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Breakfast and School-Related Outcomes in Children and Adolescents in the US: A Literature Review and its Implications for School Nutrition Policy

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Abstract
Purpose of Review To identify and review the latest research on the connections between breakfast and school-related outcomes in children and adolescents in the US, and to explore the implications of this research on US school nutrition policy, particularly as it applies to students experiencing or at risk for food insecurity.
Recent Findings Although school personnel, parents, and students have positive attitudes about breakfast and its benefits for learning, recent research finds mixed evidence for the role of breakfast in improving objectively measured grades and test scores. Few recent studies examined behavioral outcomes, limiting the ability to draw clear conclusions about breakfast and school behavior. Several studies observed improved attendance with increased school breakfast access and participation, especially when schools offered breakfast at no cost to all students.
Summary There are many challenges to studying the connections between breakfast and learning. The recent research on breakfast and academic outcomes is mixed, but there is a growing body of evidence that eliminating fees for both school breakfast and lunch has promise for improving school-related outcomes.

Keywords Breakfast · School breakfast · Academic achievement · Cognition · Attendance · Suspension

Introduction

"Breakfast is the most important meal of the day," is a saying that has endured over time in the popular press, educational settings, and households across the US. Undoubtedly, there is evidence to support the benefits of breakfast for children and adolescents based on decades of domestic and international research. For instance, research finds an association between breakfast consumption and better dietary quality, weight-related outcomes, metabolic and cardiovascular risk factors, and mental health among children and adolescents [1–4]. Breakfast consumption also has been associated with multiple school-related outcomes, including improvements in school grades, test scores, memory, attention, attendance, and classroom behavior [5–7].

However, there is a growing body of research that contradicts prior findings and popular notions on the benefits of breakfast. For example, a small, US-based laboratory study found no significant association between breakfast consumption and cognitive performance in the morning among 8- to 10-year-old boys and girls [8]. In addition, researchers have raised methodological limitations that complicate and challenge our understanding of breakfast's potential impacts on children and adolescents [9].

Although the importance of breakfast may be less definitive than it once seemed and methodological weaknesses persist and must be addressed in future research, it is widely accepted that well-nourished children and adolescents are healthier and perform better in school. Conversely, food insecurity has detrimental impacts on health (physical, emotional, and mental), nutrition, behavior, development, and learning for this population in the short and long terms [10–12].

Food insecurity indicates that the availability of nutritionally adequate and safe food, or the ability to acquire such

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food, is limited or uncertain for a household [13]. According to data from the US Department of Agriculture, 14.8% of US households with children were food insecure in 2020 [13]. This represents a statistically significant increase from the 13.6% figure observed in 2019 prior to the COVID-19 pandemic. Certain households with children face higher rates of food insecurity, including low-income households and those headed by a single female, Black, or Hispanic adult [13].

A broad coalition of stakeholders have facilitated numerous changes to federal child nutrition policy over the past two decades in an effort to reduce food insecurity and its harmful impacts on children and adolescents [14, 15]. Much of this work has targeted improving access to and the quality of the School Breakfast Program (SBP) and National School Lunch Program (NSLP) given the considerable amount of time spent and food consumed at school by this population [16, 17]. In addition, stakeholders have recognized that students living in low-income households and struggling with food insecurity need additional nutrition supports, such as school meals at low or no cost, in order to address and reduce disparities that compromise their growth and learning [18, 19]. The efforts to expand school meal access and reduce food insecurity became, and continue to be, even more urgent due to the economic and public health fallout from the COVID-19 pandemic and the pandemic's disruption to normal school meal delivery [20, 21].

Even before the COVID-19 pandemic, school breakfast access was a focus of federal child nutrition policy action due to socioeconomic and racial disparities in breakfast consumption, historically lower participation in SBP compared to NSLP, and research finding an association between school breakfast and improvements in food security status and student achievement [4, 22–26]. As a result, much of the more recent breakfast research in the US has examined the impacts of SBP policy and programmatic changes on school-related outcomes. This SBP research, as well as breakfast research generally, has important and timely implications given the extensive reach of SBP to nearly 14 million students every day and current efforts to further strengthen or expand the program [24].

The purposes of this paper are, therefore, twofold: (1) to identify and review the latest research on the connections between breakfast and school-related outcomes in US children and adolescents, and (2) to explore the implications of this research on US school nutrition policy, particularly as it applies to students experiencing or at risk for food insecurity.

Methods

The current literature review focused on English-language studies conducted in the US among non-pregnant children and adolescents in kindergarten through grade 12 (K-12). Of primary interest were studies examining breakfast and school-related outcomes (e.g., academic performance, cognition, classroom behavior, absenteeism, test scores). Nutrition (e.g., dietary intake), mental health (e.g., depression, anxiety), and physical health (e.g., body weight) outcomes, while important and related to student well-being and learning, were considered outside of the scope of the current review. In addition, studies that examined school breakfast in combination with school lunch were excluded since the effects of breakfast alone could not be isolated.

Each author first independently searched for peer-reviewed research articles and reviews published in the last 5 years (between January 2017 and early February 2022) in PubMed, PsycInfo, and ERIC. Predetermined search terms applied by both authors included "breakfast," "school breakfast," "cognitive," "attention," "behavior," "psychosocial," "discipline," "school performance," and "academic achievement." Boolean operators were used when applicable. Each author then independently reviewed the titles and abstracts of studies from the database search to remove duplicate studies and exclude studies that did not meet the inclusion criteria. Next, after the title and abstract reviews, the authors convened to compare and confirm study selections from the database search. Finally, the authors independently searched the reference lists of selected studies for relevant literature that met inclusion criteria, but that had been omitted in the electronic database search. Any discrepancies or disagreements were resolved by consensus. This entire process yielded 16 studies for inclusion in the final review.

Findings

Review Articles on Breakfast and School-Related Outcomes

Of the 16 studies selected, six were literature or systematic reviews that examined, at least in part, breakfast and school-related outcomes in K-12 children and adolescents (Table 1). While ranging in the period of research covered, all six reviews included research in the US as well as beyond the US, primarily in developed countries. Although different in scope and focus, the reviews reached similar conclusions: the evidence was inconclusive on the impact of breakfast on children's cognition and school-related outcomes. Further, multiple authors pointed to methodological challenges that hampered the ability to assert stronger associations.

A systematic review conducted by Lundqvist et al. made the strongest assertion of conclusive findings on the favorable impact of breakfast consumption on cognition and academic performance [3]. The 26 studies identified in the review were published between 2003 and 2017, collected primary data, and clearly defined breakfast consumption

Table 1 Peer-reviewed literature or systematic reviews on breakfast and school-related outcomes among children and adolescents published between January 2017 and February 2022

Author(s), Year	Purpose	Number of studies included	Years included	Key finding(s) on school-related outcomes
Adolphus et al. 2017 [9]	Provide a comprehensive discussion of key methodological challenges and considerations in studies assessing the effect of breakfast on cognitive performance in children	142	1976–2016	Methodological challenges prevent conclusive findings about the effects of breakfast on cognitive performance in children
Burrows et al. 2017 [28]	Systematically review studies on the effects of dietary intake on school-aged children's academic achievement	40	1985–2016	Moderate association between regular breakfast consumption and improved academic achievement (i.e., grades, test scores)
Cohen et al. 2021 [29••]	Examine the association between universal free school meals and students' school meal participation rates, dietary intake, attendance, academic performance, and body mass index as well as school finances	47	1999–2020	Mixed findings on the association between access to free school breakfast and test scores in the US; stronger evidence for a positive association between test scores and access to universal free meals (both breakfast and lunch)
Lundqvist et al. 2019 [3]	Systematically review quantitative studies that clearly defined breakfast consumption and collected primary data on the effects of eating breakfast on academic achievement, cognitive performance, quality of life, and morbidity	26	2003–2017	Positive and consistent associations between eating breakfast and academic achievement and cognitive performance
O'Neil and Nicklas 2019 [30]	Review definitions for eating and skipping breakfast and examine how these definitions affect data interpretation	29	2000–2017	Lack of a standard definition of breakfast makes it difficult to determine associations between breakfast consumption and cognitive performance
Sünram-Lea 2019 [27]	Review the evidence on the impact of breakfast-based glycemic response on cognition in school-aged children and adolescents	34	1977–2017	Some evidence of an association between a stable blood glucose profile and better cognitive functioning in the morning, but a lack of conclusive evidence on the effect of glycemic index on cognition due to methodological challenges

versus nonconsumption. Six of the 26 studies focused on cognition (none from the US) and 8 focused specifically on academic achievement, such as grades and test scores (including one conducted in the US). Lundqvist et al. concluded that these studies showed an association between breakfast consumption and improved cognitive and academic performance among children and adolescents.

Sünram-Lea reviewed the evidence on breakfast-based glycemic response and cognition in school-aged children and adolescents [27]. After reviewing 34 studies conducted over a 40-year period in a wide variety of settings and countries, Sünram-Lea concluded that a more stable blood glucose profile was associated with better cognitive function across the morning. However, according to Sünram-Lea, the evidence was currently insufficient to allow clear nutrition recommendations related to glycemic index and cognition because studies have widely differed with respect to subject characteristics, cognitive tests used, and the timing of cognitive assessment.

Two of the six reviews, both of which examined 40 or more studies, concluded that there was mixed evidence on the association between school-related outcomes and breakfast [28, 29••]. Burrows et al. focused on the evidence connecting academic achievement (e.g., self-reported grades and standardized and non-standardized test scores) to dietary intake more generally, with breakfast being one of several factors considered. While noting the evidence was mixed, Burrows et al. found moderate associations for regular breakfast consumption and improved academic achievement. Cohen et al. focused on the relationship between academic performance and attendance and free school meal programs. Of the six US studies in their review, Cohen et al. found mixed results, noting that three studies found a correlation with free school breakfast access and improved test scores while the other three did not. According to the authors, the inconsistent findings were possibly related to lower participation rates in school breakfast than in school lunch.

Two of the reviews focused on methodological challenges to studying the impact of breakfast consumption among children and adolescents. They argued that variation in how researchers define breakfast and data collection methodology has contributed to mixed research findings [9, 30]. Key methodological issues related to data collection included the location of studies (e.g., lab/simulated versus field/schools), cognitive testing challenges (e.g., appropriateness, reliability), and timing of breakfast (e.g., at home before school versus in-school). Both reviews concluded that there was not a clear association between breakfast and cognition or learning outcomes in this population. According to O'Neil, "the question of whether breakfast is the most important meal of the day remains unanswered" [30].

US-Based Studies on Breakfast and School-Related Outcomes

Ten of the 16 studies identified for the current review were single, US-based studies investigating the association between breakfast consumption and school-related outcomes, including chronic absenteeism, attendance, disciplinary action, and test scores (Table 2). This research generally focused on the availability of breakfast at school, rather than breakfast at home, or breakfast in any setting.

Data collection methodology varied widely across the 10 studies. Three focused on the attitudes of students, parents, or school personnel through survey and/or qualitative data analysis [31–33]. Two examined survey data collected directly from high school students [34, 35]. Four examined school administrative data only [36•, 37, 38•, 39•] and one [40•] employed a range of analytical and data collection approaches, including survey and administrative data analyses. The research settings also varied, from diverse urban locations to predominantly White suburban locations.

Overall, the studies fell into three categories: adolescent breakfast consumption, attitudes about the importance of eating breakfast and offering school breakfast, and effects of school breakfast program models on school-related outcomes. One study addressed two of these categories [38•].

Adolescent Breakfast Consumption

Two studies focused on daily breakfast consumption and school outcomes among high school students. Utilizing state or national data from the Youth Risk Behavior Survey, the studies found an association between self-reported school performance (i.e., achieving mostly A's and B's) and daily breakfast consumption [34, 35]. A third study, an analysis of Colorado and Nevada school breakfast programs, found stronger reductions in chronic absenteeism with increased breakfast participation in high schools than in middle or elementary schools [38•]. These researchers argued that offering breakfast as a part of the school day for high school students "is very much intertwined with student success" [38•].

Attitudes About the Importance of Eating Breakfast and Offering School Breakfast

Primarily through qualitative research and survey methods, three studies built on and reinforced prior work demonstrating that school administrators, teachers, students, and parents believe that breakfast is important for good school behavior and academic performance. One three-state study examined the determinants of breakfast consumption and motivators for regular breakfast consumption among a sample of children 6 to 11 years of age and parents of children

Table 2 Peer-reviewed US-based studies on breakfast and school-related outcomes among children and adolescents published between January 2017 and February 2022

Author(s), Year	Study purpose	Sample	Study design	Breakfast variable	Measure(s) of school-related outcome(s)	Key findings on school-related outcomes
Bartfeld et al. 2019 [36•]	Examine the impact on school attendance and standardized test scores after adding a school breakfast program, changing to a free school breakfast program, or implementing free breakfast in the classroom	Approximately 1000 elementary schools in Wisconsin (attendance analysis n = 481,799 students; test score analysis n = 248,328 students)	Analysis of state-level administrative data	Access to school breakfast, access to free school breakfast, or access to free school breakfast in the classroom at the beginning of the school day	Attendance and standardized test scores	- Adding a school breakfast program was associated with improved attendance among likely-participants and improved reading test scores for likely-participant boys - Free school breakfast was associated with improved attendance for students and improved reading and math test scores among higher-income students - Free school breakfast in the classroom had no association with attendance or test scores in most cases, but was associated with slightly lower math test scores among likely-participant boys
Burns et al. 2018 [34]	Examine relationships between physical activity, sleep duration, diet, and academic achievement	4625 high school students in Nevada	Analysis of Youth Risk Behavior Survey data	Eating breakfast every day	Self-reported grades of A or B	High school students reporting daily breakfast consumption were more likely to report achieving mostly A's and B's
Burns et al. 2019 [35]	Examine associations between physical activity, dietary behaviors, and health behaviors	14,765 US high school students	Analysis of Youth Risk Behavior Survey data	Eating breakfast every day	Self-reported grades of A or B	High school students reporting daily breakfast consumption were more likely to report achieving mostly A's and B's
Eck et al. 2019 [31]	Examine breakfast-related beliefs of parents and school-age children	37 parents of children ages 6–11 years and 41 children ages 6–11 years in Florida, New Jersey, and West Virginia	Analysis of focus group interviews	N/A	N/A	Parents and children believe breakfast is important for school performance

Table 2 (continued)

Author(s), Year	Study purpose	Sample	Study design	Breakfast variable	Measure(s) of school-related outcome(s)	Key findings on school-related outcomes
Hearst et al. 2019 [37]	Assess the relationship between grade point average (GPA) and increased school breakfast consumption after implementing free breakfast delivery models	636 rural Minnesota ninth and tenth grade students in 13 schools	Randomized- control trial that used school administrative data on GPA and school breakfast participation	Access to free school breakfast	GPA	No change in GPA was found with increased school breakfast consumption among the treatment group
Kirksey and Gottfried 2021 [38•]	Examine whether school absenteeism is affected by implementation of a Breakfast After the Bell program (i.e., breakfast served during the school day in the classroom in elementary schools or hallways before or after first period in high schools)	1883 kindergarten through twelfth grade (K-12) schools in Colorado and Nevada	Analysis of state and national administrative data	Access to school breakfast after the school day starts	Chronic absenteeism (i.e., missed 15 days or more in a school year)	- Schools implementing Breakfast After the Bell experienced declines in chronic absenteeism - Larger effects on absenteeism were observed in schools that provided free breakfast meals to all students, high schools, schools with higher breakfast participation rates, and schools in suburban locations
Krueger et al. 2018 [32]	Identify teacher perceptions of different school breakfast service models	369 K-12 teachers in Utah	Analysis of electronic survey data	Access to school breakfast in the cafeteria or school breakfast in the classroom	Teacher perceptions of school-related outcomes	- Vast majority of teachers believed that school breakfast helps students perform better academically - Half of teachers believed that school breakfast helps students have fewer behavioral problems
Luan et al. 2021 [39•]	Examine effects of free school breakfast in the classroom versus free school breakfast in the cafeteria on attendance and test scores	1362 fourth to sixth grade students in Philadelphia, Pennsylvania	Randomized-control trial that used school district data	Access to free school breakfast in the cafeteria or free school breakfast in the classroom	Attendance and standardized test scores	Breakfast in the classroom did not improve attendance or standardized test scores
Stokes et al. 2019 [33]	Explore teachers' perceptions of breakfast in the classroom and traditional breakfast served in the cafeteria	369 K-12 teachers in Utah	Analysis of open-ended responses from an electronic survey	Access to school breakfast in the cafeteria or school breakfast in the classroom	Teacher perceptions of school-related outcomes	Teachers had mixed reactions as to whether school breakfast improves student behavior or outcomes (e.g., tardiness, grades)

Table 2 (continued)

Author(s), Year	Study purpose	Sample	Study design	Breakfast variable	Measure(s) of school-related outcome(s)	Key findings on school-related outcomes
Walker et al. 2021 [40•]	Investigate the attitudes of school personnel and the effects on school-related outcomes of changing from traditional school breakfast to free breakfast in the classroom	2,906 elementary and middle school students in South Orange, New Jersey	Mixed methods analysis of interviews of school personnel, online teacher survey, 21 classroom observations, and school data	Access to traditional school breakfast in the cafeteria or free school breakfast in the classroom	Days absent, suspensions, days tardy	- Teachers expressed concerns about negative impacts on instructional time from breakfast in the classroom - Absences and suspensions were lower in schools that offered free breakfast in the classroom compared to schools that offered breakfast in the cafeteria

in this age group [31]. Focus group discussions revealed that children and parents believed that breakfast consumption was important to school performance. For instance, parents agreed that children "won't be able to focus without it [*because*] they will feel hungry" [31].

Two studies focused on attitudes about school breakfast among K-12 teachers in Utah via an electronic survey [32, 33]. Utah teachers generally affirmed that school breakfast improved outcomes, specifically that students who ate school breakfast would not be hungry, would perform better academically, and would have fewer behavioral problems. Conversely, teachers expressed concerns about disruptions to the classroom when breakfast is offered in the classroom at the beginning of the school day.

Effects of School Breakfast Program Models on School-Related Outcomes

Three studies analyzed school district administrative data to examine the effects of increased access to breakfast in schools and found mixed effects [36•, 37, 38•]. Two of these studies used large, statewide datasets and took advantage of recent policy changes that resulted in the implementation of school breakfast programs, alternative models of school breakfast delivery, or elimination of fees for school breakfast [36•, 38•].

Using statewide data from Wisconsin, Bartfeld et al. found that initiating a school breakfast program in the cafeteria before school was associated with improved attendance among likely-participants and, among likely-participant boys, improved reading scores [36•]. (Likely-participants were defined as low-income students in households with a recent history of Supplemental Nutrition Assistance Program (SNAP) participation.) The researchers also found that eliminating fees for breakfast programs in the cafeteria before school was associated with better attendance among all students and higher math and reading test scores for higher-income students. However, initiating a free breakfast in the classroom program at the start of the school day did not have an effect on attendance or test scores except that the program was associated with slightly lower math scores for likely-participant boys.

Using state and national data, Kirksey and Gottfried examined the impacts on chronic absenteeism after implementation of a "Breakfast After the Bell" model. This model allows for school breakfast to be eaten during the school day, either at the beginning of the school day or between first and second period in high schools. The researchers found that this approach was associated with a decline in chronic absenteeism in K-12 schools. The association was strongest in high schools, schools with higher rates of breakfast participation, schools offering breakfast free to all students, and suburban schools [38•].

The third study utilized a smaller data set of ninth and tenth grade students in high schools in rural Minnesota [37]. No change in grade point average (GPA) was observed with increased breakfast consumption after 1 year of implementation of various free school breakfast models. The researchers concluded that focusing on changes in one year at the high school level using GPA was "a somewhat blunt tool of assessment…given the lifetime of learning and habits it may reflect" [37].

Two additional studies sought to determine whether offering free breakfast in the classroom at the beginning of the school day impacted school-related outcomes among elementary and middle school students in low-income, urban school districts [39•, 40•]. Both found that breakfast in the classroom significantly increased school breakfast participation, but the studies came to different conclusions on its effect on school-related outcomes. One study, a randomized control trial, found that offering free breakfast in the classroom, compared to free breakfast in the cafeteria before school, had a negative effect on standardized math test scores, and otherwise no effect on attendance or standardized reading test scores [39•]. These researchers hypothesized that breakfast in the classroom may result in students eating multiple breakfasts or eating at school instead of at home, rather than reducing the proportion that missed breakfast entirely.

The second study — a mixed-methods study that included interviews with school personnel, a teacher survey, classroom observations, and school data — found improvements in school absences and suspension rates among schools that offered free breakfast in the classroom at the start of the school day compared to schools that served breakfast in the cafeteria before the school day started and charged a fee based on family income [40•]. Specifically, breakfast in the classroom was associated with an improvement in attendance by 1.12 days of school per year per student. While suspension rates increased during the study period at both groups of schools, they increased at a lower rate in the schools that offered breakfast in the classroom.

Discussion

Summary of Key Findings

Recent research in the US on breakfast and school-related outcomes in children and adolescents has examined grades, test scores, attendance, and behavioral outcomes. While school personnel, parents, and students have positive attitudes about breakfast and its benefits for learning, the research presented here finds mixed evidence for the role of breakfast in improving objectively measured grades and test scores. Few recent studies examined behavioral outcomes, such as suspensions, limiting the ability to draw clear conclusions here about the impact of breakfast on behavior at school.

However, several studies in this review, two that used large data sets, observed improved school attendance with increased school breakfast access and participation [36•, 38•, 40•]. The favorable impact on attendance was more readily apparent when schools offered breakfast at no cost to all students. These impacts on school attendance are important because research finds a correlation between higher rates of absenteeism and poorer school-related outcomes, including lower standardized test scores [38•].

Consistent with the reviews included in this paper, methodological limitations and contextual challenges were present in many of the US-based studies (Table 2). Researchers reported biases due to self-reported data, a lack of definition of the breakfast meal, local school breakfast implementation controversies, and small data sets. At the same time, some researchers had large enough datasets to overcome the common challenge of analyzing sub-group effects. In these instances, researchers generally found meaningful differences related to students' socio-economic status, age, and geographical location, which further underscores the complexity of studying the effects of breakfast on school-related outcomes in the US context.

School Nutrition Policy Implications

The current US nutrition policy landscape has been significantly altered by the COVID-19 pandemic. The pandemic exposed and exacerbated long-standing disparities and inequities in health care, employment, education, and food access [41]. The pandemic also disrupted school meal delivery due to stay-at-home orders, virtual or hybrid learning, labor shortages, and supply chain issues [21, 42]. In fact, school breakfast and lunch participation declined during the pandemic [24].

Child nutrition waivers provided greater flexibility to schools to provide meals during the pandemic and other federal policy changes helped support families dealing with the economic and public health fallout from the pandemic [20, 43]. Food insecurity would have been far worse without these waivers and supports, but food insecurity among households with children still significantly increased between 2019 and 2020 [13]. There also is emerging evidence that students, particularly low-income students and students of color, have lost ground in their learning because of the pandemic [44–46].

As the nation recovers from these and other effects of the pandemic, policymakers and stakeholders need to identify, implement, and evaluate evidence-based strategies to address pre- and post-pandemic disparities, boost school meal participation, and improve student outcomes. Undoubtedly, a comprehensive, equitable approach is warranted. In the context of the school environment, school breakfast has

an important role to play in these efforts given, based on this review, the program's favorable impact on school attendance. Furthermore, other research shows that school breakfast supports food security, good nutrition, and health, which is important for all students, but especially for students from food-insecure or low-income households who are at greater risk for poor outcomes [12, 25, 47–49].

A number of strategies can improve school meal access, participation, and consumption [50]. For breakfast specifically, studies included in this review as well as other research demonstrates that offering breakfast at no charge to all students and innovative models of serving breakfast — e.g., breakfast in the classroom, grab-and-go breakfast, and second chance breakfast — increase student participation in the program [51, 52]. These models serve breakfast after the school day has started, which is often more convenient and less stigmatizing than when breakfast is served before school in a traditional cafeteria setting.

Furthermore, a broad coalition of stakeholders have advocated for the provision of all school meals (not just breakfast) at no cost to all students to improve meal access, reduce the stigma associated with participation, and improve student learning, health, and well-being. For example, in the summer of 2021, these efforts were successful as California and Maine passed legislation making school meals free for all students [53]. In addition, during the pandemic, temporary child nutrition waivers allowed the vast majority of school meals to be provided at no cost to all students [24]. But even before the pandemic, changes brought about by the Healthy, Hunger-Free Kids Act of 2010 increased the number of schools offering universal free meals (UFM) — breakfast, lunch, snack, and sometimes suppers — through the creation of the Community Eligibility Provision (CEP). This provision improved on and largely supplanted earlier provisions allowing for schools to provide meals to all students at no charge. CEP created an administrative reimbursement model for school meals based on the percentage of children in a school whose families receive SNAP. It has allowed more schools in high-poverty areas to serve meals to all children at no charge and receive enough federal reimbursement to cover their expenses (with some school districts supplementing the federal reimbursement) [29••, 54, 55]. Recent research indicates that the CEP policy has increased meal participation and reduced food insecurity [29••, 54, 56, 57].

While the recent research on school breakfast and academic outcomes is mixed based on this review, there is a growing body of evidence in the US that eliminating fees for both breakfast and lunch (i.e., UFM) through CEP has great promise for improving school-related outcomes, including attendance and test scores [29••, 54, 55, 58–60]. For example, a study of South Carolina third to eighth grade students found that UFM were associated with improved math scores among elementary students [61]. An analysis of national education data found a 17% reduction in suspensions of white, male elementary students in schools that implemented UFM [55]. A Wisconsin study found an association between UFM and improved attendance for low-income elementary school students in the second year after implementation [59]. A study of New York City data found that middle schools that implemented UFM had improved math and English test scores [60]. Although more research is needed, UFM show promise and the pandemic will provide researchers additional opportunities to further examine the role of UFM in improving school-related outcomes.

Conclusion

While there remain many challenges to studying the connection between breakfast and learning in children and adolescents, the body of research in the US continues to grow and support the effectiveness of increased access to healthy school meals to combat food insecurity, improve health, and support positive school-related outcomes. Based on this review, researchers examining the importance of breakfast need to thoughtfully consider the methodological challenges and limitations in doing this work given the often inconclusive findings to date on learning and cognition. In addition, more research is needed on the potential differential impacts of breakfast consumption, especially school breakfast consumption, by socioeconomic status, age, and geographical location. More attention also should be given to UFM to build the research base on the associations between this approach to school meals and students' school-related and health outcomes.

Compliance with Ethical Standards

Conflict of Interest The authors do not have any potential conflicts of interest to disclose.

Human and Animal Rights and Informed Consent This article does not contain any studies with human oranimal subjects performed by any of the authors.

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