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Breakfast skipping and academic achievement at 8–16 years: a population study in South Australia

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Research Paper

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Abstract

Objective: While studies have highlighted a link between breakfast consumption and cognitive performance, evidence for how breakfast influences academic outcomes is mixed. This study explored the association between student breakfast skipping and academic achievement. *Design:* This cross-sectional investigation employed population data. Self-reported breakfast consumption was used to categorise students as never, sometimes and always breakfast skippers. Scores on five standardised literacy and numeracy tests were used to classify students to have low or high achievement according to national minimum standards. Poisson regression analyses estimated the relative risk (RR) of low academic achievement among students across breakfast skipping categories, adjusting for student, family and community-level confounding. *Setting:* Government schools in South Australia. *Participants:* Participants included 28 651 students in grades 5, 7 and 9 (aged 8–16 years). *Results:* Overall, 32·3 % of students reported never skipping breakfast, 57·6 % reported sometimes skipping and 10·1 % reported they always skip breakfast. Students who sometimes and always skipped breakfast had an increased risk of low achievement on all five tests, after adjustment for confounding. Greatest risk for low achievement was on numeracy (RR = 1·78, 95 % CI 1·64, 1·94) and reading (RR = 1·63, 95 % CI 1·49, 1·77) among students who always skipped breakfast. Students who sometimes skipped breakfast were also at increased risk for low achievement, though not as higher risk as that among students who reported skipping breakfast every day. *Conclusions:* Results suggest breakfast consumption plays an important role in academic success. Supports to promote regular student breakfast consumption may be one mechanism through which education stakeholders and policymakers can strengthen academic achievement.

During childhood and adolescence, regular consumption of a healthy breakfast provides the energy and nutrients required to support good health, well-being and development[1,2]. Skipping breakfast is common among children and adolescents; international evidence reports a prevalence of breakfast skipping ranging between 10 and 35%[1,3–5]. In Australia, recent research (*n* 71 390) demonstrated that one in three students aged 8–18 years reported skipping breakfast sometimes (1–6 d per week), with one in ten students skipping breakfast every day[3]. Breakfast skipping is associated with other unhealthy diet and physical activity behaviours[1,2,6], and together, these factors have a negative influence on health and well-being throughout the life course[7]. Evidence has also highlighted a link between breakfast consumption and cognitive performance among children and adolescents[2,8,9], leading researchers and policymakers to consider how these effects may play a role in educational outcomes such as school attendance and completion, as well as academic achievement. Given the enduring and wide-ranging influence of poor educational outcomes[10], establishing the relationship that modifiable lifestyle factors, such as regular breakfast consumption, share with academic achievement is important in determining appropriate policy or intervention responses.

Past research has generally indicated positive and null associations between breakfast consumption and academic achievement[1,2,11–13]. The mixed evidence may be a result of variations in how breakfast skipping and/or consumption is defined, the age of children and adolescents included in studies, adjustment of factors that confound the relationship between breakfast consumption and educational outcomes, as well as how academic achievement is measured. Additional methodological limitations including small sample sizes and lack of adjustment for clustering further limit the strength of existing evidence. For instance, a recent systematic review evaluated the effect of habitual breakfast consumption on academic achievement among children and adolescents aged 11–19 years[12]. While the majority of eligible studies demonstrated a positive association between breakfast consumption and academic grades,

some reported non-significant results. However, among studies included, many did not control for factors that confound the relationship between breakfast consumption and academic performance (e.g. socio-economic status) or had small sample sizes (<400 participants), and few included standardised measures of achievement. Only one study was deemed to be of strong quality, with comprehensive adjustment for confounding and use of standardised reading, mathematics and science achievement tests, though this was one of the studies that reported no association between breakfast and academic achievement.

Importantly, school grades and self-reported (subjective) measures of academic achievement can be influenced by extraneous factors including teacher biases and student self-perception[14–16], which may result in less accurate findings (i.e. information/measurement bias) relative to standardised, or objective, measures of academic achievement. Studies that have included standardised measures of academic achievement are limited, and among these, evidence highlighting the association between breakfast consumption and academic performance is also mixed[17–21]. For example, recent research conducted in four Nordic countries (*n* 17 161, 10–11 years) explored the association between breakfast consumption and reading literacy achievement measured via the Progress in International Reading Literacy Study (PIRLS). Students who reported eating breakfast often scored on average from 13 (Norway) to 25 (Sweden) points higher than those who reported eating breakfast rarely, after adjustment for gender and socio-economic position[18]. In contrast, research using data from the Longitudinal Study of Australian Children (LSAC) explored if breakfast skipping (measured via parent interview and time use diaries on three occasions) at ages 8–9 years predicted poor academic achievement 2 years later (*n* 2280, 10–11 years)[17]. Subjective (teacher-reported reading, mathematics, overall achievement) and objective (standardised reading, writing, spelling, grammar, numeracy tests) academic achievement measures were included, with analyses adjusted for confounding (e.g. age, gender, socio-economic status). While children who skipped breakfast were more likely to have poorer teacher-reported outcomes, compared to non-skippers, scores on standardised tests were significantly lower among breakfast skippers on the standardised numeracy test only.

The current study aims to address many of the limitations faced by existing research to examine the link between breakfast skipping and academic achievement. Specifically, we use population-level data and a cross-sectional research design to explore the association between breakfast skipping and scores on five standardised tests of academic achievement (reading, writing, spelling, grammar, numeracy) among a large sample of children and adolescents (*n* 28 651) of a wide age range (8–16 years) in South Australia. We use student-reported habitual breakfast consumption and account for school-level clustering in academic achievement outcomes[22]. We also include comprehensive adjustment of student, family and community-level factors, extending beyond basic demographic characteristics to health and well-being indicators known to influence breakfast consumption and academic outcomes[2,12], which has been another key limitation of existing research.

Methods

Data sources

We utilised existing data from three South Australian population-level datasets, collected in 2021, that included information on student's self-reported breakfast consumption, academic achievement and socio-demographic characteristics. Breakfast consumption was captured within the Wellbeing and Engagement Collection (WEC); a survey of students' emotional well-being, engagement with school, learning readiness and health and wellbeing outside of school[23]. The WEC is administered to students in grades 4–12 annually, with all South Australian schools invited to participate. The collection is conducted via an online data collection platform and usually takes students between 25 and 45 min to complete.

Academic achievement was collected via the National Assessment Program – Literacy and Numeracy (NAPLAN); an annual standardised test for all students in grades 3, 5, 7 and 9 across Australia. NAPLAN measures student's skills in numeracy, reading, writing, spelling, grammar and punctuation. All students are required to complete NAPLAN testing unless they are absent from school on the day of the test, exempt due to a disability or poor language skills, or withdrawn by their caregiver based on objections to testing or religious beliefs[24].

Student, family and community-level characteristics were collected as part of the South Australian Department for Education (DfE) school enrolment census. This included information on student's grade level, language background and parental education. The DfE undertook a linkage of the three datasets using student's unique education identifier. This limited the sample to students attending government (public) schools, as the DfE does not have access to enrolment information or NAPLAN data from private school sectors. A deidentified data file was then provided to the research team for analysis.

Measures

Breakfast skipping

Breakfast skipping was derived from an item in the Health and Wellbeing Out of School domain of the WEC. The item asked 'How often do you eat breakfast?' with an 8-point response option (Never, Once a week, Two times a week… Every day). The question is not asked with an associated definition of breakfast nor timeframe and thus students respond based on their understanding of breakfast and their typical habits of breakfast consumption. The WEC was conducted throughout March–April 2021[25]. To categorise how often students skip breakfast, this scale was recoded into 1 = never skippers (reported eating breakfast every day), 2 = sometimes skippers (reported eating breakfast 1–6 d a week) and 3 = always skippers (reported never eating breakfast).

Academic achievement

The 2021 NAPLAN testing was completed in May 2021. The numeracy domain measures students understanding, fluency, problem solving and reasoning across number and algebra, measurement and geometry and statistics and probability. The reading domain tests the reading of written English and the knowledge and interpretation of language conventions in context. The writing test provides students with a 'prompt' for an idea or topic and are asked to write a response. The spelling and grammar domains test students' use and knowledge of spelling, grammar and punctuation, for written English, within context. As well as continuous scores, students receive a categorical score on each domain based on the National Minimum Standard (NMS) on each domain. Students can be classified as below NMS (does not have the basic knowledge and skills to function at that year level),

at NMS (has basic skills but needs additional assistance to achieve their full potential) and above NMS (has all basic knowledge and skills to function at that year level)[24]. In this study, these categorical scores were used to create a dichotomous outcome for each test, where students who were at or below NMS were defined as having low achievement, and students above NMS were defined as having high achievement.

Student, family and community characteristics

Student, family and community-level characteristics used within the current study were drawn from the WEC and the school enrolment census. Students self-reported gender (Male, Female, Other) collected as part of the WEC was used to classify student gender. Student grade level (5, 7, 9), language background (English only or Non-English speaking background) and parent's highest level of education (Year 11 or below, Year 12, Certificate I to IV, Advanced Diploma or Diploma, Bachelor degree or above) were drawn from the school enrolment census. Community-level socio-economic position was based on student residential postcode (zip code) reported in the enrolment census and then measured using the 2016 Socio-Economic Indexes for Areas Index of Relative Socio-Economic Advantage and Disadvantage (SEIFA IRSAD)[26]. SEIFA categorises each Australian community into quintiles, from Quintile 1 (most disadvantaged) to Quintile 5 (most advantaged). Geographical remoteness was also based on student postcode and measured using the 2016 Accessibility and Remoteness Index of Australia (ARIA)[27]. ARIA classifies communities as major cities, inner regional, outer regional, remote and very remote. Remote and very remote categories were combined given small numbers in these categories.

Information on students' health and well-being was self-reported in the WEC. This included measures of overall health, sadness, worries and sleep quality. Overall health was captured using a question 'In general, how would you describe your health?' with a four-point response scale (1 = Poor, 2 = Fair, 3 = Good, and 4 = Excellent). We combined poor and fair responses into a poor/fair category. Sadness was measured using a three-item scale, adapted from the Seattle Personality Questionnaire Depression subscale[28,29]. The scale included items such as 'I feel unhappy a lot of the time' with a five-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree). Worries were measured on a three-item scale with the same five-point Likert response scale. Items included questions such as 'I worry about things at home'. Sleep quality was captured using the item, 'How often do you get a good night's sleep?' with response options ranging from 0 = Never to 7 = Every day. The psychometric properties of these scales/items are reported elsewhere[25].

Missing data

In the analysis sample (*n* 28 651), 3·6 % (*n* 1420) students had missing data on one to four of the NAPLAN tests, and 7·2 % (*n* 2844) students had missing data on one or more student, family or community-level confounding variable. For NAPLAN tests, this ranged from 1·2 % (*n* 336) for reading to 2·8 % (*n* 793) for numeracy and for confounders, from 0·2 % (*n* 55) for geographical remoteness to 5·9 % (*n* 700) for overall health. We imputed missing outcomes and confounders under the Missing at Random assumption. Auxiliary variables from most recent previous collections years (2019 NAPLAN, 2020 WEC) as well as the current collections were included to improve the imputation model. Auxiliary variables included 2019 NAPLAN tests, 2020 WEC student, family and community-level confounders, and from the 2021 collection, highest level of parental occupation and financial assistance with school fees. Multiple imputation by chained equations was performed using the *mi impute chained* command with 30 imputed datasets and 30 iterations. The results of the imputed analysis did not differ considerably from the complete case analysis (*n* 24 387); therefore, the imputed results are presented with results from complete case analyses in online Supplementary Tables 1–3.

Statistical approach

First, to explore the distribution of breakfast skipping across sample socio-demographic characteristics, descriptive statistics were computed for the three breakfast skipping categories (never, sometimes, always skips) stratified by student (gender, grade level, language background, overall health, sadness, worries, sleep quality), family (highest education level of parent) and community-level confounders (socio-economic position, geographical remoteness). Next, to investigate the association between exposure of skipping breakfast and outcomes of academic achievement, a series of Poisson regression analyses were conducted to estimate the relative risk (RR) of low achievement for children across breakfast skipping categories. The models were conducted using the *glm* command, with family (*poisson*), link function (*log*) and *vce* (*cluster*). The *cluster* command was used to account for the hierarchical nature of the data using the School ID variable. Unadjusted and adjusted RR with 95 % CI are presented, where a RR greater than 1 indicates a higher risk of low academic achievement among students who reported sometimes or always skipping breakfast compared with students who never skip breakfast (reference group), before and after adjusting for confounding variables. Analyses were conducted in Stata version 17[30].

Results

Study participants included students in grades 5, 7 and 9, who were enrolled in government schools and completed both the WEC and NAPLAN in 2021. Figure 1 depicts the process of participant inclusion. The total eligible sample comprised all students enrolled in a government school in February 2021 (*n* 39 583). Students were excluded if they did not participate in the 2021 WEC (*n* 8574), did not have valid WEC data (*n* 118), did not complete the WEC item regarding breakfast consumption (*n* 938) or had missing data on all five NAPLAN tests (*n* 1302). Among students with missing data on a confounding variable (*n* 2844) or missing data on one to four NAPLAN tests (*n* 1420), this information was imputed (see Missing Data). Therefore, the total imputed sample included 28 651 students (72·3 % of the eligible sample).

Overall, 32·3 % of students reported they never skip breakfast, 57·6 % reported sometimes skipping and 10·1 % reported they skip breakfast every day. A description of students in never, sometimes and always breakfast skipping categories according to student, family, and community-level socio-demographic characteristics is presented in Table 1. Among students who reported sometimes or always skipping breakfast were a higher percentage of females relative to males and students in higher *v*. lower grades. A greater percentage of students who always skip breakfast reported poorer overall health, higher levels of sadness and worries and less frequent good night's sleep, compared to sometimes and never skippers. Further, always skippers tended to have less educated parents and live in more socioeconomically disadvantaged areas.

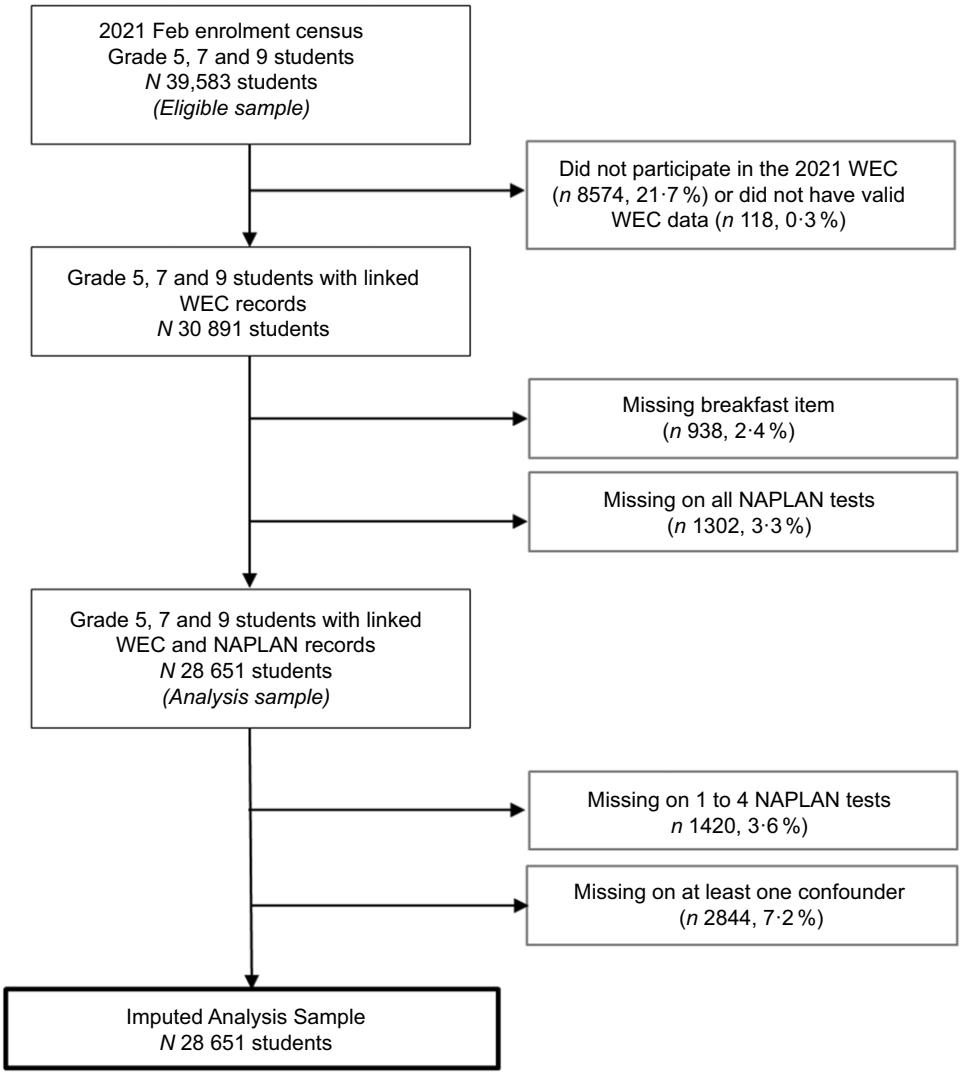

Figure 1. Flow chart of study participants. Note. WEC = Wellbeing and Engagement Collection. NAPLAN = National Assessment Program – Literacy and Numeracy.

The percentage of children with high academic achievement was largest for numeracy (80·5 %) and smallest for writing (69·7 %) NAPLAN tests. A gradient in the percentage of children with low *v.* high academic achievement across breakfast skipping categories was observed for all NAPLAN tests, with a larger percentage of students who sometimes or always skip breakfast having low achievement, compared to those who reported never skipping breakfast (Table 2). For instance, among students who reported always skipping breakfast, 29·4 % had low achievement on reading, compared with 19·6 % among students who reported sometimes skipping, and 13·8 % among those who reported never skipping breakfast.

Unadjusted and adjusted regression results are presented in Table 3, expressed as a RR (95 % CI) of low achievement across NAPLAN tests among sometimes and always skippers, compared with students who reported never skipping breakfast. Students who sometimes and always skipped breakfast had an increased risk of low achievement across all five NAPLAN tests, after adjustment for student, family and community-level confounding variables, as depicted in Fig. 2. Greatest risk for low achievement was observed on numeracy (RR = 1·78, 95 % CI 1·64, 1·94) and reading (RR = 1·63, 95 % CI 1·49, 1·77) among students who reported always skipping breakfast. Students who sometimes skipped breakfast were also at increased risk for low achievement, with risk highest for numeracy (RR = 1·36, 95 % CI 1·27, 1·45), reading (RR = 1·32, 95 % CI 1·23, 1·41) and grammar (RR = 1·32, 95 % CI 1·25, 1·40) test scores, though not as higher risk as that among students who reported skipping breakfast every day.

Discussion

This study sought to overcome many of the methodological limitations of previous research to strengthen our understanding of whether breakfast skipping is linked with poor academic achievement among children and adolescents. Findings demonstrated that students who skipped breakfast had significantly increased risk of poor performance across all five standardised tests of academic achievement, relative to students who did not skip breakfast, after adjustment for a comprehensive set of student, family and community-level confounding variables.

Existing research exploring the link between breakfast skipping and standardised measures of academic achievement is limited, with findings mixed. Research in Nordic countries reported a positive association between breakfast consumption and reading literacy achievement[18]. The current study supports these results and extends findings to a wider age range (from 10–11 years to

Table 1. Socio-demographic characteristics by breakfast skipping categories (*n* 28 651)

	Never skips		Sometimes skips		Always skips	
	n 9245 (32·3 %)		*n* 16 510 (57·6 %)		*n* 2896 (10·1 %)	
	n/Mean	%/SD	*n*/Mean	%/SD	*n*/Mean	%/SD
Gender						
Male	5312	57·5	8023	48·6	1158	40·0
Female	3865	41·8	8244	49·9	1631	56·3
Other	68	0·7	243	1·5	107	3·7
Grade level						
Grade 5	4211	45·5	5976	36·2	542	18·7
Grade 7	3122	33·8	5805	35·2	1010	34·9
Grade 9	1912	20·7	4729	28·6	1344	46·4
Language background						
English only	6896	74·6	12 368	74·9	2351	81·2
Non English	2349	25·4	4142	25·1	545	18·8
Overall health						
Poor/Fair	1038	11·2	3494	21·2	1385	47·8
Good	4335	46·9	8210	49·7	1128	39·0
Excellent	3873	41·9	4806	29·1	383	13·2
Sadness	2·6	0·9	2·9	0·9	3·4	1·0
Worries	2·9	1·0	3·2	1·0	3·6	1·0
Frequency of a good night sleep	5·0	2·0	3·9	2·0	2·5	2·2
Highest education level of parents						
Year 11 or below	795	8·6	1868	11·3	527	18·2
Year 12	788	8·5	1626	9·8	390	13·5
Certificate I to IV	2394	25·9	5047	30·6	1049	36·2
Advanced Diploma/Diploma	1306	14·1	2314	14·0	383	13·2
Bachelor degree or above	3963	42·9	5655	34·3	546	18·9
Socio-economic position						
1 (Most disadvantaged)	2049	22·2	4163	25·2	1092	37·7
2	1414	15·3	2767	16·8	503	17·4
3	1409	15·2	2687	16·3	449	15·5
4	2026	21·9	3367	20·4	502	17·3
5 (Most advantaged)	2347	25·4	3527	21·4	350	12·1
Geographical remoteness						
Major Cities	6552	70·9	11 648	70·6	2025	69·9
Inner Regional	1257	13·6	2343	14·2	408	14·1
Outer Regional	1068	11·6	1882	11·4	367	12·7
Remote/Very Remote	368	4·0	636	3·9	95	3·3

Note. SD = standard deviation.

8–16 years), broader aspects of academic performance and by accounting for more comprehensive confounding. However, our findings deviate from that of other existing research. Specifically, a study in the United States (*n* 21 400, 5–15 years) found no significant association between breakfast consumption and scores on standardised reading, mathematics, and science achievement tests[21]. The lack of association identified in this study, however, may reflect the measure of breakfast consumption used, which was frequency of breakfast consumption as a family, rather than child or adolescent breakfast consumption.

Our findings also contrast, in part, with more recent research conducted in Australia using data from the LSAC, which included the same standardised measures of academic performance (NAPLAN). The percentage of breakfast skippers in this study

Table 2. Prevalence of low academic achievement by breakfast skipping categories and among the overall sample (*n* 28 651)

	Never skips		Sometimes skips		Always skips		Total	
	n 9245 (32·3 %)		*n* 16 510 (57·6 %)		*n* 2896 (10·1 %)		*n* 28 651 (100·0 %)	
	n	%	*n*	%	*n*	%	*n*	%
Numeracy	1260	13·6	3370	20·4	950	32·8	5580	19·5
Reading	1277	13·8	3242	19·6	850	29·4	5369	18·7
Spelling	1541	16·7	3485	21·1	842	29·1	5868	20·5
Grammar	1678	18·1	4224	25·6	1052	36·3	6954	24·3
Writing	2378	25·7	5138	31·1	1171	40·4	8688	30·3

Table 3. Results from regression analyses examining the effect of breakfast skipping on low academic achievement (*n* 28 651)

	Unadjusted		Adjusted	
	RR	95 % CI	RR	95 % CI
Numeracy				
Never skips	Ref		Ref	
Sometimes skips	1·50*	1·39, 1·61	1·36*	1·27, 1·45
Always skips	2·41*	2·19, 2·64	1·78*	1·64, 1·94
Reading				
Never skips	Ref		Ref	
Sometimes skips	1·42*	1·32, 1·53	1·32*	1·23, 1·41
Always skips	2·13*	1·94, 2·33	1·63*	1·49, 1·77
Spelling				
Never skips	Ref		Ref	
Sometimes skips	1·27*	1·19, 1·35	1·19*	1·12, 1·26
Always skips	1·74*	1·60, 1·90	1·37*	1·26, 1·48
Grammar				
Never skips	Ref		Ref	
Sometimes skips	1·41*	1·32, 1·50	1·32*	1·25, 1·40
Always skips	2·00*	1·85, 2·17	1·58*	1·47, 1·70
Writing				
Never skips	Ref		Ref	
Sometimes skips	1·21*	1·15, 1·27	1·14*	1·09, 1·19
Always skips	1·57*	1·46, 1·69	1·25*	1·17, 1·33

Note. RR = Relative risk. *$P < 0·001$. Student (gender, grade level, language background, overall health, sadness, worries, sleep quality), family (highest education level of parent) and community-level (socio-economic position, geographical remoteness) variables were included as confounders in the adjusted model.

was markedly lower than the current study (9·6 % boys, 10·3 % girls), and results demonstrated significant differences between breakfast-skippers and non-skippers on numeracy test scores but not for reading, spelling, grammar and writing[17]. This study included a smaller sample with children of a narrower age range (*n* 2280, 8–9 years) compared to the current study. These sample differences may have influenced both the prevalence of breakfast skipping and variation in NAPLAN scores across studies, and therefore the associations observed. Further, breakfast skipping in this study was measured using three occasions of parent-reported breakfast consumption that day, *v.* the self-reported habitual measure utilised in the current study, which may also contribute to contrasting results.

Comparing findings across studies highlights the importance of considering how breakfast consumption/skipping is measured and defined. Evidently, this may change research conclusions and any subsequent actions. Extensive research has explored the reliability and validity of dietary assessment methods among children and adolescents[31]. Some studies have shown habitual consumption may be a better predictor of later outcomes relative to reports of consumption on individual days[8], and others have suggested children provide more accurate reports than their parents[32]. However, there is no consensus on the most accurate and predictive measure of breakfast consumption among school students, and this could be an avenue for future research.

Implications

Overall, this study has produced robust evidence for the association between student breakfast skipping and standardised test scores on both literacy and numeracy achievement. Combined with existing research demonstrating the importance of breakfast for good physical health and wellbeing[1,2] as well as engagement with school[33], results suggest breakfast consumption also plays an important role in students' academic success. Findings suggest intervention to promote breakfast consumption may help to improve academic performance and increase the percentage of students in South Australia achieving scores above the NMS on NAPLAN tests. While the study was limited to government schools in South Australia, participants included students living across diverse socio-economic and geographic areas and findings are likely to apply to other areas in Australia, as well as similar country settings internationally. Despite some existing government and donor investment in school breakfast provision across Australia[34,35], skipping breakfast remains a widespread issue, with the current study highlighting 67·7 % of students skipped breakfast sometimes or always. Parallel to the ongoing social and economic effects felt by families throughout the COVID-19 pandemic, natural disasters and the rising cost of living in Australia[36], we anticipate the percentage of students coming to school hungry will continue to increase. Supports that promote regular breakfast consumption among students may be one mechanism through which education stakeholders and policymakers can strengthen school engagement and academic achievement outcomes.

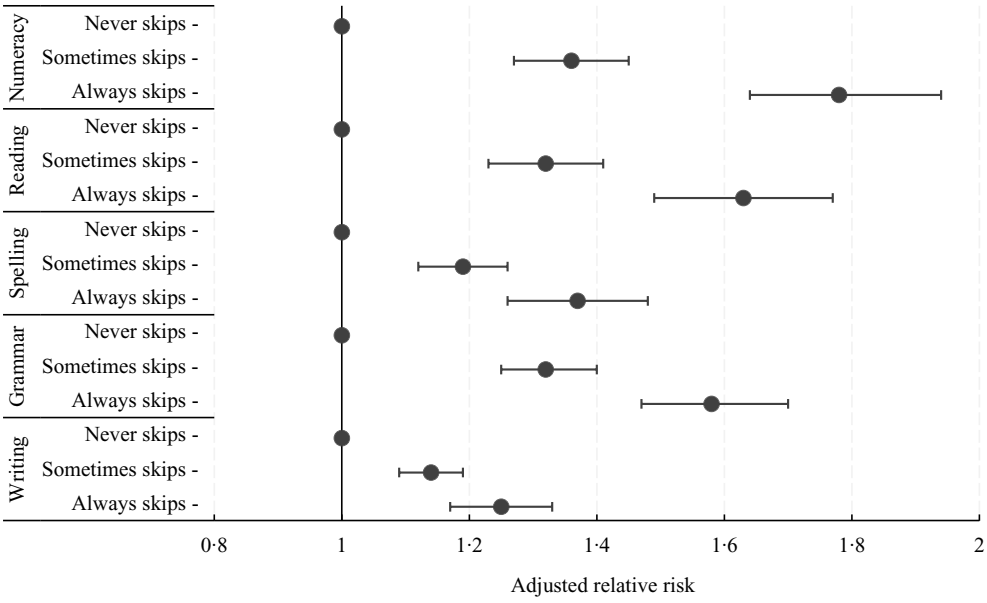

Figure 2. Adjusted RR of low academic achievement by breakfast skipping categories (*n* 28 651).

Limitations

This study was unable to incorporate information on breakfast content among students who reported regularly consuming breakfast. The macro- and micronutrient quality of breakfast students consume may be a mechanism through which breakfast is associated with academic outcomes, and although not within the scope of the current study, is an important area for future research. Our measure of breakfast consumption was not able to ascertain breakfast skipping on weekdays (whereby students are at school and completing academic testing) *v.* weekends, which may also have important implications for the association between breakfast consumption and academic outcomes. Further, information on meal provision in schools (e.g. School Breakfast Programs) was not available to be used in analysis. Importantly, the current study as well as much of the existing research discussed is limited in that reasons behind breakfast skipping were not captured, which needs to be considered when informing next steps for policy and practice. While household food insecurity is assumed to be a key influence, reasons behind skipping breakfast among children and adolescents may vary[1,37], and therefore strategies to effectively counter these to promote breakfast consumption and thus students' academic outcomes, will also differ. Future research should investigate the drivers of breakfast skipping, incorporating community and consumer voices (i.e. students, schools, families) in the development of interventions designed to support them. This will guide the effective implementation of supports and policy responses to maximise the benefits of investments designed to promote breakfast consumption among children and adolescents.

Conclusion

Findings indicate that breakfast consumption among children and adolescents plays an important role in literacy and numeracy outcomes. Supports to promote regular student breakfast consumption may be one strategy that education stakeholders and policymakers can employ to strengthen academic achievement. While this research addressed the methodological limitations of previous research, future investigation into the role of breakfast nutritional quality and drivers of breakfast skipping is necessary to better understand the mechanisms through which breakfast is associated with academic outcomes.

Supplementary material. For supplementary material accompanying this paper visit https://doi.org/10.1017/S1368980024002258

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