

## Original Research Article

# Validity and reliability of a targeted nutrition-risk screening tool for mental health services

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## ABSTRACT

**Objectives:** This study aimed to evaluate the measurement properties of a targeted nutrition-risk screening tool developed for mental health and alcohol and other drug (AOD) services.

**Methods:** A multicenter validation study was conducted in 12 public and private mental health and AOD services in Australia. People receiving care in inpatient, community, forensic, and residential mental health settings and 1 AOD setting were recruited through convenience sampling. The NutriMental Screener was administered at 3 time points to assess interrater reliability (2 healthcare professionals within 24 h) and test–retest reliability (repeat administration ~1 wk later). Concurrent criterion validity was examined through comparison with a dietitian-completed nutrition assessment incorporating established measures of constipation, malnutrition risk, eating disorder symptomatology, and food insecurity. Reliability was evaluated using Cohen's  $\kappa$  coefficients, and sensitivity and specificity analyses were conducted for domain-specific validity. Feasibility was assessed using completion time and referral outcomes. Findings were reviewed through a structured expert consultation process to refine tool instructions, scoring response layers, and referral processes and frameworks.

**Results:** A total of 207 participants completed the initial screening, with 198 completing all assessments. Test–retest and interrater reliability demonstrated moderate to almost perfect agreement across items ( $\kappa = 0.421$ – $0.939$ , all  $P < 0.001$ ). Domain-specific concurrent validity analyses showed clinically acceptable sensitivity–specificity trade-offs across constructs. Median completion time was ~5 min. Screening generated a dietitian referral in 40.1% of cases and prompted clinical team discussion in a further 34.8% of cases. Expert-informed refinement resulted in minor modifications to wording and referral framework, producing a clinically ready tool.

**Conclusions:** The NutriMental Screener demonstrated acceptable reliability, clinically meaningful validity, and high feasibility. This tool provides an alternative to undernutrition-focused screening tools currently employed in mental health settings and preliminary evidence for use in AOD services.

**Keywords:** nutritional status, nutrition screening, dietitian, health risk behaviors, mental health services, mental disorders

**Abbreviations:** AOD, alcohol and other drug; COSMIN, Consensus-based Standards for the selection of health Measurement Instruments; EDE-QS, Eating Disorder Examination–Questionnaire Short; HFIAS, Household Food Insecurity Access Scale; MST, malnutrition screening tool; MUST, malnutrition universal screening tool.

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## Introduction

Nutrition-risk screening is a critical component of healthcare, initiating the Nutrition Care Process and facilitating early detection of individuals who may require comprehensive assessment by a dietitian or other specialist clinician [1]. In general hospital settings, screening typically focuses on malnutrition associated with acute illness or injury, where increased metabolic demands and reduced appetite contribute to undernutrition, poorer clinical outcomes, prolonged hospital stays, and increased healthcare costs [2].

In contrast, the nutrition risks experienced by people receiving care in mental health and alcohol and other drug (AOD) services differ substantially from those observed in general medical settings [3]. Although undernutrition remains a concern, many individuals experience hyperphagia [4], disordered eating [5,6], impairments in executive functioning affecting dietary behaviors [7], rapid weight gain [8], severe constipation [9], and food insecurity [10]. These multifactorial risks contribute to the well-documented physical health disparities and associated life expectancy gap [11]. Given the complexity and chronicity of care in mental health and AOD services, a broader, contextually appropriate conceptualization of nutrition risk is required.

Despite growing recognition of the importance of nutrition in mental healthcare, a recent scoping review identified a paucity of suitable nutrition screening tools tailored to mental health treatment settings [12]. Of the 17 tools identified, most focused narrowly on single domains such as malnutrition, dysphagia, constipation, disordered eating, or medication side effects in isolation, and only 3 had undergone validation in populations with mental illness. Collectively, this evidence highlighted a critical gap in psychometrically robust, multifaceted screening tools designed to reflect the spectrum of nutrition risks experienced by people receiving care from mental health and AOD services.

To address this gap, the NutriMental Screener was developed as a multidimensional nutrition-risk screening tool specifically designed for mental health settings [13]. Development followed a structured and iterative process, including: 1) identification of priority nutrition-risk domains, 2) targeted literature reviews and qualitative interviews with consumers to incorporate lived experience perspectives, 3) refinement through a modified Delphi process with a multinational expert working group, and 4) feasibility testing in both a Swiss sample using a German-language version [14] and an Australian sample using an English-language version [15].

The present study aimed to evaluate the measurement properties of the NutriMental Screener within Australian mental health and AOD services. Specifically, this study examined the concurrent criterion validity, interrater reliability, and test-retest reliability. We hypothesized that the NutriMental Screener would demonstrate acceptable concurrent criterion validity, moderate-to-high interrater and test-retest reliability, and high feasibility for routine implementation within mental health and AOD services.

## Methods

### Design

This study was an observational, multicenter reliability and validation study conducted in Australian mental health and AOD services. The study was approved by the South Eastern Sydney Local Health District Human Research Ethics Committee (2025/ETH00241) and conducted in accordance with the National Statement on Ethical

Conduct in Human Research. Written informed consent was obtained before study enrolment. Capacity to consent was determined by consensus of clinical staff and, where required, assessed using the University of California, San Diego Brief Assessment of Capacity to Consent [16].

This study was designed in line with the Consensus-based Standards for the selection of health Measurement INstruments (COSMIN) design checklist [17] and reported in line with STROBE [18] reporting standards and Guidelines for Reporting Reliability and Agreement Studies [19].

### Setting

Participants were recruited from 12 public and private mental health and AOD services, comprising inpatient, residential, forensic, and community/outpatient settings across New South Wales, Victoria, Queensland, and Western Australia between May 2025 and December 2025. Services were recruited following expressions of interest from people who contacted the chief investigator to participate. Participating services were: Eastern Health, Gateway Health, Gold Coast Health, Mackay Health, Metro South Addiction and Mental Health Service, Nepean Blue Mountains Local Health District, Northern Health, South Eastern Sydney Local Health District, St John of God Midland Public and Private Hospitals, Sydney Local Health District, West Moreton Health, and Western New South Wales Local Health District.

### Participants

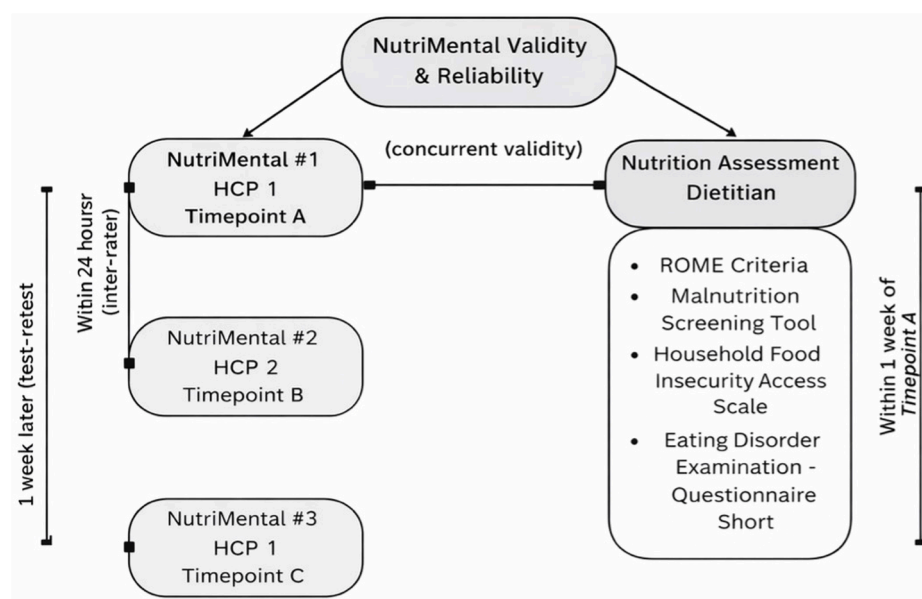
Eligible participants were adults ( $\geq 18$  y) engaged in mental health and AOD services who were able to provide informed consent and communicate in English or via a healthcare interpreter. Participants were excluded if they were unlikely to remain engaged in services for  $\geq 1$  wk to permit completion of repeat assessments.

Participants were identified through convenience sampling by treating clinical teams, aligned with systematic time points in routine care (e.g., at intake, at 1-mo follow-up assessment). Consecutive eligible participants were approached where possible. No participants identified as eligible were recorded on on-site screening logbooks as declining.

### Procedure

The measurement properties of the NutriMental Screener were evaluated using a structured multitime point design completed by a healthcare professional (Figure 1). For this study, “healthcare professional” referred to any professional working within the participating health services, for example, dietitians, dietitian assistants, nurses, occupational therapists, and other allied health practitioners. Interrater reliability was assessed by administering the NutriMental study version (Supplemental File 1) at time point A by healthcare professional 1 and again within 24 h by healthcare professional 2. Test-retest reliability was examined through repeat administration by healthcare professional 1  $\sim 1$  wk later (time point C). Concurrent criterion validity was evaluated at time point A through comparison with a comprehensive dietitian-completed nutrition assessment incorporating established measures of constipation, malnutrition, food insecurity, and eating disorder symptomatology.

The NutriMental Screener is a multifaceted nutrition-risk screening tool comprising 14 items across 3 parts, intended to identify nutrition-related concerns that may warrant referral to a dietitian. Part 1 captures physical health conditions relevant to nutritional risk, including diabetes, cardiovascular disease, dysphagia, active eating disorder, and



**FIGURE 1.** Study design for the evaluation of NutriMental measurement properties. The figure outlines the assessment of interrater reliability, test–retest reliability, and concurrent criterion validity of the NutriMental tool. NutriMental was administered by HCP1 at time point A and by HCP2 within 24 h (time point B) to evaluate interrater reliability. HCP1 repeated administration ~1 wk later (time point C) to assess test–retest reliability. Concurrent validity was examined at time point A through comparison with a dietitian-completed nutrition assessment incorporating established assessment tools. HCP, healthcare professional.

low body weight, using data extracted from the service user's medical record. Part 2 assesses modifiable nutrition-risk factors that may require further assessment if endorsed, and part 3 captures the service user's interest in receiving dietetic support. Parts 2 and 3 are administered through a structured screening conversation between the healthcare professional and the service user. The domains assessed in part 2 include constipation, weight change, appetite, disordered eating thoughts and behaviors, and food security. Items are dichotomous (yes/no). On the basis of a previously conducted modified Delphi process involving principal investigators from Australian feasibility testing [15], items were classified as “high” or “standard” priority for dietetic referral. A high-priority referral is generated if the participant responds “yes” to both  $\geq 1$  high-priority item and to part 3—desire for dietetic support. A standard referral is generated if the participant responds “yes” to both  $\geq 1$  standard priority item and to part 3 but not to any high-priority items. No referral is generated if the participant responds “no” to part 3; however, if the person responds “yes” to  $\geq 1$  high-priority item and “no” to part 3, a clinical team discussion is required due to duty of care.

The comprehensive 30 to 60 min dietitian-led nutrition assessment was completed in parallel to screening procedures and served as the comparator framework for domain-specific validation analyses. Constipation was assessed using the Rome IV criteria for functional constipation, which assesses 6 core symptom items, alongside duration and exclusion criteria, culminating in a binary diagnostic outcome [20]. Malnutrition risk (overnutrition and undernutrition) was assessed using a modified version of the malnutrition screening tool (MST). The MST is a 2-item instrument evaluating recent weight change and appetite, with scores  $\geq 2$  indicating risk of malnutrition (undernutrition) [21]. For the purposes of construct alignment with NutriMental, the MST was modified to capture both weight loss and weight gain and both reduced and increased appetite. Eating disorder symptomatology

was assessed using the 12-item Eating Disorder Examination–Questionnaire Short (EDE-QS) [22], which generates a total score ranging from 0 to 36, with higher scores indicating greater symptom severity and a cutoff score of  $\geq 15$  indicating probable eating disorder. Food security was assessed using the Household Food Insecurity Access Scale (HFIAS), which comprised 9 occurrence items assessed over the previous 4 wk, each followed by a frequency-of-occurrence question with response options of 0 = never, 1 = rarely (once or twice), 2 = sometime (3–10 times), and 3 = often ( $>10$  times) [23]. Frequency scores were summed to yield a total score ranging from 0 to 27, where higher scores indicated greater food insecurity and classified food security status into 4 categories (food secure, mild, moderate, or severe food insecurity).

Before participant recruitment, all healthcare professionals were offered standardized training on the administration of the NutriMental Screener and comparator assessments. Training comprised demonstration videos using simulated assessments to illustrate consistent application of the screening tool and study procedures, together with written guidance documents that included alternative wording for NutriMental Screener questions and use of the Bristol Stool Chart to support application of the Rome IV constipation criteria.

## Outcomes

The primary outcomes were concurrent criterion validity, assessed by measuring the sensitivity and specificity of each item in part 2 of the NutriMental Screener against the corresponding reference assessment; interrater reliability, assessed by measuring the agreement between time point A (healthcare professional 1) and time point B (healthcare professional 2) screener results; and test–retest reliability, assessed by measuring the agreement between time point A and time point C screener results, both completed by healthcare professional 1.

The secondary outcome was feasibility, assessed by the time required for healthcare professionals to complete the NutriMental Screener and the proportion of completed screeners that generated either a dietitian referral or a recommendation for discussion within the clinical team.

### Sample size

We aimed to recruit a sample size of  $n = 200$  to enable precise estimation of item-level interrater and test-retest reliability (Cohen's  $\kappa$ ) and to support domain-specific concurrent validity analyses, assuming item prevalence of approximately 30% to 50% in mental health settings. This target exceeded COSMIN guidance on adequate sample sizes in measurement property studies, improving precision for item-level agreement estimates.

### Statistical analysis

All analyses were conducted using IBM SPSS Statistics, Version 30.0.0. (IBM Corp.). Descriptive and clinical details were presented as the number of people and percentage of the sample. Age was also presented as mean and SD. Feasibility outcomes were presented as median and range (time taken to complete the screener) and number and percentage (number of dietitian referrals or recommended discussions within clinical teams, generated from the total number of screeners completed). All reliability and validity outcomes were analyzed using binary (yes/no) variables and included individual NutriMental items, constipation based on Rome IV criteria, undernutrition based on the modified MST, overnutrition based on the modified MST, likely eating disorder based on the EDE-QS, and food insecurity based on the HFIAS—any form of food insecurity (mild, moderate, or severe). To assist in validity analyses, the NutriMental appetite data were recoded into 2 independent binary variables: increased appetite and decreased appetite.

Interrater and test-retest reliability were assessed using Cohen's  $\kappa$  coefficients with 95% confidence intervals. Percentage agreement was also reported to aid interpretation. Concurrent criterion validity was examined through domain-specific sensitivity and specificity analyses between dichotomous NutriMental items and corresponding dichotomous reference measures from the dietitian-led assessment (e.g., constipation measured by the Rome IV criteria). All analyses were conducted using available data for each outcome. Participants who did not complete a study assessment at a given time point were excluded from analyses for that assessment only, and item-level missing responses were excluded only from analyses involving the affected variable. No imputation of missing data was undertaken.

### Expert refinement and development of the clinically ready tool

After completion of reliability and validity analyses, an expert refinement process was undertaken to optimize the validated study version of the NutriMental Screener for routine clinical practice. Refinements were undertaken in consultation with specialist mental health and AOD dietitians involved in the study, drawing on their clinical expertise and experience with implementation in routine care. The purpose of this process was to improve tool clarity and formatting, align selected thresholds with established clinical standards, and optimize referral prioritization and implementation guidance within real-world service contexts. Importantly, the underlying nutrition-risk domains, screening questions, and response categories remain largely unchanged, with refinements focused on improving interpretability,

clinical alignment, and implementation feasibility rather than altering the constructs being assessed. Accordingly, the psychometric findings reported in this manuscript relate to the validated version, while the implementation-ready version incorporates expert-informed refinements to improve clinical usability.

## Results

### Participant flow and recruitment

In total, 207 people provided consent and completed the first screening (time point A), 204 completed the dietitian-led assessment, 203 completed time point B screening, and 198 completed time point C screening. Participants were recruited from mental health outpatient/community (40.5%), mental health inpatient (36.7%), AOD residential (10.0%), mental health residential (7.6%), and forensic (5.2%) services. The median number of participants included by each organization was 20 (range: 6–25). Median time between first and second screenings was 23.0 h (range: 1.0–95.0), and between first and third screenings was 6.9 d (range: 4.0–47.0).

Mode of interaction for screenings was 76.3% in-person ( $n = 158$ ) at time point A, 66.0% in-person ( $n = 134$ ) at time point B, 60.9% in-person ( $n = 120$ ) at time point C, and 74.4% in-person ( $n = 151$ ) for the dietitian-led assessment. Interpreter support was used in 2.9% ( $n = 6$ ) of screenings at time point A, 1.0% ( $n = 2$ ) at time point B, 1.5% at time point C ( $n = 3$ ), and 1.5% during dietitian-led assessments ( $n = 3$ ).

### Sample characteristics

Participant demographic and clinical details are presented in Table 1. Mean participant age was 39.4 y (SD: 13.8), with the largest age groups being 18 to 30 y (30.0%) and 31 to 40 y (26.1%). For sex and gender, 54.6% were assigned male at birth, with 53.6% identifying as male; one participant identified as gender fluid (0.5%). Most participants identified as Australian as their ethnic or cultural group (84.7%), including 8.4% identifying as Aboriginal and/or Torres Strait Islander.

All participants had one or more psychiatric diagnoses. The most frequent psychiatric diagnoses recorded were schizophrenia spectrum disorder (F20–F29; 52.7%), mood disorders (F30–F39; 32.4%), anxiety and stress-related disorders (F40–F48; 30.9%), and substance use disorders (F10–F19; 22.2%). Most participants were prescribed antipsychotic medication (79.7%), and antidepressants (47.8%) and mood stabilizers or anticonvulsants (22.7%) were also frequently prescribed.

### Test-retest reliability

Test-retest reliability ( $n = 198$ ) demonstrated moderate to almost perfect agreement across NutriMental items, with all Cohen's  $\kappa$  coefficients statistically significant ( $P < 0.001$ ). Items in part 1 generally showed substantial to almost perfect reliability, including diabetes or prediabetes ( $\kappa = 0.939$ ), active eating disorder ( $\kappa = 0.843$ ), weight below recommended range ( $\kappa = 0.823$ ), and heart disease ( $\kappa = 0.743$ ). Reliability for digestive system disorders ( $\kappa = 0.657$ ) and chewing/swallowing disorders ( $\kappa = 0.616$ ) was moderate to substantial (Table 2).

For part 2 items, agreement ranged from moderate to substantial. Significant weight change demonstrated substantial reliability ( $\kappa = 0.815$ ), whereas compensatory behaviors ( $\kappa = 0.677$ ) and food insecurity ( $\kappa = 0.637$ ) showed moderate to substantial agreement. Bowel frequency ( $\kappa = 0.537$ ), appetite change ( $\kappa = 0.519$ ), and disordered eating thoughts ( $\kappa = 0.540$ ) demonstrated moderate agreement. Part 3,

**TABLE 1**  
Participant demographic and clinical characteristics (*n* = 207)

| Demographic and clinical detail                                    | <i>n</i> (%) |
|--------------------------------------------------------------------|--------------|
| Gender ( <i>n</i> =207)                                            |              |
| Female                                                             | 95 (45.9)    |
| Male                                                               | 111 (53.6)   |
| Gender fluid                                                       | 1 (0.5)      |
| Sex assigned at birth ( <i>n</i> =207)                             |              |
| Female                                                             | 94 (45.4)    |
| Male                                                               | 113 (54.6)   |
| Age ( <i>n</i> = 207)                                              |              |
| Mean ± SD                                                          | 39.4 ± 13.8  |
| 18–30 y                                                            | 62 (30.0)    |
| 31–40 y                                                            | 54 (26.1)    |
| 41–50 y                                                            | 48 (23.2)    |
| 51–60 y                                                            | 29 (14.0)    |
| 61–70 y                                                            | 8 (3.9)      |
| 71–80 y                                                            | 5 (2.4)      |
| 81–90 y                                                            | 1 (0.5)      |
| Ethnic/cultural group ( <i>n</i> =202)                             |              |
| Oceania                                                            | 171 (84.7)   |
| Australian (no further specification)                              | 146 (72.3)   |
| Aboriginal and/or Torres Strait Islander                           | 17 (8.4)     |
| New Zealand (no further specification)                             | 1 (0.5)      |
| Māori                                                              | 3 (1.5)      |
| Polynesian                                                         | 4 (2.0)      |
| South and Central Asian                                            | 8 (4.0)      |
| South-East Asian                                                   | 8 (4.0)      |
| North-East Asian                                                   | 1 (0.5)      |
| North-West European                                                | 2 (1.0)      |
| Southern and Eastern European                                      | 2 (1.0)      |
| Sub-Saharan African                                                | 5 (2.5)      |
| Peoples of the Americas                                            | 5 (2.5)      |
| Setting ( <i>n</i> = 207)                                          |              |
| Inpatient                                                          | 75 (36.2)    |
| Mental health residential                                          | 16 (7.7)     |
| Alcohol and other drugs residential                                | 21 (10.1)    |
| Forensic <sup>1</sup>                                              | 11 (5.3)     |
| Outpatient/community                                               | 84 (40.6)    |
| Mental disorder diagnoses ( <i>n</i> = 207)                        |              |
| F10–F19. Substance use disorders                                   | 46 (22.2)    |
| F20–F29. Schizophrenia spectrum disorders                          | 109 (52.7)   |
| F30–F39. Mood (affective) disorders                                | 67 (32.4)    |
| F40–F48. Anxiety and stress-related disorders                      | 64 (30.9)    |
| F50–F59. Behavioral syndromes (e.g., eating/sleep disorders)       | 6 (2.9)      |
| F60–F69. Personality disorders                                     | 24 (11.6)    |
| F70–F79. Intellectual disability                                   | 2 (1.0)      |
| F80–F89. Neurodevelopmental disorders                              | 21 (10.1)    |
| Psychotropic and adjunct medication prescription ( <i>n</i> = 207) |              |
| Antipsychotic                                                      | 165 (79.7)   |
| First-generation antipsychotic                                     | 14 (6.8)     |
| Second-generation antipsychotic                                    | 139 (67.1)   |
| Both first-generation and second-generation antipsychotics         | 12 (5.8)     |
| Antidepressant                                                     | 99 (47.8)    |
| Mood stabilizer/anticonvulsants                                    | 47 (22.7)    |
| Anxiolytics/sedatives                                              | 19 (9.2)     |
| Psychostimulants                                                   | 5 (2.4)      |
| Opioid substitutes/antagonists/analgesics                          | 14 (6.8)     |
| Melatonin                                                          | 6 (2.9)      |

Participants may have multiple diagnoses and be prescribed >1 medication.

<sup>1</sup> Includes both inpatient forensic patients and forensic units.

desire for dietetic support, showed moderate reliability ( $\kappa$  = 0.577) (Table 2).

### Interrater reliability

Interrater reliability (*n* = 203) demonstrated moderate to almost perfect agreement across items (all  $P$  < 0.001). Part 1 items showed

substantial agreement for weight below the recommended range ( $\kappa$  = 0.787), active eating disorder ( $\kappa$  = 0.743), and diabetes or prediabetes ( $\kappa$  = 0.762). Moderate agreement was observed for heart disease ( $\kappa$  = 0.594), digestive system disorders ( $\kappa$  = 0.561), and chewing/swallowing disorders ( $\kappa$  = 0.501). Agreement was lower for the item assessing other physical health disorders ( $\kappa$  = 0.421), indicating fair to moderate reliability (Table 2).

Within part 2, significant weight change demonstrated almost perfect interrater reliability ( $\kappa$  = 0.855). Compensatory behaviors ( $\kappa$  = 0.725), food insecurity ( $\kappa$  = 0.640), and disordered eating thoughts ( $\kappa$  = 0.629) showed substantial agreement. Moderate agreement was observed for appetite change ( $\kappa$  = 0.560) and bowel frequency ( $\kappa$  = 0.535). Part 3, desire for dietetic support, showed substantial agreement ( $\kappa$  = 0.642) (Table 2).

### Concurrent criterion validity

Concurrent criterion validity demonstrated variable sensitivity and specificity across items depending on the construct assessed and the combination rule applied (Table 3). For constipation, item 2a showed moderate sensitivity (46.7%) and good specificity (83.6%) against the Rome IV criteria, indicating stronger performance in ruling out constipation than detecting all cases.

For undernutrition risk, item 2b (weight loss) demonstrated balanced performance with weight loss (>5 kg) against the modified MST (sensitivity 70.8%, specificity 90.9%); decreased appetite (item 2c) showed very high sensitivity (82.5%) and specificity (95.9%) against the decreased appetite element of the modified MST. When combined in a way like that of the standard MST, item 2b (weight loss) and item 2c (decreased appetite) together resulted in high sensitivity (78.3%) and specificity (96.1%) against the modified MST high-risk category (scores 3–5). Overnutrition risk showed similar results, with 2b (weight gain) (83.0% and 85.7%) and increased appetite (67.1% and 93.2%) against their equivalents in the modified MST. The combination of item 2b (weight gain) and item 2c—increased appetite—showed moderate sensitivity (54.5%) and high specificity (93.7%) against the modified MST—high risk (score 3–5).

For disordered eating, item 2d (disordered eating thoughts) demonstrated balanced performance (sensitivity 70.3%, specificity 77.8%), whereas compensatory behaviors (item 2e) showed lower sensitivity (43.2%) but high specificity (90.4%). The combination of an affirmative response to either item 2d or item 2e improved sensitivity (75.7%) with moderate specificity (71.3%), whereas the combination of affirmative responses to both items 2d and 2e increased specificity (97.0%) but reduced sensitivity (37.8%). Food insecurity (item 2f) demonstrated moderate sensitivity (65.0%) and high specificity (88.3%) relative to the HFIAS.

### Feasibility

Median time taken to complete the screener at each time point was 5.0 min (range: 1.0–20.0) for time point A, 5.0 min (range: 1.5–16.0) for time point B, and 5.0 min (range: 5.0–18.0) for time point C. Combining data from the 3 time points into a total sample, the mean time taken to complete the screener was 5.0 min (range: 1.0–18.0), with 66% completed in ≤5 min.

At time point A (*n* = 207), 135 screeners (65.2%) had ≥1 high-priority item selected, and a further 54 screeners (26.1%) had ≥1 standard priority item selected. When applying predefined referral criteria, 62 high-priority referrals (30.0%) were generated, and 21 standard referrals (10.1%) were generated. An additional 72 cases (34.8%) required discussion with the clinical team regarding potential

**TABLE 2**

Test–retest and interrater reliability of the NutriMental Screener

| Item number                                                                                                                                            | Test–retest reliability ( <i>n</i> = 198) |          |              |                | Interrater reliability ( <i>n</i> = 203) |          |              |                |
|--------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|----------|--------------|----------------|------------------------------------------|----------|--------------|----------------|
|                                                                                                                                                        | <i>P</i> <sub>0</sub> (%)                 | $\kappa$ | 95% CI       | <i>P</i> value | <i>P</i> <sub>0</sub> (%)                | $\kappa$ | 95% CI       | <i>P</i> value |
| 1a. Diabetes or prediabetes?                                                                                                                           | 98.5                                      | 0.939    | 0.870, 1.000 | <0.001         | 94.6                                     | 0.762    | 0.627, 0.897 | <0.001         |
| 1b. Heart disease (e.g., stroke, coronary artery disease, dyslipidemia, high blood pressure)?                                                          | 88.9                                      | 0.743    | 0.643, 0.843 | <0.001         | 82.8                                     | 0.594    | 0.474, 0.714 | <0.001         |
| 1c. Chewing or swallowing disorders (e.g., dysphagia)?                                                                                                 | 95.5                                      | 0.616    | 0.387, 0.845 | <0.001         | 93.1                                     | 0.501    | 0.276, 0.726 | <0.001         |
| 1d. Digestive system disorders/issues (e.g., significant diarrhea, constipation, reflux)?                                                              | 84.8                                      | 0.657    | 0.545, 0.769 | <0.001         | 80.8                                     | 0.561    | 0.439, 0.683 | <0.001         |
| 1e. An active eating disorder (e.g., anorexia, bulimia, binge eating)?                                                                                 | 97.5                                      | 0.843    | 0.708, 0.978 | <0.001         | 96.1                                     | 0.743    | 0.572, 0.914 | <0.001         |
| 1f. Weight below the recommended range (BMI <20 kg/m <sup>2</sup> )                                                                                    | 98.0                                      | 0.823    | 0.652, 0.994 | <0.001         | 97.5                                     | 0.787    | 0.607, 0.967 | <0.001         |
| 1g. Another physical health disorder that could be supported by a dietitian?                                                                           | 90.4                                      | 0.733    | 0.619, 0.847 | <0.001         | 80.8                                     | 0.421    | 0.270, 0.572 | <0.001         |
| 2a. Had bowel movements fewer than 3 times per week?                                                                                                   | 86.4                                      | 0.537    | 0.384, 0.690 | <0.001         | 85.7                                     | 0.535    | 0.386, 0.684 | <0.001         |
| 2b. Have you experienced significant changes in weight (either losing or gaining it) without trying (e.g., $\geq 5$ kg difference)?                    | 94.4                                      | 0.815    | 0.705, 0.925 | <0.001         | 93.1                                     | 0.855    | 0.726, 0.984 | <0.001         |
| 2c. Experienced significant change in appetite (e.g., loss or gain of appetite)?                                                                       | 75.8                                      | 0.519    | 0.403, 0.635 | <0.001         | 77.8                                     | 0.560    | 0.448, 0.672 | <0.001         |
| 2d. Had several days of strong urges to eat, preoccupation or distress about eating, or thinking about food in a way which you felt unable to control? | 80.3                                      | 0.540    | 0.413, 0.667 | <0.001         | 85.2                                     | 0.629    | 0.509, 0.749 | <0.001         |
| 2e. Fasted for nonreligious reasons, vomited, taken laxatives, or exercised in a way that you felt unable to control to try to manage your weight?     | 91.9                                      | 0.677    | 0.530, 0.824 | <0.001         | 92.6                                     | 0.725    | 0.594, 0.856 | <0.001         |
| 2f. Had multiple occasions where you went without food or did not have sufficient food in the home and could not readily access more?                  | 88.4                                      | 0.637    | 0.502, 0.772 | <0.001         | 87.7                                     | 0.640    | 0.511, 0.769 | <0.001         |
| 3a. Do you feel you require additional support with your nutrition and eating for any of the discussed issues?                                         | 79.8                                      | 0.577    | 0.461, 0.693 | <0.001         | 83.3                                     | 0.642    | 0.534, 0.750 | <0.001         |

Abbreviations: CI, confidence interval;  $\kappa$ , Kappa coefficient; *P*<sub>0</sub>, observed agreement.**TABLE 3**

Concurrent criterion validity of the NutriMental Screener items against reference measures

| NutriMental item                       | Comparator                                      | True positive | False negative | Sensitivity (%) | True negative | False positive | Specificity (%) |
|----------------------------------------|-------------------------------------------------|---------------|----------------|-----------------|---------------|----------------|-----------------|
| Constipation                           |                                                 |               |                |                 |               |                |                 |
| 2a.                                    | Rome criteria for constipation                  | 7             | 8              | 46.7            | 158           | 31             | 83.6            |
| Malnutrition (undernutrition)          |                                                 |               |                |                 |               |                |                 |
| 2b. (substantial weight loss)          | Modified MST—weight loss (>5 kg)                | 17            | 7              | 70.8            | 160           | 16             | 90.9            |
| 2c. (decreased appetite) <sup>2</sup>  | Modified MST—decreased appetite question        | 47            | 10             | 82.5            | 140           | 6              | 95.9            |
| 2b. (weight loss) and 2c. <sup>2</sup> | Modified MST—high-risk (score 3–5)              | 18            | 5              | 78.3            | 172           | 7              | 96.1            |
| 2b. (substantial weight gain)          | Modified MST—weight gain (>5 kg)                | 39            | 8              | 83.0            | 132           | 22             | 85.7            |
| 2c. (increased appetite) <sup>2</sup>  | Modified MST—increased appetite question        | 57            | 28             | 67.1            | 110           | 8              | 93.2            |
| 2b. (weight gain) and 2c. <sup>2</sup> | Modified MST—high-risk (score 3–5)              | 24            | 20             | 54.5            | 148           | 10             | 93.7            |
| Disordered eating                      |                                                 |               |                |                 |               |                |                 |
| 2d.                                    | Eating Disorder Examination Questionnaire—Short | 26            | 11             | 70.3            | 130           | 37             | 77.8            |
| 2e.                                    | Eating Disorder Examination Questionnaire—Short | 16            | 21             | 43.2            | 151           | 16             | 90.4            |
| 2d. or 2e.                             | Eating Disorder Examination Questionnaire—Short | 28            | 9              | 75.7            | 119           | 48             | 71.3            |
| 2d. and 2e.                            | Eating Disorder Examination Questionnaire—Short | 14            | 23             | 37.8            | 162           | 5              | 97.0            |
| Food insecurity                        |                                                 |               |                |                 |               |                |                 |
| 2f.                                    | Household Food Insecurity Assessment Scale      | 26            | 14             | 65.0            | 144           | 19             | 88.3            |

Abbreviation: MST, malnutrition screening tool.

<sup>1</sup>Modified MST risk aligns with standard MST with a score of 3–5 indicating high risk of malnutrition.<sup>2</sup> Reanalysis separating NutriMental appetite change into decreased or increased appetite.

action due to a duty of care. Fifty-two screeners (25.1%) did not result in a dietetic referral or require clinical team discussion.

### Expert refinement for clinical implementation

Specialist mental health and AOD dietitians provided verbal and written feedback to refine the version used in the validation study and produce a clinically ready tool ([Supplemental File 2](#)). Key updates are summarized in [Box 1](#).

### Discussion

This multicenter study evaluated the measurement properties—concurrent criterion validity, interrater reliability, test–retest reliability, and feasibility—of the NutriMental Screener, a multidimensional nutrition-risk screening tool developed specifically for mental health and AOD services. The NutriMental Screener demonstrated moderate to substantial reliability across domains, clinically

**Box 1**

## Expert refinement informed by study findings

After the planned expert refinement process, the following key updates were made to generate the clinically ready version of the NutriMental Screener.

- Screening timeframes: recommended screening timeframes were added based on health service nutrition screening policy.
- Weight below the recommended range: BMI threshold revised from 20 kg/m<sup>2</sup> to <18.5 kg/m<sup>2</sup> (≤65 y) and <23 kg/m<sup>2</sup> (>65 y) to align with clinical definitions of underweight and age-related risk.
- Weight change: categories stating the magnitude of weight change, consistent with the malnutrition screening tool, were incorporated as a second-tier response to support clinical decision-making, while retaining the original binary (yes/no) response used in the validation study.
- Appetite: item refined to distinguish increased and decreased appetite, reflecting differential validity against comparator measures.
- Referral prioritization: the “high” and “standard” referral process automatically generated from the screening tool was removed and a suggested dietitian prioritization framework developed.

The clinically ready version of the NutriMental Screener designed for integration into routine mental health and alcohol and other drug care, and a suggested dietitian prioritization framework, are available in [Supplemental File 2](#).

interpretable sensitivity–specificity trade-offs, and high feasibility within routine care. Together, these findings support its use as a brief, structured screening instrument for identifying nutrition-related risks in mental health and AOD settings.

Mental health and AOD services face persistent challenges in systematically addressing physical health. Nutrition is an important target because it influences both physical and mental health through interconnected pathways, including systemic inflammation, oxidative stress, metabolic dysfunction, and alterations in the gut–brain axis and microbiota [11,24]. Consequently, an early identification of nutrition-related risks may provide opportunities to address modifiable factors that contribute to both cardiometabolic health and mental health outcomes. This aligns with international initiatives such as the Equally Well Consensus Statement in Australia [25], alongside similar programs in New Zealand and the United Kingdom, which emphasize earlier identification of physical health risks, improved access to allied health services including dietitians, and systems to monitor progress toward improved health outcomes.

A key finding of this study is that the NutriMental Screener identified undernutrition risk with performance characteristics comparable with established malnutrition screening approaches, while also capturing risks that are common in mental health and AOD populations but not addressed by traditional tools such as the MST or malnutrition universal screening tool (MUST). The MST and MUST focus primarily on weight loss and reduced food intake [21,26], whereas people receiving mental healthcare frequently experience rapid weight gain related to psychotropic medication [27], food disinhibition [28] and disordered eating behaviors [5,6], constipation (particularly in clozapine-treated populations) [9], and food insecurity [10], in addition to undernutrition risk [29]. By incorporating these domains, the NutriMental Screener better reflects the nutrition-risk profiles encountered in routine mental health practice.

Importantly, the weight and appetite domains demonstrated clinically coherent validity relative to MST-style risk identification, suggesting NutriMental could provide a suitable alternative to the MST or

MUST in mental health settings, while substantially broadening nutrition risks detected.

The reliability findings strengthen confidence in the tool’s suitability for routine practice. Most items demonstrated moderate to substantial agreement across raters and time points, indicating consistent performance regardless of who administered the screener or when it was completed. This is particularly important in mental health services, where screening is often completed by nurses, dietitian assistants, or other allied health clinicians rather than dietitians [30]. For a tool intended for service-wide implementation, consistency across different professionals is essential to ensure equitable and dependable identification of nutrition risk.

The NutriMental Screener also demonstrated high feasibility for routine practice, with a median completion time of ~5 min. The inclusion of service user preference distinguishes it from traditional MSTs and aligns with recovery-oriented, person-centered models of care [31]. The proportion of screeners generating dietetic referral or clinical team discussion highlights the substantial burden of nutrition-related risk within mental health and AOD services and supports the need for systematic rather than ad hoc nutrition-risk identification [32]. The binary format necessarily simplifies complex constructs to serve as an entry point into the Nutrition Care Process [33], identifying individuals who require further assessment, and is not intended to replace comprehensive assessment tools such as an EDE.

Several limitations should be considered when interpreting these findings. First, participants were recruited through convenience sampling across participating services, which may be more engaged with nutrition screening than typical services. In addition, participants identified by clinical teams may have been more available, stable, cooperative, or perceived as suitable for repeated screening and dietitian assessment. These possibilities could influence feasibility estimates, referral rates, and the apparent acceptability of the tool. Second, although participants were recruited from both mental health and AOD services, AOD representation was limited to a single residential service comprising ~10% of the sample ( $n = 21$ ). Consequently, although these findings provide preliminary support for the use of the NutriMental Screener in residential AOD care, additional validation across a broader range of AOD settings is required. Furthermore, participants were recruited exclusively from Australian mental health services and were required to provide informed consent and engage in repeated assessments. Therefore, the findings may not be fully generalizable to more culturally and linguistically diverse populations, individuals with more acute illness or impaired decision-making capacity, or healthcare systems outside Australia. Third, in some cases, conceptual alignment between the NutriMental screening items and the broader constructs captured by the reference tools required simplification. For example, single screening items were compared against multiitem instruments that capture severity, duration, or functional impact. Some discordance between tools is, therefore, expected and reflects differences in purpose—screening compared with comprehensive assessment—rather than measurement error alone. Fourth, the binary format required to compare against the NutriMental Screener responses reduces complex elements into a yes/no category and does not capture graduations of risk. Fifth, the implementation-ready version of the NutriMental Screener incorporates expert-informed refinements developed after the completion of the validation study. Although these refinements were intended to optimize clinical usability rather than alter the underlying constructs assessed, implementation studies are required to evaluate the performance of the final version in routine care.

Future research should extend beyond concurrent validity to examine predictive validity and clinical impact. It will be important to determine whether screening identifies those most at risk for nutrition-related health complications, whether screening facilitates appropriate intervention, and whether systemic implementation leads to improvements in health outcomes and quality of life.

In summary, these findings support the reliability, validity, and feasibility of the NutriMental Screener study version and informed the development of an implementation-ready version intended for routine clinical practice. It retains the core function of traditional malnutrition screening while extending to domains highly relevant to psychiatric populations. For dietitians and service managers, it offers a structured and time-efficient method to identify nutrition-related risk and can be embedded in mental health services.

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## Author contributions

The authors' responsibilities were as follows – SBT, OA-Y, ASM-S: designed the research; SBT, OA-Y, JC, PBW, ASM-S, SR: developed the methodology; SBT: analyzed the data, wrote the manuscript, and visualized the data; SBT, OA-Y: provided resources; AA, CB, KB, AC, PC, KD, AE, EH, MH, BI, CJ, DJ, RL, KM, OM, AP, ST: conducted the investigation; OA-Y, AA, CB, KB, AC, PC, KD, AE, EH, MH, BI, CJ, DJ, RL, KM, OM, AP, ST: administered the project; JC, PBW, AM-S, SR: supervised the study; OA-Y, AA, CB, KB, AC, PC, KD, AE, EH, MH, BI, CJ, DJ, RL, KM, OM, AP, ST, JC, PBW, AM-S, SR: reviewed and edited the manuscript; and all authors: read and approved the final manuscript.

## Conflict of interest

The authors report no conflicts of interest.

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## Q6 Data Availability

Data are not publicly available due to ethical and privacy restrictions associated with health service data. Access may be granted

upon reasonable request to the corresponding author, subject to relevant institutional and ethics approvals.

## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ajcnut.2026.101489>.

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