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Received: 1 October 2024 | Revised: 6 January 2025 | Accepted: 31 January 2025

DOI: 10.1111/1747-0080.70000

ORIGINAL RESEARCH

Nutrition & Dietetics Journal of Dietitians Australia WILEY

# Feasibility of a targeted nutrition-risk screening tool in Australian mental health services: The NutriMental screener

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## Abstract

**Aims:** This study aimed to test the feasibility and acceptability of mental health clinicians using a multifaceted nutrition-risk screening tool in Australian mental health settings.

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**Funding information**
University of New South Wales

Open access publishing facilitated by University of New South Wales, as part of the Wiley - University of New South Wales agreement via the Council of Australian University Librarians.

**Methods:** A mixed-methods cross-sectional design was used. Mental health clinicians implemented the multifaceted NutriMental screener at seven sites across Australia and provided feedback via a standardised form. Primary outcomes were the feasibility, acceptability and appropriateness domains of the feedback questionnaire. Additional outcomes included association/agreement between the consumer's desire for dietetic support, clinicians' impression of need for dietetic support, and total nutrition risks reported. Directed content analysis was employed to analyse open-ended sections of the clinician feedback questionnaire.

**Results:** Fifty-four clinicians participated, completing the NutriMental screener with a total of 256 mental health consumers. Mean total nutrition risks reported were $6.4 \pm 1.8$ (out of nine). Mean implementation outcomes (out of five) were $3.1 \pm 0.8$ for acceptability, $3.7 \pm 0.5$ for appropriateness, and $4.3 \pm 1.7$ for feasibility. There was moderate agreement between consumer's desire for dietetic support and clinicians' impression of need for dietetic support $\kappa = 0.32$ (95% CI: 0.21–0.43), $p < 0.001$, and positive correlations between the number of nutrition risks reported and consumer's desire for dietetic support ($r = 0.29$, $p < 0.001$) and clinicians' impression of need for dietetic support ($r = 0.29$, $p < 0.001$). Six themes and 17 subthemes related to barriers and facilitators to the screener's implementation were identified.

**Conclusion:** The multifaceted risk screening tool appears to be feasible, acceptable and appropriate for use within Australian mental health services. Refinements of the NutriMental screener based on clinician feedback may further improve its implementation.

**KEYWORDS**
dietitians, health risk behaviours, mental disorders, mental health services, nutrition risks, nutritional status

## 1 | INTRODUCTION

Nutrition-risk screening is a critical element of healthcare, initiating the Nutrition Care Process.[1] Nutrition-risk screening identifies people with characteristics associated with nutritional issues requiring assessment from a specialist clinician, such as a dietitian. Australian state and territory nutrition care policies mandate the use of validated screening tools, typically specifying the use of tools to assess malnutrition (undernutrition).[2–5] Traditional malnutrition screening tools are used in hospital sectors outside of mental health as people are frequently recovering from an injury or illness that increases protein and calorie needs, whilst potentially also experiencing a reduced appetite, leading to high rates of malnutrition, poor health outcomes and higher health costs.[6]

The nutrition risks differ for people receiving treatment from mental health inpatient and outpatient/community services.[7] Undernutrition remains a concern, however many experience hyperphagia and disordered eating due to psychotropic medication side-effects[8] and impairments in executive functioning,[9] rapid weight gain,[10] severe constipation,[11] and food insecurity.[12] These are important contributors to the life expectancy gap experienced by this group of 12–16 years,[13] primarily resulting from physical health disparities, with rates of cardiovascular and metabolic diseases 1.4–2.0 times higher than the general population.[14]

It is important to take a broader view of nutrition-risk given the increased acknowledgement in international research of the importance of diet in mental health and growing dietetic workforce in Australian mental health services, often employed to take a holistic treatment approach.[15] A recent scoping review of nutrition screening tools used in mental health settings found a dearth of appropriate and adequately validated tools.[16] The 17 tools identified had restricted foci: 1 focused solely on malnutrition, 1 focused solely on dysphagia, three assessed constipation only, 11 assessed disordered eating only, and

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1 was a checklist of medication side-effects. Additionally, only three of these tools had been validated in people with mental illness.[16]

The gap in suitable tools has led to the development of a multifaceted nutrition-risk screening tool, targeted to mental health services, the NutriMental Screener.[17] This tool has undergone multiple steps in its development: (i) identification of nutrition-risk domains and themes of interest,[17] (ii) literature reviews on relevant nutrition-risks[12,18–20] and qualitative interviews with consumers to understand their experiences,[21,22] (iii) drafting of a tool in a modified Delphi approach with a multinational working group,[23] and (iv) initial feasibility testing in a Swiss study sample using a German version.[23]

This study aimed to: (i) test the feasibility and acceptability of using the multifaceted nutrition-risk screening tool in Australian mental health services; (ii) explore the reported prevalence of nutrition risks identified through the screener; and (iii) explore relationships between aggregated nutrition-risk scores, the consumer's desire for dietetic support and the clinicians' recommendation on need for dietetic support.

## 2 | METHODS

We employed a mixed-methods cross-sectional design, incorporating quantitative and qualitative data, conducted between November 2022 and July 2023. The routine use of the NutriMental Screener by clinicians with mental health consumers was approved as a quality improvement project by service management at each of the included health services. We focused on perspectives of clinicians who used the NutriMental Screener with mental health consumers; participating clinicians provided informed consent to be part of the feasibility study. The study received ethical approval from the South Eastern Sydney Local Health District (SESLHD) Human Research Ethics Committee (2022/ETH00127), with subsequent site-specific approvals obtained for each healthcare site involved. The study is reported in line with Strengthening the Reporting of Observational Studies in Epidemiology statement for cross-sectional studies.[24]

Feasibility testing was conducted across seven mental health sites (six public and one private) in NSW, Victoria and WA: i) Prince of Wales Hospital Inpatient Units and Eastern Suburbs Community Mental Health Service, South Eastern Sydney Local Health District, ii) Concord Repatriation General Hospital Inpatient Unit and Community Mental Health Services, Sydney Local Health District, iii) Mental Health, Drug and Alcohol Inpatient and Community Services, Western New South Wales Local Health District, iv) Nepean Hospital and Anzac Memorial Hospital Inpatient Units, Nepean Blue Mountains Local Health District, v) Mental Health Inpatient Units, Murrumbidgee Local Health District, vi) Thomas Embling Forensic Hospital, Forensicare Victoria, and vii) Mental Health Inpatient Unit, St John of God Midland Public Hospital.

Inclusion criteria were mental health clinicians who: (a) perform nutrition screening as part of routine care, and (b) were willing to provide informed consent. Eligible clinicians were approached by a site-specific investigator either in-person or via email, provided with an information sheet and consent form, and given the opportunity to discuss the study in full. Clinicians were given at least 24-h to consider the decision to consent before enrolment was confirmed.

Once a clinician was enrolled, they were provided with paper copies of the NutriMental Screener to be implemented as part of routine clinical care, a guiding document containing instructions for the screener items, the additional information sheet which was completed with each use of the NutriMental Screener and a feedback questionnaire to be answered once by each clinician (see File S1 for study documents including the full screener tool and clinician guidance). The minimum number of clinicians required was 30 based on guidelines for feasibility studies.[25]

The NutriMental Screener consisted of 10 items. Item 1 listed five groupings of clinical conditions indicating need for dietitian support and an 'other' category with binary (yes/no) responses. The remaining nine items were single, binary (yes/no) questions. Broad themes examined through the 10 items were presence of nutrition-related chronic conditions, underweight or obesity, appetite or weight change, disordered eating behaviour, constipation, food insecurity, and the consumer's desire for dietitian support. Missing responses were counted as a 'no' response.[25]

The additional information sheet was completed contemporaneously with screening, and collected data on: the setting (inpatient/community), the consumer's age (years), gender (male/female/diverse), mental health diagnosis (text), height (centimetres), current weight and weight 6 months previously (kg), current medication (text), and whether the clinician would recommend support from a dietitian based on their clinical impression ('Yes'/'No'/'Don't know') and open-response comments on this. In addition, the duration of the screening assessment (0–5/5–10/>10 min), the clinicians' perspective on the ease of use of NutriMental ('Very difficult'/'Rather difficult'/'Rather easy'/'Very easy') with this consumer and open-response comments on this were documented.

Clinicians were instructed to trial use of the NutriMental screener (target of five consumers) and then

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complete a feedback questionnaire. This number was chosen by the research team as a necessary amount of exposure to generate appropriate feedback without overburdening participating clinicians. The questionnaire collected data on: professional background, whether the clinician was in training ('Yes'/'No'), duration of use of the NutriMental screener in clinical routine (days), number and mental health diagnoses of consumers the screener was completed with (as per the International Classification of Diseases and Related Health Problems version 10 codes, using multiple checkboxes). The questionnaire also included a custom-built survey drawing on theory of implementation outcomes.[26] The survey explored domains of feasibility (three items), acceptability (two items), and appropriateness (seven items), and participating clinicians rated their level of agreement with statements on a 5-point Likert scale anchored at "1 = Strongly disagree" and "5 = Completely agree." The questionnaire also gathered open-response feedback on suggestions for changes to NutriMental, suggestions for changes to the screening instructions, and barriers to and facilitators of using NutriMental.

Mean scores for the subscales of the feedback survey were derived. Scoring ranged from one to five with higher values indicating greater acceptability, appropriateness, or feasibility. Additionally, a total score out of the three subscales was calculated by weighting all subscales independent of the number of items.

Descriptive statistics were calculated for quantitative data from the NutriMental Screener responses, the additional information sheet and the feedback questionnaires. The primary outcomes were mean and standard deviation for the subscales of the implementation outcome survey obtained through the feedback questionnaire. For feasibility, the number of missing data in the NutriMental screener was explored and Chi-square analyses were used to assess differences between inpatient and community settings.

Additional outcomes included number of people and percent responding 'Yes' to each item of the NutriMental screener. The total of 'Yes' responses to items 1–9 of the NutriMental screener were summed to create a total number of nutrition risks out of nine. Chi-square analyses were run to determine if proportion of 'Yes' responses differed between inpatient and community settings. Independent samples *t*-test analysis was run to test for a difference in the NutriMental total score between inpatient and community settings.

To test whether the total number of risks (items 1–9) reported is a viable method for referral to a dietitian, the relationship between the total number of nutrition risks (items 1–9) and, (i) consumer's desire for dietitian support (item 10 of the NutriMental screener) and, (ii) clinicians' impression of need for dietitian support, were calculated using point-biserial correlation, with assumptions of normality and equality of variances measured through the Shapiro–Wilk and Levene's tests, respectively. To test whether the consumer's desire for dietitian support was related to the clinicians' impression on the need for dietitian support, a measure of agreement between item 10 of the screener and clinical impression of the need for support was calculated using Cohen's $\kappa$. Analyses were performed using Statistics Package for the Social Sciences (International Business Machines Corporation, Version 27, Armonk, NY).

Directed content analysis was employed to analyse qualitative data from the open-response sections of the feedback questionnaire.[27,28] Inductive semantic and latent line-by-line coding was conducted independently by two researchers on 20% of the dataset to develop a thematic framework. One researcher then coded the entire dataset to this framework in NVivo 14 Software®, iterating the framework twice through discussion with the second researcher. In a hybrid inductive/deductive approach, themes specifically related to barriers and facilitators to implementation were then mapped to the Consolidated Framework for Implementation Research.[29,30] All authors discussed and reviewed the final themes.

**TABLE 1** Demographics of clinician participants.

| Variable | *N* (total = 54) | % |
|---|---|---|
| State | | |
| New South Wales | 43 | 79.6% |
| Victoria | 8 | 14.8% |
| Western Australia | 3 | 5.6% |
| Setting | | |
| Inpatient | 34 | 63.0% |
| Community | 20 | 37.0% |
| Profession | | |
| Nurse | 27 | 50.0% |
| Dietitian | 13 | 24.1% |
| Exercise physiologist | 5 | 9.3% |
| Social worker | 3 | 5.6% |
| Occupational therapist | 2 | 3.7% |
| Allied health assistant | 2 | 3.7% |
| Speech pathologist | 1 | 1.9% |
| Psychiatrist | 1 | 1.9% |
| In training? | | |
| No | 52 | 96.3% |
| Yes | 2 | 3.7% |

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**TABLE 2** Demographics of people screened with NutriMental.

| Variable | *n* (total = 255) | % |
|---|---|---|
| Gender* | | |
| Male-identifying | 149 | 58.2% |
| Female-identifying | 104 | 40.6% |
| Diverse | 2 | 0.8% |
| Age (mean, SD) | 47.3 | 17.9 |
| Number of diagnoses | | |
| One diagnosis | 142 | 55.5% |
| Multiple diagnoses | 94 | 36.7% |
| Diagnosis(es) not reported | 20 | 7.8% |
| International Classification of Diseases, 10th Revision diagnosis categories | | |
| Organic mental disorders (F00–09) | 5 | 2.0% |
| Disorders due to psychoactive substance use (F10–19) | 34 | 13.3% |
| Schizophrenia and related disorders (F20–29) | 138 | 53.9% |
| Mood [affective] disorders (F30–39) | 87 | 34.0% |
| Neurotic, stress-related and somatoform (F40–49) | 41 | 16.0% |
| Behavioural syndromes (incl. eating disorders) (F50–59) | 2 | 0.8% |
| Personality disorders (F60–69) | 18 | 7.0% |
| Mental retardation (F70–79) | 7 | 2.7% |
| Disorders of psychological development (F80–89) | 5 | 2.0% |
| Behavioural and emotional disorders (F90–98) | 4 | 1.7% |

*Data was available on 255 people.

## 3 | RESULTS

Fifty-four clinicians participated, completing the NutriMental Screener with a total of 256 mental health services users (mean 4.3 ± 1.7 consumers, range 1–11). Demographic details of clinicians and people screened are presented in Tables 1 and 2. Clinicians were predominantly nurses (50.0%), not in training (96.3%), working in an inpatient setting (63.0%), and working in NSW (79.6%). Consumers screened identified mostly as male (58.2%), with a mean age of 47.3 ± 17.9 years (range 13–90 years) and had mostly received a diagnosis of a schizophrenia spectrum disorder (International Classification of Diseases, 10th Revision, F20–F29, 53.9%).

The majority of screeners were completed in an inpatient setting ($n = 209$, 81.6%). Most screenings were stated to take less than 5 min ($n = 137$, 53.5%), with 36.7% stated as lasting between 5 and 10 min, and 7.8% stated as lasting more than 10 min. Proportion of missing values in the NutriMental Screener was low, with a maximum of 10 missing (3.9%) for item 5 (medication-related appetite or weight change) and item 10 (desire for dietitian support). The mean rating for the implementation outcome was 3.5 ± 0.5 (out of five), with subscales scoring 3.1 ± 0.8 for acceptability, 3.7 ± 0.5 for appropriateness, and 4.3 ± 1.7 for feasibility.

Data on 'Yes' responses to NutriMental screener items are presented in Table 3. The most prevalent nutrition risk was reported for nutrition-related chronic conditions requiring dietitian support (item 1, 71.0%). Frequently reported nutrition risks were weight outside of the recommended range and appetite changes (items 3–5, positive responses ranging from 27.6% to 38.7%). The lowest prevalence was reported for item 8, that refers to fasting, vomiting or taking laxatives in attempt to control weight (6.3%). There were no significant differences in proportions of nutrition risks between the inpatient and community setting. Mean number of nutrition risks reported were 6.4 ± 1.8 (out of nine); there was no difference between scores from inpatient (6.4 ± 1.9) and community settings (6.4 ± 1.7) ($t[254] = -0.9$, $p = 0.93$).

One-hundred and twenty-eight consumers (50%) reported a desire for dietetic support (noting data was missing for 10 screeners, 3.9%). Consumers in the community setting were more likely to have 'desire for dietetic support' selected compared to consumers in the inpatient setting (69.6% vs. 43.0%, $X^2 = 10.57$, $p = 0.001$). Clinicians' impression of the need for dietetic supported was selected in the majority of additional information sheets ($n = 157$, 61.3%).

There was moderate agreement between selecting a desire for dietetic support on the NutriMental Screener and clinicians' impression of the need for support selected in the additional information sheet, $\kappa = 0.32$ (95% CI: 0.21–0.43), $p < 0.001$. There were low positive correlations between total NutriMental scores and desire for dietetic support according to question 10 of the screener ($r = 0.29$, $p < 0.001$), and between NutriMental scores and clinical impression of need for dietetic support ($r = 0.29$, $p < 0.001$).

Content analysis of open-ended feedback questionnaires identified six themes and 17 subthemes. The theme and subtheme names, number of times coded, description and supporting quotes are presented in Table 4. Language (Theme 1) was generated based on feedback that included removing ambiguity and inappropriate language, and to be more direct and supportive by using examples, for example, '*Some of the terminology is not understood by client when asked. Simplified*

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**TABLE 3** Proportion of 'Yes' responses for the total sample and by setting for each item of the NutriMental screener.

| | Total sample | | Inpatient setting | | Community setting | | Statistical test | |
|---|---|---|---|---|---|---|---|---|
| Item no.[a] | *N* | % | *N* | % | *N* | % | $X^2$ | *p*-value |
| 1 | 181 | 71.0 | 149 | 71.6 | 32 | 68.1 | 0.23 | 0.63 |
| a | 107 | 42.5 | 89 | 43.2 | 18 | 39.1 | 0.26 | 0.61 |
| b | 13 | 5.2 | 11 | 5.4 | 2 | 4.3 | 0.10 | 0.76 |
| c | 49 | 19.4 | 38 | 18.5 | 11 | 23.4 | 0.58 | 0.45 |
| d | 81 | 32.0 | 61 | 29.6 | 20 | 42.6 | 2.95 | 0.09 |
| e | 30 | 12.3 | 28 | 13.7 | 2 | 4.3 | 3.22 | 0.07 |
| f | 57 | 24.2 | 50 | 26.3 | 7 | 14.9 | 2.69 | 0.10 |
| 2 | 42 | 16.7 | 36 | 17.6 | 6 | 12.8 | 0.63 | 0.43 |
| 3 | 98 | 38.7 | 80 | 38.8 | 18 | 38.3 | 0.01 | 0.95 |
| 4 | 87 | 34.1 | 72 | 34.6 | 15 | 31.9 | 0.12 | 0.72 |
| 5 | 68 | 27.6 | 54 | 27.0 | 14 | 30.4 | 0.22 | 0.64 |
| 6 | 53 | 21.0 | 40 | 19.5 | 13 | 27.7 | 1.53 | 0.22 |
| 7 | 46 | 18.3 | 34 | 16.7 | 12 | 25.5 | 2.01 | 0.16 |
| 8 | 16 | 6.3 | 15 | 7.2 | 1 | 2.1 | 1.70 | 0.19 |
| 9 | 36 | 14.2 | 28 | 13.5 | 8 | 17.0 | 0.39 | 0.54 |
| 10 | 118 | 48.0 | 86 | 43.0 | 32 | 69.6 | **10.57** | **0.001** |

*Note*: Statistical tests tested for differences in proportions between settings. Bold figures are statistically significant at $p < 0.05$.
[a]Details of each item within the NutriMental Screener are provided in Supplementary File S1.

*questionnaire will be helpful*.' This led to four subthemes: (i) simplify wording, (ii) more person-centred, (iii) clarify who the respondent should be and (iv) provide examples.

Referral (Theme 2) was generated based on feedback identifying a lack of referral criteria, action pathways and suitable and sufficient staff to act on the referral, for example, '*[Include] rating scale to reflect action plan*.' This led to two subthemes: (i) unclear scoring and (ii) limited workforce capacity.

Screener administration (Theme 3) was generated based on perceived barriers and challenges to clinicians' delivery including taking too much time to administer, a lack of applicability to children and young people, a lack of consumer knowledge and poor accuracy of consumers communication of their health status and risks, for example, '*Consumer feedback is often not accurate compared to the medical record*.' This led to four subthemes: (i) lengthy, (ii) age appropriateness varies, (iii) inadequate consumer health literacy, and (iv) conflicting information from consumer versus medical record.

Design (Theme 4) was generated based on challenges with the structural format of the tool, and limiting the responses to binary (Yes/No) responses, for example, '*Layout and readability of the screening form was problematic*.' This led to two subthemes: (i) simpler formatting and flow and (ii) include open response sections.

Screener domains (Theme 5) was based on issues with the domains (topics) covered in the questions. These issues often included missing domains, for example, '*Also ask about types of food consumed*,' and a restricted scope, for example, '*Disorders does not include swallowing issues*,' some of which could be encompassed with modified wording to the question. This led to four subthemes: (i) include diet variety, (ii) broaden range of issues, (iii) consider medication side-effects and (iv) food insecurity is an important item.

Timeframe (Theme 6) was based on challenges on different timeframes used for different questions and certain timeframes being limited, reducing the sensitivity of the tool, for example, '*Timeframes may exclude significant data (e.g., just because appetite has been stable for 1 month it may still be clinically relevant)*.' This led to one subtheme—Limited timeframes. The relation of themes to barriers and facilitators, mapped to the Consolidated Framework for Implementation Research domains intervention, inner setting and outer setting, is depicted in Figure I.

## 4 | DISCUSSION

This study found that the multifaceted, targeted nutrition-risk screening tool is moderately feasible,

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**TABLE 4** Themes constructed from content analysis of feedback questionnaires.

| Theme | Sub-theme | Number of times coded | Quotation | Description |
|---|---|---|---|---|
| Language | Simplify wording | 26 | *Some of the terminology is not understood by client when asked. Simplified questionnaire will be helpful.* | Clinicians frequently suggested more direct, less wordy questions. Some also suggested condensing items to achieve this. |
| | More person-centred | 13 | *Some question [*sic*] are quite confronting or medical terminology is used ("defecation"). More inclusive language to different groups of people* | Some language was identified as inappropriate and confronting, potentially damaging rapport during the screening. |
| | Clarify who the respondent should be | 11 | *More clear on if/what the patients should answer instead of staff completing it themselves.* | Clinicians perceived ambiguity in the intended respondent for items. |
| | Provide examples | 7 | *[Include] prompt points/other info that might be useful to a non-dietitian administering the tool* | Use of examples was suggested to help clinicians explain items during screening, and to ameliorate false negative responses (i.e., ticking 'No') to item 1G when administered by non-dietitians. |
| Referral | Unclear scoring | 4 | *[Include] rating scale to reflect action plan* | Clinicians identified a lack of clarity on which results require referral, the urgency of referral, and an action pathway. |
| | Limited workforce capacity | 4 | *Dietetics services are already under-resourced and don't need extra non-clinical services* | Concerns over increases in inappropriate referrals occupying staffing resources, increases in appropriate referrals due to greater detection overwhelming staffing resources - especially in inpatient settings - or scepticism over scope for intervention by inpatient dietitians were raised. |
| Screener administration | Lengthy | 12 | *Too many questions for a screener* | The screener was perceived by some to be too long and either overlapping with domains of an assessment, causing people being screened to become irritated, or discouraging clinicians from completing it. |
| | Age appropriateness varies | 2 | *I found the screening tool useful for [older people]. However, I found it difficult for adolescents.* | Clinicians reported conflicting views on the applicability of the screener with children and young people. |
| | Inadequate consumer health literacy | 12 | *Often the consumer is not aware of their own history* | A lack of the person's understanding of their health history and a tendency for clinicians to 'read between the lines' were frequently described. |
| | Conflicting information from consumer versus medical record | 12 | *Consumer feedback is often not accurate compared to the medical record* | Clinicians encountered conflicting responses to items when comparing sources and felt unclear on how to resolve this. |
| Design | Simpler formatting and flow | 15 | *Layout and readability of the screening form was problematic* | The structural format (e.g., position of checkboxes) and domain progression (e.g., beginning with weight items) were often identified as negatively impacting acceptability. |

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**TABLE 4** (Continued)

| Theme | Sub-theme | Number of times coded | Quotation | Description |
|---|---|---|---|---|
| | Include open-response sections | 6 | *Option to add more info at the end of some of the questions* | Clinicians reported a perceived need to provide answers other than 'Yes/No' to items for greater accuracy and contextual detail. |
| Screener domains | Include diet variety | 2 | *Also ask about types of food consumed instead of just asking about weight and appetite* | Dietary diversity was viewed as an important missing domain. |
| | Broaden range of issues | 6 | *Disorders does not include swallowing issues* | Clinicians perceived a restricted scope of issues screened for especially disordered eating. However, some reflected that adapting the language could encompass this, without adding items. |
| | Consider medication side-effects | 4 | *Maybe a question about nausea/vomiting as this is a common side-effect of some antidepressants and can impact nutritional intake* | Medication side-effects were seen as an important missing domain. |
| | Food security is an important item | 2 | *Very important to screen for food insecurity* | Food insecurity was seen as a key domain to include, though lacking adequate intervention capabilities. |
| Timeframe | Limited timeframes | 10 | *Time frames may exclude significant data (e.g., just because appetite has been stable for 1 month it may still be clinically relevant)* | Time frames (e.g., around appetite, starting new medications) were perceived as limited, reducing the sensitivity of the tool. |

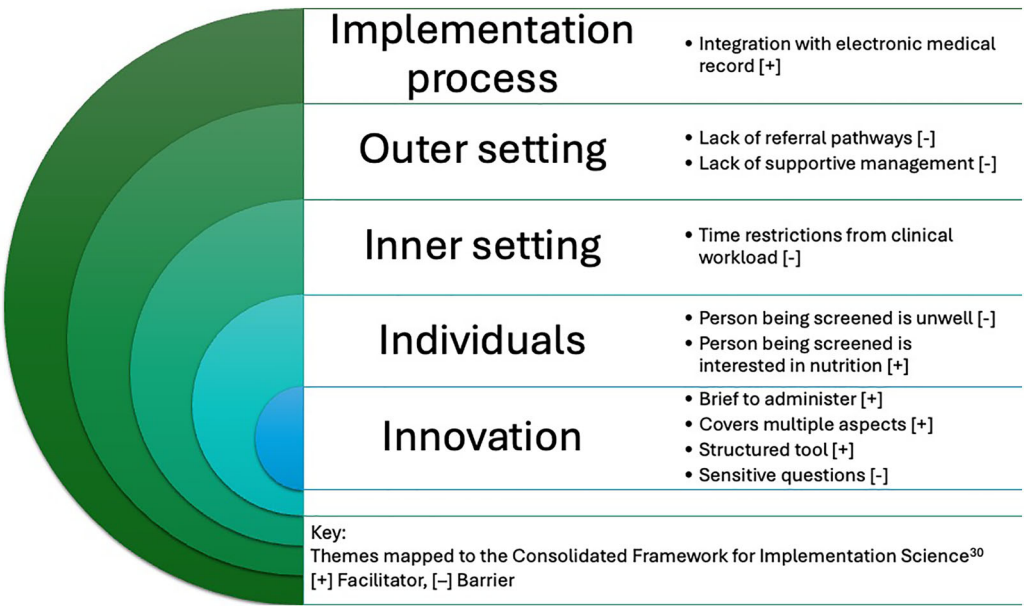


**FIGURE 1** Barriers and facilitators to implementation of the NutriMental Screener.

acceptable, and appropriate (all mean scores >3/5) when tested by 54 inpatient and outpatient clinicians with 256 consumers across seven Australian mental health settings. Content analysis identified 17 areas for consideration (subthemes) to improve the feasibility, acceptability and appropriateness of the screener, and for its implementation into routine clinical care.

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This study builds upon the preliminary feasibility testing of the tool, implemented by research assistants in Switzerland.[23] In the Swiss study, a German version of the tool was included alongside a range of other nutrition assessments, conducted by research assistants with three evenly spread groups: (i) mental health inpatients ($n = 65$), (ii) mental health outpatients ($n = 67$) and (iii) people without mental illness (controls) ($n = 64$). Mental health inpatients and outpatients were considerably more likely to report at least one nutrition risk (94.7% of the clinical sample compared to 34.4% of controls).[23] Similarly, the vast majority of the current Australian mental health sample reported at least one nutrition risk. The percent of 'yes' responses for each question on the screener were also similar between the Swiss study and the current Australian study, with no major discrepancies. For example, 54% of the Swiss sample responded 'yes' to Question 1 compared to 71.0% in the Australian study, and 16.7% responded 'yes' to Question 2 in both the Swiss and Australian studies.

Interestingly, the desire for dietitian support was not related to the NutriMental total score (out of 9) in the Swiss study, which differs to the current study conducted in Australia, which found a low positive correlation. This may be due to a different methodological approach applied.[23] The current Australian study also found moderate agreement between selecting desire for dietetic support and the clinicians' impression of the need for dietetic support, and a low positive correlation between total screener score and clinical impression of need for dietetic support. These findings suggest a degree of congruency between positive responses on the screener and ultimately the need for dietetic support. However, this model is built upon the idea that priority is dependent on the accumulation of nutrition-related issues, rather than any individual issues being higher priority. With the vast majority of consumers reporting at least one nutrition risk, a method for determining priority needs to be determined.

The approach to screening people with mental illness is critical to consider. Qualitative feedback reinforced that person-centred language, free from ambiguity, with simple formatting, and appropriate timeframes is important in mental health services. Negative wording can be experienced as condescending, isolating and stigmatising.[31] Further, consistency in the reference timeframe across questions, with the timeframe being appropriate to those potentially experiencing cognitive impairments,[32] is likely to assist consumers in responding. A lack of referral criteria, action pathways and staff to act on referrals reflects the growing dietetics profession in mental health services,[7,15,33] which historically, has been scarce. With the screening tool identifying a broad range of risks, a prioritisation system will need to be developed, through consensus with mental health dietitians to generate consistency.[34]

The strength of this study is that testing of the tool was conducted by >50 clinicians in seven mental health regions across Australia, with the breakdown of professions broadly reflecting current screening practices in mental health services in Australia,[25] and with feedback gained through a questionnaire based on implementation frameworks.[26] The quantitative and qualitative responses allowed for comprehensive assessment of the tool's perceived feasibility, acceptability, and appropriateness, whilst mapping qualitative feedback to the Consolidated Framework for Implementation Research.[29,30] In addition, we were able to identify positive relationships between NutriMental total scores and (i) services user's desire for dietitian support, and (ii) clinicians' perceived need for dietitian support. Together, each of these data demonstrate moderate feasibility, acceptability, and appropriateness of the tool, and provide direction for tool improvement through refinement.

Limitations of the study are as follows. First, it is unclear if the clinician responses are representative of all mental health clinicians and consumers across Australia, as recruitment of clinicians, and its testing with consumers, were completed through convenience strategies. Second, it was not possible to explore differences in responses by profession, with certain professions underrepresented. We were, however, able to recruit predominantly nurses and dietitians (~75% of the clinicians), which are often the professions to complete the screening and receive the subsequent assessment referral, respectively.[15] Third, this study focused on the mental health clinician perspective. Future studies will need to include a specific focus on consumer perspectives. Fourth, the amount of missing data may not be a true reflection of the tool's implementation in routine clinical practice, as missing data may have been filled in by principal investigators at each site.

The NutriMental Screener will undergo refinement based on feedback received during feasibility testing in Australia. The refined tool may undergo further updates following future feasibility testing in other countries, which will include consumer feedback. Following feasibility testing, the tool will undergo comprehensive reliability and validity testing. Face and content validity have been incorporated into the initial phases of development, that is, completion of literature reviews, extraction of relevant questions from already established tools, multinational expert workshop review and feedback during feasibility testing. The following will be required in the next phase: test–retest reliability, inter-rater reliability and concurrent validity. Given the range of professions

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involved, a profession-based sub-analysis should be considered. In addition, it needs be determined as to what response(s) to the NutriMental screener will trigger a dietitian referral.

Should the results of the reliability and validity testing be favourable, implementation studies will be needed to help overcome challenges with integration into routine clinical care.[30] For example, to ensure the tool is completed routinely and to minimise missing items when the tool is being completed. Further, this study highlighted the broader issue of a lack of referral pathways. Ideally the screener will be integrated into policy documents and health systems, for example, electronic Medical Records, and trigger referral to a dietitian where appropriate.

## AUTHOR CONTRIBUTIONS

Conceptualisation: ST, AMS; Data Curation: ST, OAY, AMS; Formal Analysis: OAY, ST, AMS; Funding Acquisition: N/A; Investigation: all authors; Methodology: ST, OAY, AMS, TB; Project Administration: OAY, PC, EH, BI, SK, RL, OM, AP, JR, AS, MS; Resources: ST, OAY, AMS; Supervision: ST, AMS, JC, PW, PG; Validation: ST, OAY; Visualisation: OAY, ST; Writing – Original Draft Preparation: ST, OAY; Writing – Review & Editing: All authors.

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## ETHICS STATEMENT

This study was approved by the South Eastern Sydney Local Health District (SESLHD) Human Research Ethics Committee (2022/ETH00127).

## CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

## DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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## SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

**How to cite this article:** Teasdale SB, Ardill-Young O, Crawford P, et al. Feasibility of a targeted nutrition-risk screening tool in Australian mental health services: The NutriMental screener. *Nutrition & Dietetics*. 2025;82(4):392-402. doi:10.1111/1747-0080.70000

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