



# Self-reported Swallowing and Nutrition Status in Community-Living Older Adults

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## Abstract

More New Zealanders are forecast to grow older in the community, ranging in levels of abilities and needs. Many health conditions can affect swallowing function or nutrition status in older age. However, older adults may not be aware of risk factors and when to seek help. A nationwide survey was conducted of self-reported swallowing ability and nutrition status in community-living New Zealanders aged 65 years and older to assess whether undisclosed swallowing and nutrition problems exist. Respondents completed an amalgamated questionnaire including two validated screening tools: Eating Assessment Tool (EAT-10) and Seniors in the Community: Risk Evaluation for Eating and Nutrition (SCREEN-II). A convenience sample of 1020 adults aged 65–96 years old was obtained. Mean EAT-10 score was 2.15 (SD = 4.3); 22.1% scored above the normative score (3 or more). Mean SCREEN-II score was 48.50 (SD = 6.5); 46.9% scored below normal (< 50 for adults under 85 years old, < 49 for adults over 84 years old). EAT-10 scores significantly correlated with SCREEN-II scores ( $p < 0.001$ ). Scores did not correlate with age or differ between age groups. Significantly more respondents with medical history associated with dysphagia disclosed swallowing and nutrition problems ( $p < 0.001$ ). This data suggest increased prevalence of swallowing difficulties in older age is attributed to health conditions and medications, rather than ageing itself. Swallowing complaints from community-living older adults should not be ignored or attributed to the normal ageing process. This study supports routine nutrition screening in older adults.

**Keywords** Aged · Community dwelling · Deglutition · Deglutition disorders · Malnutrition · Survey

## Introduction

Since 1988, the New Zealand population of adults aged 65 years and older has more than doubled to over 746,900 [1]. In another 30 years, this number is projected to double again. The New Zealand Positive Ageing Strategy was designed to address and support the growing ageing population [2] and was recently relaunched as ‘Better Later Life—He Oranga Kaumātua 2019 to 2034’ [3]. An early goal of

the strategy was for older adults to choose where to live in the community, termed ‘ageing in place’. Implications for remaining in one’s own home extend beyond the physical environment to personal and sociocultural factors, such as sense of attachment, familiarity, security, and self-identity [4]. Policies, services and programmes have since been developed to facilitate ageing in the community in New Zealand [5]. The updated strategy reiterates the objective that ‘people can age in a place they call home, safely and, where possible, independently’ ([3], p. 33). While a fundamental theme in later life is promoting, enhancing and maintaining independence [6], education and support are required for making informed choices [7]. Regarding healthcare decisions, most older adults prefer a shared approach with their doctor [8].

Older age is associated with increased health conditions, comorbidities and medications, some of which are known to affect swallowing function [9–13]. Swallowing difficulties (dysphagia) may also coincide with a medical event unrelated to the head and neck region [14] or occur after

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a period of illness resulting in hospitalisation [15]. Studies investigating the prevalence of dysphagia in hospitalised older adults [16], residential care [17] and community settings [18] include varied methodologies and prevalence estimates, yet all highlight the value of utilising screening tools. Identifying dysphagia risk may also alert clinicians to monitor for associated risks, such as malnutrition [19], aspiration pneumonia [12], reduced quality of life [20] and functional decline [21].

Research highlights the association between dysphagia and malnutrition in older adults [22], yet it is unknown how well older adults themselves are aware of risk factors and when to seek help [23, 24]. We conducted a nationwide survey of self-perceived swallowing and nutrition status in New Zealanders aged 65 years and older who are ageing in place. Self-reported questionnaires are commonly used in ageing research [25]. Our primary aim was to assess whether, based on simple screening tools, swallowing and nutrition problems existed in this population. We hypothesised that community-living older adults with medical history associated with dysphagia would present with swallowing concerns and nutrition risk as defined by validated screening tools. We also hypothesised that swallowing and nutrition scores would worsen with older age.

## Methods

This cross-sectional study was approved by the local ethics committee (University of Auckland Human Participants Ethics Committee: 022615) and was conducted from July 2019 until December 2019.

### Participants

Community-living adults 65 years old and over were eligible to participate in this survey. The study advertisement was emailed once to 543 community groups involving active adults of retirement age in New Zealand. The advertisement was also posted on two professional online forums, inviting readers to circulate the questionnaire weblink with members aged 65 years and older. The authors' email addresses were supplied in case further information about the study was sought by potential respondents. Due to snowball sampling, it is not possible to estimate the response rate. Paper copies were provided with postage paid envelopes as requested. Consent was implied by respondents accessing and completing the survey voluntarily.

### Measurement

The 37-item questionnaire was created on a secure online survey platform (Qualtrics, Provo, UT) and comprised of

demographic information (age, gender, ethnicity, living situation, postcode), general knowledge of 'dysphagia' (Have you heard of the term 'dysphagia'? If yes, what does 'dysphagia' mean in 2–3 words?), medical history, medications, dentition ('condition of teeth') and validated screening tools: Eating Assessment Tool (EAT-10) [26] and Seniors in the Community: Risk Evaluation for Eating and Nutrition (SCREEN-II) [27].

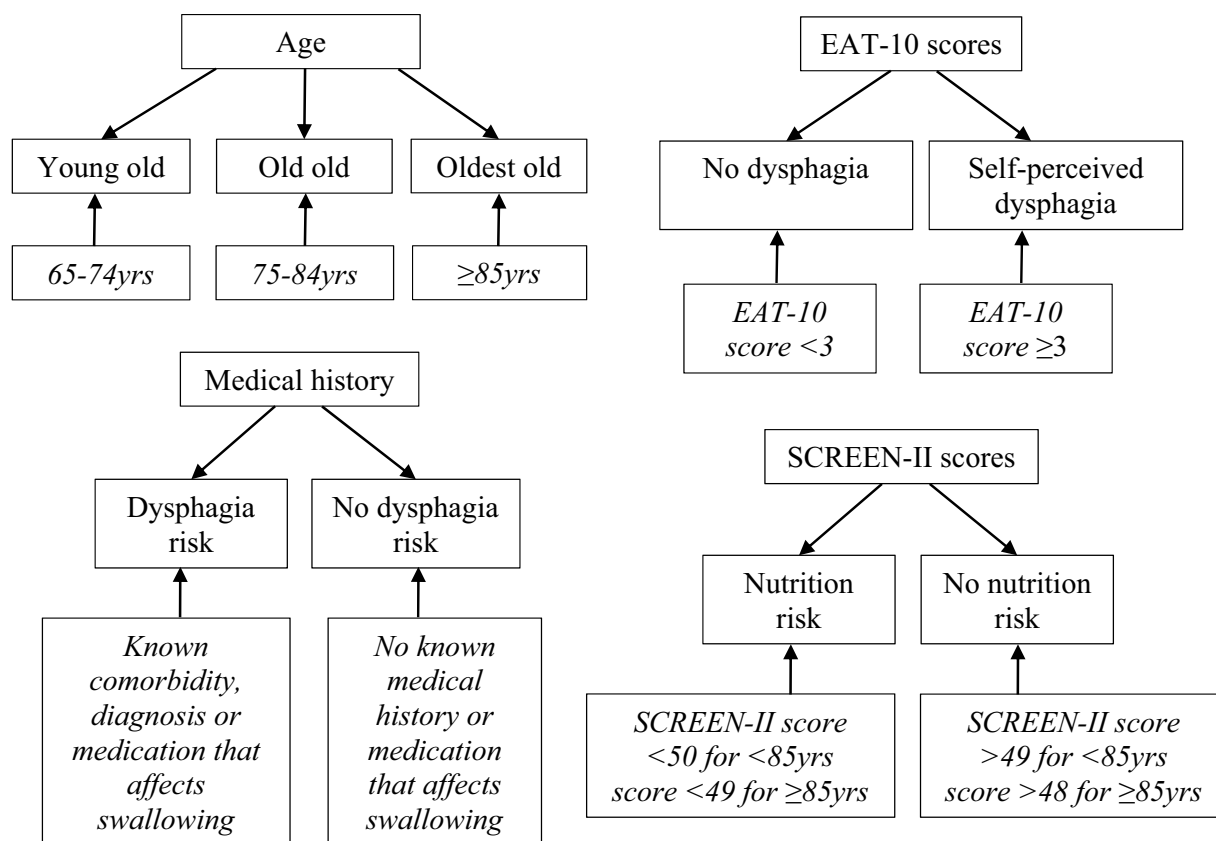
The EAT-10 is a ten-item questionnaire asking users to rate statements about swallowing problems from 0 (no problem) to 4 (severe problem). It is easy to complete, short and used internationally both clinically and in research [26]. It has been translated and validated in many non-English speaking countries [28–33]. A total score of three or higher is considered abnormal. The EAT-10 has been used in prevalence studies for swallow problems in older adults within a number of settings, including hospital [21, 34, 35], residential care [36], the community [37] and mixed settings [38].

SCREEN-II was developed to identify nutrition risk in community-living older adults in Canada [27]. This screening tool includes 17 items with multiple choice answers, such as weight, food intake (fruit, vegetables, meat and alternatives, dairy, fluid) and risk of reduced food intake (swallowing problems, restriction, supplements, eating alone and difficulty with food preparation or obtaining groceries). The maximum score is 64; a score of < 50 is considered high nutrition risk, warranting onward referral to a dietitian or physician. In the original validation study the majority of participants were aged 65–84 years old. Therefore, a local study validated the tool for community-living New Zealanders aged 85–86 years old and defined a new SCREEN-II score of < 49 for high nutrition risk in this age band [39].

### Data Analysis

Descriptive statistics and statistical analysis were performed on SPSS (Version 25). The dependent variables were age, EAT-10 scores and SCREEN-II scores. Distributions for scores were skewed due to greater frequency of normal ratings from community-living respondents: positive skewness for EAT-10 results (normative score < 3) and negative skewness for SCREEN-II results (normative score > 49). Given the size of the sample ( $n > 30$ ), the sampling distribution is assumed normal based on the central limit theorem (Field 2018). Pearson's correlation coefficient was used to assess the association between age, EAT-10 scores and SCREEN-II scores. Respondents were categorised into three age groups (Fig. 1). One-way Analysis of Variance (ANOVA) was performed to compare scores between each group. The alpha level  $p < 0.05$  was considered significant.

Post hoc analyses were conducted on additional groups as defined in Fig. 1. Scores for EAT-10 and SCREEN-II were transformed based on whether they fell within the



**Fig. 1** Groups for data analysis

normative range or not and were organised into dichotomous groups. Any medical history linked to gastrointestinal (including reflux), neurological, head and neck and respiratory diseases were determined as associated with dysphagia by consensus from the authors (all registered medical practitioners or speech-language pathologists). The category ‘other’ included reported swallowing problems or coughing dysfunction of unknown aetiology. For example ‘some swallowing issues started after one surgery’, ‘occasional choking caused by swallowing (saliva) the wrong way’, ‘cough for 30 years caused by unconscious stress mostly but treated with Losec’. Medications were counted and screened; respondents who took anti-reflux medication and did not report a history of reflux were categorised into the ‘gastrointestinal’ group. These groups (Fig. 1) served as independent variables for *t* test analyses. Two-way independent ANOVAs were also performed to investigate the interactions between dysphagia risk and swallowing concern or nutrition risk on scores. If an interaction was significant, a simple effects test was conducted to examine the differences between groups in the interaction. The transformed data were compared with other categorical data, including general knowledge of ‘dysphagia’ and living situation, using chi-square tests.

## Results

The median duration to complete the questionnaire online was 11.5 min. Of the 1039 respondents, 971 completed the questionnaire online and 68 answered on paper. 19 questionnaires were removed from analyses due to age exclusion (18/19 under 65 years old) and repetition (1/19). This resulted in a convenience sample of 1020 adults aged 65–96 years old with a wide geographical distribution the length of New Zealand (Fig. 2). The final dataset included respondents with missing data. If a question was not answered in a validated screening tool, a resulting score was not calculated and therefore omitted from further analysis. Table 1 presents demographic and health information of respondents; where the total percentage of a row does not equal 100%, the percentage difference indicates missing data.

There were 999 valid EAT-10 scores that ranged from 0 to 34; the mean EAT-10 score was 2.15 (SD = 4.3) and the median was 0. Almost one quarter of respondents (22.1%) reported self-perceived dysphagia, scoring above the normative score (3 or more). There were 957 valid SCREEN-II scores that ranged from 25 to 64; the mean SCREEN-II score was 48.50 (SD = 6.5) and the median was 49. Nearly half



**Fig. 2** Location of respondents (Microsoft product screen shot reprinted with permission from Microsoft Corporation: Bing™Maps)

of respondents (46.9%) were identified with nutrition risk, scoring below the normative range (< 50 for adults under 85 years old, < 49 for adults over 84 years old). Neither EAT-10 scores nor SCREEN-II scores correlated with age or significantly differed between age groups. EAT-10 scores across age groups were similar: young old (65–74 years):  $M(\text{mean}) = 2.10$ ,  $SD = 4.3$ , old old (75–84 years):  $M = 2.11$ ,  $SD = 4.4$  and oldest old ( $\geq 85$  years):  $M = 1.90$ ,  $SD = 3.5$ ; median scores were the same (0). Mean SCREEN-II scores were similar across age groups, while median SCREEN-II scores decreased by one point for each age group, ranging from young old: 50 (normative score) to oldest old: 48. There was a significant association between EAT-10 scores and SCREEN-II scores; as EAT-10 scores increased (worsened), SCREEN-II scores decreased (worsened),  $r = -0.368$ ,  $p < 0.001$  (Fig. 3).

One quarter (25.9%) of respondents presented with dysphagia risk based on their medical history (Table 1). The minority of respondents (11.7%) presented with dysphagia risk and self-perceived dysphagia; most respondents did not have dysphagia risk and did not report swallowing difficulties (62.3%). There was a significant interaction between respondents with dysphagia risk and nutrition risk

on EAT-10 scores  $F(1, 937) = 11.33$ ,  $p = 0.001$ , which is presented in Fig. 4. Simple effects analysis demonstrated that respondents with dysphagia risk and nutrition risk had significantly higher EAT-10 scores than respondents without nutrition risk  $F(1, 937) = 45.50$ ,  $p < 0.001$ . Respondents with nutrition risk and dysphagia risk had significantly higher EAT-10 scores than those without dysphagia risk  $F(1, 937) = 90.90$ ,  $p < 0.001$ . Respondents without dysphagia risk had significantly higher EAT-10 scores if they had nutrition risk compared to those without nutrition risk  $F(1, 937) = 22.84$ ,  $p < 0.001$ . Respondents without nutrition risk had significantly higher EAT-10 scores if they also had dysphagia risk  $F(1, 937) = 16.32$ ,  $p < 0.001$ .

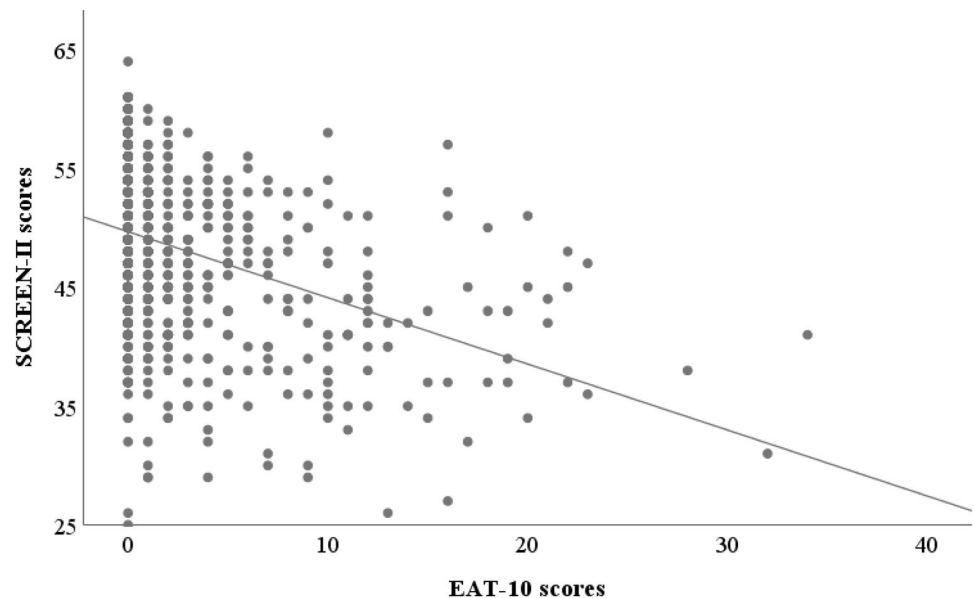
About one third of respondents (35.5%) correctly defined the term dysphagia, while a small proportion provided an incorrect definition (3.2%) or had heard of the term but did not know how to describe the term (2.4%). Just over half of respondents had no general knowledge of ‘dysphagia’ (58.3%); six responses were missing. General knowledge of the term dysphagia did not significantly differ between age groups or screening results. With regards to living situation, a significant difference was observed for SCREEN-II scores; respondents who lived alone presented with higher nutrition risk ( $M = 45.9$ ,  $SD = 6.7$ ) than those living with others ( $M = 50.0$ ,  $SD = 5.8$ ),  $t(631.76) = -9.55$ ,  $p < 0.001$ .

## Discussion

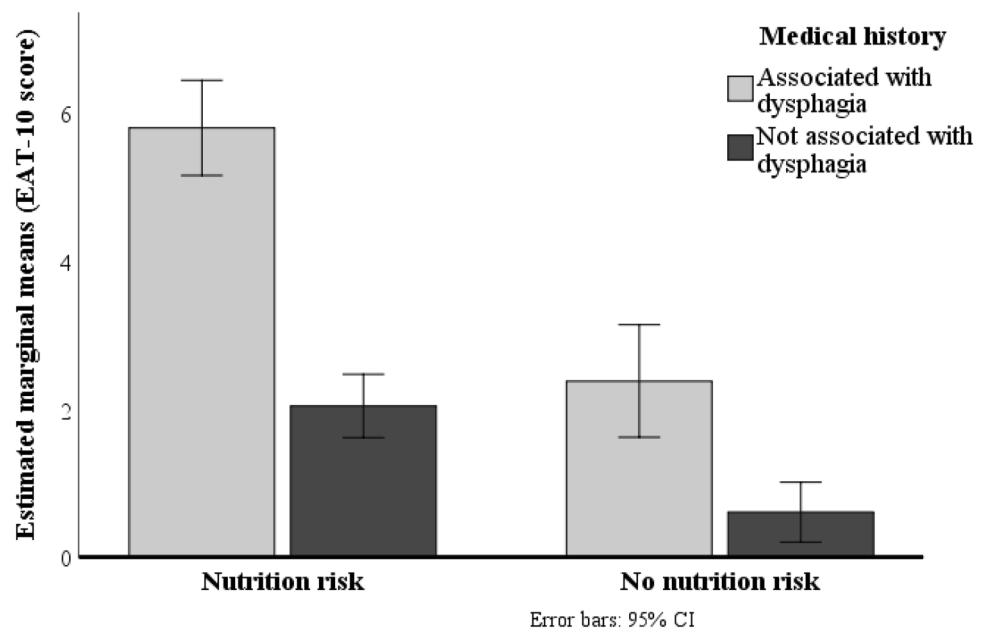
This is the largest cross-sectional study to date of self-reported swallowing and nutrition status in community-living New Zealanders aged 65 years and older. In our convenience sample, almost one quarter (22.1%) scored outside the normative range for EAT-10 and nearly half (46.9%) for SCREEN-II. Overall, mean EAT-10 scores were normal (2.15: normal is < 3), whereas mean SCREEN-II scores were just below normal (48.50: high nutrition risk is < 50). Furthermore, there was a significant relationship between EAT-10 and SCREEN-II scores. Significantly more respondents with medical history associated with dysphagia disclosed swallowing and nutrition problems, supporting our first hypothesis. Contrary to our second hypothesis, swallowing and nutrition scores did not change with age. This implies that the increased prevalence of swallowing difficulties in older age is attributed to health conditions and medications, rather than ageing itself. In other words, older New Zealanders with no medical history associated with dysphagia should not experience swallowing difficulties. While the majority of respondents had at least one medical condition and regular medicine, 10% of the cohort reported no medical condition or described themselves as fit and healthy, and 20% reported no prescribed medications.

**Table 1** Demographic and health information of respondents

Age (years)	Mean, SD	75.22, 6.24
	Median	74.0
Gender <i>n</i> (%)	Female	622 (61.0)
	Male	396 (38.8)
	Gender diverse	2 (0.2)
Ethnicity <i>n</i> (%)	NZ European	958 (93.9)
	Other	50 (4.9)
	NZ Māori	12 (1.2)
Living situation <i>n</i> (%)	Partner/others	665 (65.2)
	Alone	355 (34.8)
State of dentition <i>n</i> (%)	All/mostly own teeth	746 (73.1)
	Denture	159 (15.6)
	Fixed partial	101 (9.9)
	No teeth, no denture	2 (0.2)
Medical history associated with dysphagia <i>n</i> (%)	No overt association	717 (70.3)
	Gastrointestinal	186 (18.2)
	Neurological	48 (4.7)
	Head and Neck	18 (1.8)
	Other	8 (0.8)
	Respiratory	4 (0.4)
'Please report your history of main medical conditions' <i>n</i> (%)	Positive: 'very/pretty good, extremely/very/disgustingly healthy, fit, never sick'	38 (3.7)
	Neutral: 'nil, none'	70 (6.9)
	Reported medical conditions	873 (85.6)
Medications	Mean, SD	2.71, 2.42
	Range	0–15
	<i>n</i> took 0 medications (%)	190 (18.6)
	<i>n</i> took 5 or more (%)	205 (20.1)

**Fig. 3** Correlation between EAT-10 scores and SCREEN-II scores

**Fig. 4** A comparison of EAT-10 scores between groups with and without nutrition risk (from SCREEN-II scores) and dysphagia risk (from medical history)



### Prevalence of Self-reported Dysphagia in Community-Living Older Adults

In prevalence studies, there is risk of inflating prevalence estimates because of variable methodology, lack of standardisation and using screening tools not catered towards the older population [18]. Although the EAT-10 was not specifically devised for older adults, since its validation it has been used for community-living older adults. The percentage of our respondents who self-perceived dysphagia (22.1%) is in line with other studies that have utilised the EAT-10. In a postal survey 25.1% of community-living older adults scored three or more [37], whereas in a large telephone survey 13% reported swallowing problems [40]. In each of these studies, age was disclosed but further participant details were unknown. Conversely, in face-to-face interviews 26.7% scored abnormal EAT-10 scores, which was associated with cerebrovascular disease, COPD, recent pneumonia, medications and altered performance in a 100 ml water swallowing test [41]. Furthermore, a systematic review significantly associated dysphagia with history of clinical disease (e.g. stroke), physical frailty, age (over 70 years old) and depression, estimating a 15% dysphagia prevalence in community-living adults from high quality studies [18]. Prevalence studies of swallowing deficits require critical appraisal not only of the assessment tool, but also of medical history and health status of respondents. Since dysphagia is a symptom, medical history and medications should be documented and analysed, rather than viewing swallowing difficulties in isolation. By dividing our cohort into dysphagia risk associated with medical history and no associative risk, we observed that swallowing and nutrition screening scores

were significantly outside the normative range for the dysphagia risk group. We also observed a significant interaction between dysphagia risk and nutrition risk on EAT-10 scores. If an older adult has a health condition or takes medication that may alter swallowing function, a swallowing screening tool should be utilised. Swallowing difficulties without an overt aetiology should not be overlooked and attributed to age as this risks undermining health care [42]. Initiatives to provide education about swallowing problems should extend from public and patient arenas to interprofessional education and continuing professional development, particularly at the first port of call, such as general practice clinics.

### Associated Nutrition Risk in Community-Living Older Adults

The association between swallowing difficulties and nutrition risk is well established in the literature [43]. Even though age was not associated with nutrition risk in the current study, nearly twice as many community-living older adults reported nutrition problems than swallowing difficulties. It is not possible to predict nutrition risk solely based on medical history or medications, as there are numerous physical and psychosocial factors that contribute to malnutrition [44]. For example, biological ageing processes increase the susceptibility to malnutrition [45]. Social isolation and loneliness are also associated with a higher nutrition risk [46]. In our study, the mean SCREEN-II score for those living with others was normal and better than for the total cohort.

A number of nutrition screening tools are available, some of which are setting dependent [47]. The SCREEN-II was

used in this study because it was designed for community-living older adults and has been adopted in New Zealand. A local study of community-living octogenarians (Life and Living in Advanced Age: A Cohort Study in New Zealand: LILACS NZ) identified 49% of Māori (indigenous people of New Zealand) and 38% of non-Māori with high nutrition risk [48]. Due to our convenience sampling method, our data are not representative of Māori or the culturally diverse population in New Zealand. However, the percentage of our respondents with high nutrition risk (46.9%) falls within the prevalence for the LILACS NZ study. High nutrition risk was also associated with living alone, as well as other factors not investigated in the current study: lower education level, lower physical health-related quality of life and depressive symptoms [48].

Nutrition and dysphagia risk have been assessed in other recent local studies across various settings. There was significantly higher dysphagia and nutrition risk in hospital and residential care settings compared to the community, where 5.3% presented with nutrition risk and 3.5% reported abnormal EAT-10 scores. These percentages are substantially lower than in the current study, which may be attributed to the smaller sample size ( $n=57$ ). A study of newly hospitalised patients in which the majority (88%) had been admitted from the community identified 26.9% as malnourished and 46.6% with malnutrition risk. Mean EAT-10 scores for adults with nutrition risk were 3.6 (SD=6.5) compared to 1.4 (SD=2.2) for no risk [22]. While an association between nutrition risk and self-perceived dysphagia was observed, the cohort is unrepresentative of the current study. At the time of their self-report, participants had experienced an acute change in health that necessitated a hospital admission that may culminate in functional decline [49]. The relationship between dysphagia and nutrition risk necessitates a strong partnership between speech-language pathologists and dietitians in dysphagia management [50]. However, a recent study identified a gap in the community setting; almost one third of speech-language pathologists did not usually collaborate with dietitians [51].

## Limitations

Due to time and financial constraints, random sampling was not possible in this study, therefore results should be interpreted cautiously. The survey was primarily advertised online or distributed by community group emailing lists, relying on older adults who are computer literate and perhaps contributing to an imbalanced response from adults over 85 years old. Furthermore, our cohort may be over-representative of active adults. Therefore, results may not reflect the spectrum of community-living older adults, such

as lower levels of socioeconomic status which was not enquired about. Cognitive status was not assessed and there was no opportunity for respondents to report whether they had difficulty answering the questions or to clarify responses which may have impacted results. While SCREEN-II was originally devised as a face-to-face interview which involved a prerequisite training package for clinicians, it is now available as an online tool 'Nutri-eSCREEN' (Dietitians of Canada, 2020).

## Future Directions

This study may be replicated using a random sampling method that includes equal representation from adults 85 years and older. If conducted again in New Zealand, a strategy should be considered to include more respondents from Māori and Pasifika descent to obtain a sample that is more culturally diverse. The questionnaire may be extended to determine socioeconomic, cognitive, current health and quality of life status. Anthropometrics and instrumental swallowing assessment, such as videofluoroscopic swallowing study with quantitative analyses would advance the interpretation of self-reported results for this population. Community education about dysphagia should be developed and disseminated through general practices and community groups. Interprofessional education and continuing professional development should highlight the dissociation between healthy ageing and dysphagia, as well as the need for routine nutrition screening in community-living older adults, particularly in general practice.

## Conclusion

In this large New Zealand cohort of community-living adults over 65 years old, age did not significantly correlate with self-reported swallowing and nutrition scores. For adults with medical history associated with dysphagia, mean EAT-10 and SCREEN-II scores were outside the normative range. Therefore, the increased prevalence of swallowing difficulties in older age is attributed to health conditions and medications, rather than ageing itself. Any swallowing complaints from community-living older adults should not be ignored or attributed to part of the normal ageing process. Most adults who self-perceived dysphagia also presented with nutrition risk. Since almost half of our respondents presented with high nutrition risk, routine nutrition screening is warranted in the older community-living population. Older adults with swallowing problems in the community should be managed by a team, including regular collaboration between the speech-language pathologist and registered dietitian.

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## Compliance with Ethical Standards

**Conflict of interest** The authors declare that they have no conflict of interest.

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