the quality of interventions to increase the provision of preventive care. Utilisation of consistent care provision and reporting measures across all mental health services, relating to care provided to individual clients, would facilitate further synthesis of the prevalence of care provision. Future studies need to investigate methods to increase clinician delivery of preventive care in mental health services, which have an organisational culture and service issues that pose idiosyncratic challenges to the field of implementation science (Sandstrom et al., 2015; Michie et al., 2007).

Systematic review protocol and registration

Systematic review of the prevalence of preventive care provision for chronic disease risk behaviours in mental health services. PROSPERO 2016:CRD42016049889 Available from: https://www.crd.york.ac.uk/prospero/display_record.php?RecordID=49889

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Declaration of competing interest

None.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.pmedr.2019.100969>.

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