

Executive Summary: Health Impact Review of HB 1295

Concerning Breakfast after the Bell Programs

Evidence indicates that HB 1295 has potential to increase the number of low-income students and students of color who eat breakfast, which in turn has potential to narrow educational opportunity gaps, to narrow income gaps, and to decrease health disparities.

BILL INFORMATION

Sponsors: Representatives Hudgins, Magendanz, S. Hunt, Walsh, Walkinshaw, Lytton, Senn, Jinkins, Sawyer, Stokesbary, Reykdal, Robinson, McBride, Stanford, Tharinger, Bergquist, Clibborn, Pollet, Fey, Gregerson, Tarleton

Companion: [SB 5437](#)

Summary of Bill:

- Requires high-needs schools that have not reached target participation (70% of free or reduced-price eligible students) in both the School Lunch and Breakfast Programs to offer Breakfast after the Bell and provide adequate time for students to eat.
- Requires that all breakfasts served under these programs comply with federal meal patterns and nutrition standards.
- Requires the state to provide financial assistance to support implementation of Breakfast after the Bell programs.
- Requires the Office of the Superintendent of Public Instruction (OSPI) to develop and distribute procedures and guidelines and to dedicate staff within the office to offer training and technical and marketing assistance to schools to implement Breakfast after the Bell.
- Directs OSPI and schools to partner with nonprofits, philanthropic organizations, and communities to implement these programs.

HEALTH IMPACT REVIEW

Summary of Findings:

This health impact review found the following evidence regarding the provisions in HB 1295:

- Strong evidence that Breakfast after the Bell programs would likely increase the number of low-income students and students of color participating in the School Breakfast Program and eating breakfast.
- Strong evidence that eating breakfast would likely improve educational outcomes for these students and decrease educational opportunity gaps.
- Strong evidence that eating breakfast would likely improve health outcomes for these students and decrease health disparities.
- Very strong evidence that decreasing educational opportunity gaps would likely decrease gaps in educational attainment.
- Very strong evidence that decreasing gaps in educational attainment would likely decrease income gaps.
- Very strong evidence that decreasing gaps in educational attainment would likely decrease health disparities.
- Very strong evidence that decreasing income gaps would likely decrease health disparities.

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Health Impact Review of HB 1295

Concerning Breakfast after the Bell Programs

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Introduction and Methods

A health impact review is an analysis of how a proposed legislative or budgetary change will likely impact health and health disparities in Washington state ([RCW 43.20.285](#)). For the purpose of this review ‘health disparities’ have been defined as the differences in disease, death, and other adverse health conditions that exist between populations ([RCW 43.20.270](#)). This document provides summaries of the evidence analyzed by State Board of Health staff during the health impact review of House Bill 1295 ([HB 1295](#)).

Staff analyzed the content of HB 1295 and created a logic model depicting possible pathways leading from the provisions of the bill to health outcomes. We consulted with stakeholders and conducted objective reviews of the literature for each pathway using databases including PubMed and Google Scholar.

The following pages provide a detailed analysis of the bill including the logic model, summaries of evidence, and annotated references. The logic model is presented both in text and through a flowchart (Figure 1). The logic model includes information on the strength of the evidence for each relationship. The strength-of-evidence has been defined using the following criteria:

- **Not well researched:** the literature review yielded few if any studies or only yielded studies that were poorly designed or executed or had high risk of bias.
- **A fair amount of evidence:** the literature review yielded several studies supporting the association, but a large body of evidence was not established; or the review yielded a large body of evidence but findings were inconsistent with only a slightly larger percent of the studies supporting the association; or the research did not incorporate the most robust study designs or execution or had a higher than average risk of bias.
- **Strong evidence:** the literature review yielded a large body of evidence on the relationship (a vast majority of which supported the association) but the body of evidence did contain some contradictory findings or studies that did not incorporate the most robust study designs or execution or had a higher than average risk of bias; or there were too few studies to reach the rigor of ‘very strong evidence’; or some combination of these.
- **Very strong evidence:** the literature review yielded a very large body of robust evidence supporting the association with few if any contradictory findings. The evidence indicates that the scientific community largely accepts the existence of the association.

Staff made modifications to these criteria at the start of the 2015 legislative session beginning January 12, 2015. Therefore strength-of-evidence rankings may not be comparable between reviews completed before and those completed after this date.

This review was subject to time constraints, which influenced the scope of work for this review. The annotated references are only a representation of the evidence and provide examples of current research. In some cases only a few review articles or meta-analyses are referenced. One article may cite or provide analysis of dozens of other articles. Therefore the number of references included in the bibliography does not necessarily reflect the strength-of-evidence. In addition, some articles provide evidence for more than one research question so they are referenced for multiple research questions.

Analysis of HB 1295 and the Scientific Evidence

Summary of HB 1295

- Requires high-needs schools that have not reached target participation (70% of free or reduced-price eligible students) in both the School Lunch and Breakfast Programs to offer Breakfast after the Bell and provide adequate time for students to eat.
- Requires that all breakfasts served under these programs comply with federal meal patterns and nutrition standards.
- Requires the state to provide financial assistance to support implementing Breakfast after the Bell programs.
- Requires the Office of the Superintendent of Public Instruction (OSPI) to develop and distribute procedures and guidelines and to dedicate staff within the office to offer training and technical and marketing assistance to schools to implement Breakfast after the Bell.
- Directs OSPI and schools to partner with nonprofits, philanthropic organizations, and communities to implement these programs.

Health impact of HB 1295

Evidence indicates that HB 1295 has potential to increase the number of low-income students and students of color who eat breakfast, which in turn has potential to narrow educational opportunity gaps, to narrow income gaps, and to decrease health disparities.

Pathways to health impacts

The potential pathways leading from the provisions of HB 1295 to decreased health disparities are depicted in Figure 1. There is strong evidence that Breakfast after the Bell programs increase participation in the School Breakfast Program and increase the number of students who eat breakfast, particularly among low-income students and students of color who are more likely to skip breakfast than their peers.¹⁻¹² There is also strong evidence that eating breakfast is directly associated with improved education¹²⁻¹⁴ and health outcomes.^{9,15-18} The same students who tend to skip breakfast in Washington are facing educational opportunity gaps and health disparities, therefore increasing breakfast consumption among these students has potential to decrease these disparities.¹⁸ In addition, the literature indicates that increased educational opportunities and outcomes are very strongly linked to increased educational attainment,¹⁹⁻²² which is in turn is very strongly associated with both improved health^{18,23-31} and increased income^{28,32} (which is also very strongly linked to improved health).^{18,28,29,33-36}

Due to time limitations we only researched the most direct connections between the provisions of the bill and decreased health disparities and did not explore the evidence for all possible pathways. For example, potential pathways that were not researched include:

- Evidence of how breakfast consumption impacts student behavior and discipline incidence and how discipline incidence relates to educational outcomes.
- Evidence of how students eating breakfast at school impacts the financial and food security and nutrition of their family members.

Logic Model

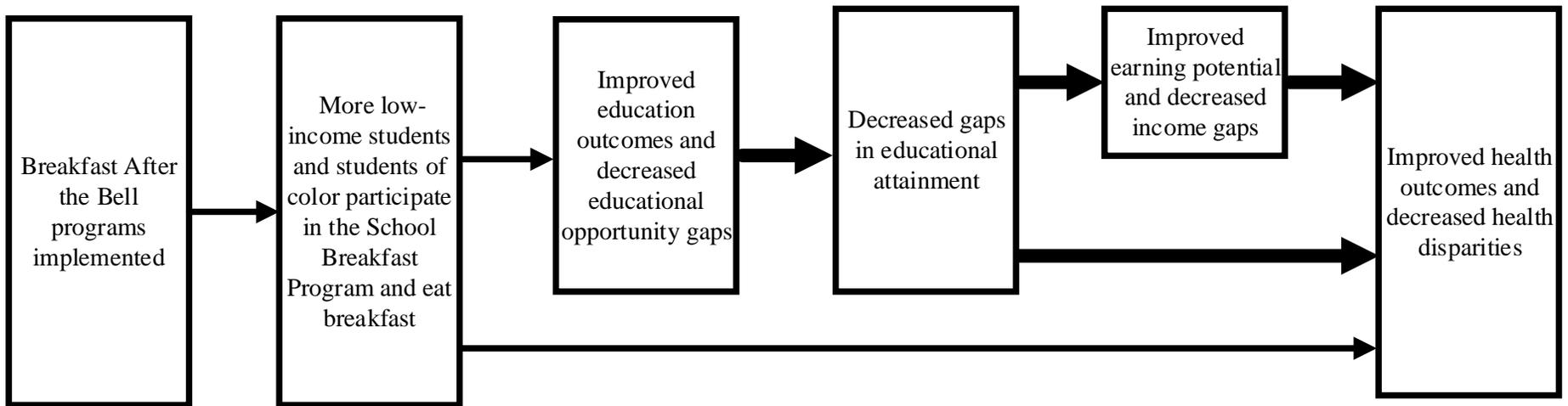
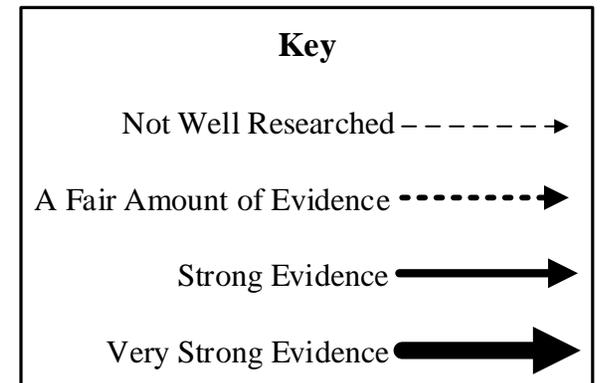


Figure 1
Concerning Breakfast After the Bell Programs
HB 1295



Summaries of Findings

Will implementing Breakfast after the Bell programs increase the number of low-income students and students of color who participate in the School Breakfast Program and who eat breakfast in Washington state?

There is strong evidence that Breakfast after the Bell models such as Grab-and-Go, extended breakfast hours, and Breakfast in the Classroom increase participation in the School Breakfast Program and decrease the number of students who skip breakfast.^{1,3-7,9,10,12} The language of HB 1295 specifically requires that schools with large populations of students eligible for free and reduced-price meals and with low percentages of these students participating in school meals must offer Breakfast after the Bell, therefore this bill is more likely to increase breakfast participation among low-income students. In addition, evidence indicates that Breakfast after the Bell programs are more likely to increase breakfast participation for low-income students than for their higher income peers even within the same school,⁶ so it is likely that this positive effect will be enhanced for low-income students in the schools where these programs are implemented. In addition, because schools in Washington with high percentages of low-income students also have higher percentages of students of color,^{2,11} this bill could help decrease the number of students of color who skip breakfast as well. This is important because Washington state data indicate that students of color and American Indian/Alaska Native students were more likely than their white peers to report having skipped breakfast on the day of the Healthy Youth Survey.⁸ HB 1295 also requires the state to provide financial assistance to support these programs, reducing the risk of an unfunded mandate on low-income schools.

Magnitude of impact

This legislation could impact a large number of students in Washington as more than 20% of 6th grade students, more than 30% of 8th grade students, more than 37% of 10th grade students, and nearly 39% of 12th grade students reported skipping breakfast that morning on the 2012 Healthy Youth Survey. In addition, evidence indicates that Breakfast after the Bell models have increased the participation of students in the School Breakfast Program by between 28 and 53%. One school which added a mobile breakfast cart and extended the morning cafeteria hours saw the average daily School Breakfast Participation increase by nearly 400% and the number of students who skipped breakfast at least once per week decrease by 8.7% following implementation of these programs.

Will increasing the number of low-income students and students of color who participate in the School Breakfast Program and eat breakfast in Washington improve educational outcomes and decrease educational opportunity gaps?

There is strong evidence that eating breakfast is associated with improved educational and cognitive outcomes such as better grades, achievement test scores, memory, punctuality, readiness to learn, classroom behavior, reading scores, fewer errors on attention tasks, and decreased dropout rates. The literature also indicates that these positive effects are more apparent in nutritionally vulnerable children, indicating that increasing access to breakfast may have a greater positive impact on low-income students. Access to breakfast may therefore work to narrow the opportunity gaps experienced by low-income students and students of color. There is

also evidence that School Breakfast Programs are associated with improved attendance which may at least partially account for improvements in academic outcomes.¹²⁻¹⁴

Will increasing the number of low-income students and students of color who participate in the School Breakfast Program and eat breakfast in Washington improve health outcomes and decrease health disparities?

There is strong evidence that eating breakfast is directly associated with improved health outcomes. We found evidence that eating breakfast is positively associated with a number of beneficial health outcomes such as healthy weight, lower fasting insulin, lower cholesterol, increased daily nutrient intake, and decreased hunger related health symptoms.^{9,15-17} One review article found that the literature overall supports an association between eating breakfast and decreased rates of obesity, but that the literature yields inconsistent results.¹⁵ In contrast the evidence shows a strong consistent link between eating breakfast and other health indicators such as adequate daily nutrient intake.^{16,17} Due to time limitations we focused this literature search specifically on the impacts of eating breakfast on health outcomes and did not expand the scope to include evidence on the impacts of food insecurity in general on health outcomes or the cascading positive health effects of adequate nutritional intake. Including publications on these additional aspects would likely further bolster the evidence for the link between eating breakfast and positive health impacts. Because the same students who experience disparities in access to breakfast are also experiencing health disparities,¹⁸ improved health outcomes for these students has potential to decrease health disparities.

Will improved educational outcomes and decreased educational opportunity gaps contribute to decreased gaps in educational attainment?

There is very strong evidence that improved educational outcomes such as those linked to eating breakfast (e.g. higher grades and increased readiness to learn) are associated with higher educational attainment.¹⁹⁻²² For example, one study found that low grades during primary school were predictive of not having completed a secondary education by age 20 or 21.²² These links are well documented and because this connection is widely accepted, less time was dedicated to researching this relationship. In addition several measures of educational outcomes are innately indicative of education attainment (e.g. specific grades are required as a prerequisite for high school graduation—one measure of educational attainment) further supporting the strength-of-evidence for this relationship.

Will decreasing gaps in educational attainment improve earning potential and decrease income gaps?

There is very strong evidence for the connections between increasing educational attainment and increasing income as well as decreasing rates of unemployment. These links are well documented globally, and data indicate that these trends do exist in Washington state as well.^{28,32} Because this connection is widely accepted, less time was dedicated to researching this relationship.

Will decreasing income gaps improve health outcomes and decrease health disparities?

There is very strong evidence that economic instability, low-income, and low socioeconomic status (SES) are associated with adverse health outcomes, such as, depression, acute and recurring infections, poor health-status, higher body mass index (BMI), and poor oral health.^{18,28,29,33-36} Data indicate that the correlation between low-income and poor health is also found in Washington state.^{18,28,29}

Will decreasing gaps in educational attainment improve health and decrease health disparities?

There is very strong evidence that higher educational attainment is associated with better health. Data collected nationally and in Washington state indicate a correlation between higher educational attainment and positive health outcomes such as decreased rates of diabetes, oral health problems, tobacco use, inactivity, obesity, depression, and coronary heart disease. The correlation between health and education is observed even after controlling for income, which can also serve as a mediating factor.^{18,23-31}

Annotated References

- 1. Anzman-Frasca S, Djang HC, Halmo MM, Dolan PR, Economos CD. Estimating impacts of a breakfast in the classroom program on school outcomes. *JAMA pediatrics*. 2015;169(1):71.**

Anzman-Frasca et al. conducted a quasi-experimental study to estimate the impact of Breakfast in the Classroom (BIC) programs on School Breakfast Program participation, school attendance, and academic outcomes. The authors analyzed data from 257 schools implementing BIC programs and 189 schools without BIC programs within one large urban school district in the United States. Over 80% of students in the district were eligible for free or reduced-price school meals, and more than 70% of the students were Hispanic/Latino. After controlling for potential confounding factors, the authors found that schools with BIC programs had significantly higher rates of participation/higher meal counts in the School Breakfast Program and greater overall student attendance than schools without these programs. On average 73.3% of students in BIC schools participated in the School Breakfast Program compared to 42.9% of students in non-BIC schools. BIC programs were implemented in different months in each school with some schools having their programs operational by November and other schools having their programs running by March. As more BIC programs were implemented participation in the breakfast program increased, with 41.9% participation in the BIC schools in August 2012 increasing to 94.6% participation in May 2013. The respective rates for non-BIC schools were 46.4% and 43.4%. BIC schools also had attendance rates of 95.5% versus rates of 95.3% for non-BIC schools. This difference represents an additional 76 attended days per grade per month. The data did not reveal significantly different outcomes for BIC versus non-BIC schools in relation to achievement test scores. The measure of test scores may not have been timely as some of the schools did not implement their BIC programs until March.

- 2. Aud S, Fox MA, KewalRamani A. *Status of trends in the education of racial and ethnic groups*. Washington DC: National Center for Education Statistics; U.S. Department of Education;2010.**

This report compiled national level school data and survey data from 2007, and was analyzed by US Department of Education staff. They found that nationally, Hispanic, Native American/Alaska Native, Native Hawaiian and other Pacific Islander, and African American children under 18 are more likely to be living in poverty than White, Asian, or mixed race children.

- 3. Bartfeld J, Kim M. Participation in the school breakfast program: New evidence from the ECLS-K. *The Social service review*. 2010;84(4):541-562.**

Bartfeld and Kim analyzed data from the Early Childhood Longitudinal Study—Kindergarten Cohort in order to determine predictors of participation in the School Breakfast Program. They analyzed parent survey data from wave 5 (third grade) collected in 2002. The primary analysis includes 6,680 children who attended schools with a School Breakfast Program. The authors found that the probability of participating in the School Breakfast Program increases if breakfast is served in the classroom or if the duration of the breakfast period increases. They also found that for students who ride the bus, as the length of time increases between when their bus arrives at school and their first class, participation in the School Breakfast Program also increases. The

authors conclude that the “results strongly support the hypothesis that increasing the convenience of the School Breakfast Program leads to greater participation.”

4. Bernstein LS, McLaughlin JE, Crepinsek MK, Daft LM, Abt Associates ICMA. *Evaluation of the school breakfast program pilot project: Final report. Special nutrition programs. Report number cn-04-sbp. Nutrition assistance program report series. USDA, Food and Nutrition Service, 3101 Park Center Drive, Room 1014, Alexandria, VA 22302-1500; 2004.*

In 1998 Congress authorized a three year (2000-2003) School Breakfast Program Pilot Project to evaluate the effects of providing universal free school breakfast in six districts across the United States. Control schools continued to offer the regular School Breakfast Program. Bernstein et al. found that schools offering universal free school breakfast saw an increase in participation in the School Breakfast Program in the first year of the pilot. However, schools that also offered breakfast in the classroom saw significantly larger increases in participation (from 27% in the base year to 66% the following year) compared to schools that did not offer breakfast in the classroom (from 17% in the base year to 28% the following year). The rate of participation in the control schools stayed relatively constant increasing from 20% to 21%.

5. Morris CT, Courtney A, Bryant CA, McDermott RJ. *Grab 'n' go breakfast at school: Observations from a pilot program. Journal of Nutrition Education & Behavior. 2010;42(3).*

Morris et al. evaluated a two week Grab ‘N’ Go pilot program in a middle school where 48% of the student body qualified for free or reduced-price lunches. For this program school nutrition staff prepared sack breakfasts that were available in the cafeteria prior to the first class of the day. The first week these were provided free to all students while in the second week they were priced at the regular breakfast prices for free, reduced (\$0.30), and full price breakfast (\$1.10). The evaluation included field notes, focus groups, interviews with school staff, and student and teacher surveys. Forty-nine percent of the students surveyed who ‘rarely ate breakfast’ indicated that they had participate in the Grab ‘N’ Go meals. Sixty-six percent of surveyed students reported participating in the program, with 27% participating for all 10 days.

6. Nanney MS, Olaleye TM, Wang Q, Motyka E, Klund-Schubert J. *A pilot study to expand the school breakfast program in one middle school. Behav. Med. Pract. Policy Res. Translational Behavioral Medicine : Practice, Policy, Research. 2011;1(3):436-442.*

Nanney et al. conducted a cohort study to evaluate the impact of a Grab 'N' Go School Breakfast Program meal that was delivered in the hallway and eaten in the classroom. The program was implemented in a classroom in Minneapolis, Minnesota with sixth grade students (n=239) for six weeks in 2010. The researchers analyzed School Breakfast Program participation data and pre-intervention BMI as well as data from post intervention student and teacher surveys and researcher observations. The response rate for the student survey was 83.9% and the teacher survey response rate was not reported. One hundred percent of teacher respondents indicated that the meals were not messy or disruptive and that the student behavior was overall excellent or good. The authors found a significant increase in School Breakfast Program participation during the intervention—with an average increase in participation of 0.47 days per week. This increase was stronger for students who received free and reduced price lunches (increase of 0.63 days per week) compared to full paid students (increase of 0.29 days per week).

7. Olsta J. Bringing breakfast to our students: A program to increase school breakfast participation. *Journal of School Nursing*. 2013;29(4):263-270.

Olsta evaluated the impact of a program extending breakfast cafeteria hours and providing a mobile cart that served a complete school breakfast during students' morning study hall classes. This study was conducted in a public high school in a Midwestern suburban area in the 2010-2011 school year. This school held a morning study hall in the cafeteria. The student body was made up of approximately 28% low-income students and 43% students of color. Before implementing the program the school's Wellness Team collected a baseline survey as a needs assessment from students enrolled in physical education (PE) classes (n=1,405) which had a response rate of 86%. Following implementation of both the food cart and the extended breakfast hours the school saw an increase in average daily school breakfast participation of nearly 400% by the end of the school year. The school Wellness Team conducted a follow-up survey in the spring of 2011 with current students enrolled in PE classes (n=826) with a response rate of 49%. These were not the same students who took the baseline survey. The survey data indicated that the percentage of students who reported that they had skipped breakfast at least once per week was 8.7% lower when compared to the baseline survey. This research did not include a comparison group. This study was partially supported by a grant from the Midwest Dairy Council so there is potential for a conflict of interest.

8. Healthy Youth Survey. QxQ Analysis. 2012;
<http://www.askhys.net/Analyzer.Washington>.

Washington state Healthy Youth Survey data from 2012 indicate that among 6th, 8th, 10th, and 12th grade respondents students of color and American Indian/Alaska Native (AI/AN) students were more likely to report having gone without breakfast on the day of the survey than their white peers. Although these disparities did not reach significance in every grade for each race/ethnicity classification, the rates of skipping breakfast were significantly higher than those for white students for the following: 6th grade AI/AN and Hispanic students as well as those that self-reported their race/ethnicity as "multiple" or "other"; 8th AI/AN, black, and Hispanic students as well as those reporting their race/ethnicity as "multiple" or "other"; and 10th grade AI/AN and Hispanic students; and 12th grade black and Hispanic students. High percentages of students from every grade reported skipping breakfast. These rates reached as high as 49.5% (95% CI 39.5-59.5%) for AI/AN 10th graders. The percentage of students who skipped breakfast in 6th, 8th, 10th, and 12th grade (all racial ethnic groups combined) were 20.2% ± 2.0%, 31.7% ± 2.0%, 37.1% ± 2.3%, and 38.5% ± 2.5% respectively.

9. Sweeney NM, Tucker J, Reynosa B, Glaser D. Reducing hunger-associated symptoms: The midmorning nutrition break. *The Journal of School Nursing*. 2006;22(1):32-39.

Sweeney et al. evaluated the impact of a 9:00 AM Nutritional Break one academic year after its implementation in an inner-city high school. A baseline survey of the high school students (n=846) indicated that 57% of the respondents had not eaten breakfast on the day of the survey despite the universal free breakfast program offered at the school (response rate not noted). Following the intervention researchers collected 590 student surveys (71% response rate) and 46 staff surveys (33% response rate). Students reported a 36% participation rate in the before-school on campus breakfast while 69% of students reported participating at least one day per week in

the Nutrition Break. The authors also found that as participation in the Nutrition Break increased, students reported a significant decrease in several hunger-related symptoms (i.e. inability to focus, tiredness, stomachache, and midmorning hunger), although participation in the Nutrition Break only accounted for small percentages in the variation. Seventy-four percent of the staff members who responded to the survey indicated that the Nutrition Breaks had a positive effect on students such as improved performance, students being more alert, energetic, motivated and refreshed after the Break and that hunger was no longer an issue during class. Thirty-five percent of staff responded that the Break had negative impacts such as sugar rushes following the Break and sugar crashes later in the day.

10. Van Wye G, Seoh H, Adjoian T, Dowell D. Evaluation of the New York City breakfast in the classroom program. *American journal of public health*. 2013;103(10):59-64. Van Wye et al. conducted a cross-sectional survey of third through fifth grade students attending schools in New York City in nine schools providing Breakfast in the Classroom (BIC) programs and in seven geographically and demographically matched randomly selected control schools. All students in the BIC and control classrooms were surveyed on what and where they had eaten that morning (n=2,289) with a 98% response rate. Both control and intervention schools offered universal free breakfast. Students in BIC classrooms were significantly less likely to report having skipped breakfast (8.7%) compared to students in the control classrooms (15.0%). While BIC students were more likely to report eating in more than one location (e.g. home and in the classroom) than control students, there were no significant differences between the two groups in consumption of fruits and vegetables, candy, doughnuts, chips, or sugary drinks. BIC students ate an estimated 95 calories more in the morning compared to control students. Among students offered BIC, those actually eating BIC consumed an estimated 151 more calories than students in control schools. The authors indicate that while the data support that BIC decreased the number of students skipping breakfast, it was also associated with an increase in caloric consumption that may be above what is needed. They also note that because the BIC programs were relatively new it is possible that as they are normalized students will be less likely to eat breakfast at more than one location.

11. Office of Superintendent of Public Instruction website. Student enrollment demographic data 2014; <http://reportcard.ospi.k12.wa.us/DataDownload.aspx>. Accessed January 21, 2015.

These recent Washington state data indicate that school districts that serve high percentages of students eligible for free and reduced-price lunch also tend to serve high percentages of students of color. Although the relationship is not true for every district, the trend is apparent when looking at data for all of the districts combined.

12. Mosehauer K, et al. *The future of school breakfast: An analysis of evidence-based practices to improve school breakfast participation in Washington state*. Washington Appleseed;2013.

Mosehauer et al. analyzed 2013 Washington student School Breakfast Program participation data and found that districts with some schools using Breakfast after the Bell models had higher average participation rates among the target population (students eligible for free and reduced-price lunch) in the School Breakfast Program than districts only using traditional cafeteria models. For example, the districts using traditional models had participation rates for the target

population of 49.85% while districts with some schools using traditional cafeteria models and some using Second Chance Breakfast had rates of 50.97%, districts with some schools using traditional models and some using Second Chance Breakfast or Grab 'N' Go had rates of 55.46%, and districts with some schools using traditional models and some using Second Chance Breakfast, Grab 'N' Go, and Universal Breakfast had rates of 77.47%. The report does not indicate if these rates are statistically significantly different. These data also indicate that low-income students missed more days of school than their high-income counterparts, but that schools with higher participation in the School Breakfast Program by students eligible for free and reduced-price meals had smaller disparities in attendance between low and high-income students. Schools meeting national breakfast participation goals saw 40% fewer absences for low-income students than schools not meeting these goals. For example, in Auburn School District, low-income students at schools serving breakfast to 70% or more of the students eligible for free or reduced-price meals missed 1.7 more days of school each year than their higher-income peers, while free and reduced-price eligible students at schools serving less than 70% of the target population missed 3.62 days more than their peers. These are descriptive data only and do not account for potential confounding factors, however the authors did exclude students who were not enrolled in the same school for the entire year which reduces the risk of cross-over. This report also indicates that in Washington, low-income students who experience greater food insecurity missed 1 to 5 more days of school per year than their counterparts.

13. Adolphus K, Lawton CL, Dye L. The effects of breakfast on behavior and academic performance in children and adolescents. *Frontiers in human neuroscience*. 2013;7.

Adolphus et al. conducted a systematic review of the literature to determine the effects of breakfast on school behavior and on academic performance. The authors included articles and reviews published between 1950 and 2013. Thirty-six studies met their inclusion criteria with 14 including behavior measures, 17 including academic performance measures, and five studies including both behavior and academic outcomes. Of the 19 studies which evaluated the effects of breakfast on behavior 11 found a positive effect on behavior such as being on-task in the classroom. This effect was found in both well-nourished and undernourished children as well as those with low socioeconomic position. Most of these studies are evaluations of School Breakfast Programs, which both lack scientific rigor and are looking at the connection between having a School Breakfast Program and behavior irrespective of how many students were actually participating in the program or eating breakfast. The authors indicate that in order for the School Breakfast Program to impact behavior barriers to accessing the program must be minimized. The review identified 21 studies evaluating the effect of habitual breakfast and School Breakfast Programs on academic performance. The authors found that increased frequency of habitual breakfast was consistently and positively associated with improved school performance such as school grades and achievement test scores. The evidence also supports that School Breakfast Programs have positive effects on school performance, particularly math grades and arithmetic scores. The evidence indicates that these positive effects may be more pronounced in schools with more undernourished children and worse academic outcomes—where studies carried out with these populations showed consistent positive effects of breakfast on school performance. The researchers highlight studies which have found School Breakfast Programs to be associated with increased attendance, punctuality, readiness to learn, decreased dropout rates, and better classroom behavior.

14. Hoyland A, Dye L, Lawton CL. A systematic review of the effect of breakfast on the cognitive performance of children and adolescents. *Nutrition research reviews*. 2009;22(2):220-243.

Hoyland et al. conducted a systematic review of the literature on the effects of breakfast on cognitive function in children and adolescents. The authors included studies published between 1950 and 2009. Forty-two articles consisting of 45 studies met their inclusion criteria. The authors provided a quality rating score for each study using pre-defined criteria. The researchers conclude that overall the evidence supports that eating breakfast has positive effects on cognitive performance compared to skipping breakfast. This finding was apparent in both acute studies and evaluations of longer-term School Breakfast Programs. They also found that these positive effects were more apparent in nutritionally vulnerable children, indicating that increasing access to breakfast may have a greater positive impact on low-income students. The authors also highlight evidence that School Breakfast Programs are associated with improved attendance and indicate that this may at least partially account for the benefits observed as part of the breakfast programs. They cite studies which found that breakfast was associated with improvements in, for example, memory, fewer errors on attention tasks, achievement tests, math grades, and reading scores. Although there was not complete consensus among the 45 studies, and some publications found no association between breakfast and some measure of cognition, six of the seven highest quality studies (receiving at least a 16 out of 18 possible points for quality), found a positive association between breakfast and at least one measure of cognitive performance. One of the authors of this study was supported by a grant from Kellogg Company UK, which could introduce a conflict of interest. The authors also note that many of the "studies reviewed were sponsored in whole or in part by industry."

15. Mesas AE, Muñoz-Pareja M, López-García E, Rodríguez-Artalejo F. Selected eating behaviours and excess body weight: A systematic review. *Obesity reviews: an official journal of the International Association for the Study of Obesity*. 2012;13(2):106-135.

Mesas et al. conducted a systematic review of the literature on the connection between skipping breakfast and obesity. They included studies in English, Spanish, and Portuguese that had been published through the end of 2010. The authors excluded studies that only included subjects with excess weight. This exclusion may mask any effects primarily or exclusively impacting individuals with high BMI. The authors identified 63 cross sectional and 10 longitudinal studies that fit their inclusion criteria. Of the publications focusing on children and/or adolescents 35 of the 48 cross sectional studies found that skipping breakfast was associated with overweight or obesity. This association between skipping breakfast and obesity was observed even by studies that controlled for confounding factors. Seven of the longitudinal studies focused on children and/or adolescents and these found conflicting results. In three of these seven studies skipping breakfast was associated with excess weight. The cross-sectional studies on adults were conflicting, though a slightly higher percentage of the studies found that skipping breakfast was associated with increased BMI. However, the two longitudinal studies in adults that controlled for confounders (higher quality studies) found that skipping breakfast was associated with an increase in BMI of at least 5% after one year of follow-up.

16. O'Neil CE, Nicklas TA, Fulgoni VL, The Benefits of B. Nutrient intake, diet quality, and weight/adiposity parameters in breakfast patterns compared with no breakfast in adults: National health and nutrition examination survey 2001-2008. *Journal of the*

Academy of Nutrition and Dietetics. 2014;114(12):S27-S43. O'Neil et al. cite eleven studies in their introduction which indicate that breakfast consumption among adults is associated with improved daily nutrient intake, food group selection, dietary adequacy, diet quality, and intake of micronutrients. The authors also cite evidence that breakfast consumption is associated with positive measures of BMI and cardiovascular risk factors but note that the literature addressing these measures has been inconsistent. O'Neil et al. analyzed 2001-2008 National Health and Nutrition Examination Survey data for respondents 19 years of age or older (N=18,988). They found eleven different meal patterns among respondents. The data indicate that individuals who ate quality breakfasts (e.g. grains, 100% fruit juice, lower-fat milk, whole fruit) had higher daily intakes of nutrients and lower BMI and waist circumference than breakfast skippers. Note that individuals with meal patterns that included, for example, doughnuts, muffins, etc., did not have higher nutrient intake or lower BMI than breakfast skippers. O'Neil was a member of the Kellogg's Breakfast Council at the time this article was written, and publication of this article was supported by an unrestricted education grant from the Kellogg Company, both of which may introduce a conflict of interest.

17. Smith KJ, Gall SL, McNaughton SA, Blizzard L, Dwyer T, Venn AJ. Skipping breakfast: Longitudinal associations with cardiometabolic risk factors in the childhood determinants of adult health study. *The American journal of clinical nutrition*. 2010;92(6):1316-1325.

Smith et al. cite evidence in their introduction that skipping breakfast is associated with a poorer overall diet; lower physical activity levels; higher intakes of fat, cholesterol, and energy; and lower intakes of fiber, vitamins and minerals. The authors conducted a longitudinal cohort study in Australia in order to determine the effects of skipping breakfast in both childhood and adulthood. The national cohort of 9-15 year olds were first surveyed in 1985 (67.5% response rate). Between 2004 and 2006, participants (n=2,248) filled out a questionnaire and just over 1,720 participants had their diet quality assessed, their waists measured, and their fasting blood drawn by researchers. The data indicate that those who skipped breakfast as a child and as an adult had the least healthy eating habits. The authors also found that, after controlling for lifestyle factors, age, sex, and sociodemographic factors, participants who skipped breakfast both as a child and as an adult had significantly larger waist circumferences, higher fasting insulin, higher total cholesterol, and higher low-density lipoproteins (LDL or 'bad') cholesterol than participants who ate breakfast both as a child and in adulthood. Lifetime breakfast skippers had an average waist circumference of 4.63cm larger than their counterparts. This study was partially funded by an unrestricted grant from the Kellogg Company and support from the Kellogg's Corporate Citizenship Fund which has potential to introduce a conflict of interest.

18. VanEenwyk J, Brandt G, Bezruchka S, Pobutky, A. Washington State Department of Health. 2013. *Health of washington state report: Social and economic determinants of health*. 2013.

VanEenwyk et al. conducted a review of the literature on the complex relationships between the social factors that impact health. The authors found that the literature provides extensive evidence of the association between lower educational attainment and poor health outcomes, and of the association between lower income and poor health outcomes.

19. Lucio R, Hunt E, Bornovalova M. Identifying the necessary and sufficient number of risk factors for predicting academic failure. *Developmental psychology*. 2012;48(2):422-428.

Lucio et al. analyzed data from the Educational Longitudinal Study: 2002 which includes a national sample of 14,796 students. The authors used a 5-step process to identify which factors contribute to academic ‘failure’—a grade point average (GPA) of less than 2.0 which is the minimum GPA needed to graduate from high school. They found that a number of academic outcomes impact a student’s GPA and therefore their ability to attain a high school diploma. Many of these are academic outcomes that other research has found to be impacted by skipping breakfast such as academic engagement, grade retention, and behavior among. The authors also found that the odds of passing decreased with each additional risk factor: “For each risk factor that is added, there is a 47% increased likelihood of failing.”

20. Melby JN, Conger RD, Fang SA, Wickrama KA, Conger KJ. Adolescent family experiences and educational attainment during early adulthood. *Developmental psychology*. 2008;44(6):1519-1536.

Melby et al. analyzed data from a longitudinal study of two-biological-parent intact families in Iowa. They had a sample size of 451 families. The researchers conducted modeling to determine what factors impact educational attainment and found level of academic engagement was strongly correlated with later educational attainment.

21. Ou S-R, Reynolds AJ. Predictors of educational attainment in the Chicago longitudinal study. *School Psychology Quarterly*. 2008;23(2):199-229.

Ou and Reynolds analyzed data from the Chicago Longitudinal Study, using a sample size of 1,286 youth in order to investigate predictors of high school completion and total educational attainment. They found that, among other factors, school absences, grade retention, and youth’s educational expectations all influenced educational attainment.

22. Winding TN, Nohr EA, Labriola M, Biering K, Andersen JH. Personal predictors of educational attainment after compulsory school: Influence of measures of vulnerability, health, and school performance. *Scandinavian journal of public health*. 2013;41(1):92-101.

Winding et al. analyzed data from a 2004 questionnaire completed by a cohort of adolescents born in 1989 (n=3053) in Denmark (83% response rate) and linked 2010 educational attainment data from Statistics Denmark. This allowed for a follow-up of 6.5 years. The authors found that low grades during primary school was predictive of not having completed a secondary education by age 20/21 (odds ratios between 1.7 and 2.5). For students with low math grades this association was even stronger. The authors cite two additional studies which have also found an association between school performance and later educational attainment.

23. Kandel DB, Griesler PC, Schaffran C. Educational attainment and smoking among women: Risk factors and consequences for offspring. *Drug and alcohol dependence*. 2009;104:24-33.

Researchers examined United States data from four national data sets and found that, among women, lower levels of education are associated with greater risk of being a current smoker, smoking daily, smoking heavily, being nicotine dependent, starting to smoke at an early age, having higher levels of circulating cotinine (a metabolite of nicotine) per cigarettes smoked, and

continuing to smoke in pregnancy. In addition, lower levels of maternal education were linked to increased risk of antisocial behavior among offspring.

24. McCarty CA, Mason WA, Kosterman R, Hawkins JD, Lengua LJ, McCauley E. Adolescent school failure predicts later depression among girls. *The Journal of adolescent health : official publication of the Society for Adolescent Medicine.* 2008;43(2):180-187.

McCarty et al. conducted a prospective longitudinal cohort study with a sample of 808 youth followed from ages 10 to 21. The researchers discovered that adolescent school ‘failure’ (meaning being suspended, expelled, or dropping out of high school early) predisposed girls to depression in early adulthood.

25. McLaren L. Socioeconomic status and obesity. *Epidemiologic Reviews.* 2007;29(1):29-48.

McLaren et al. conducted a meta-analysis exploring the relationship between obesity and SES among adults. A total of 333 studies published internationally met the inclusion criteria. In highly developed countries, the majority of the studies found higher body weights among women with lower education attainment. Nearly 50% of the studies in highly developed countries found the same relationship for men.

26. Mersky JP, Reynolds AJ. Educational success and adult health: Findings from the Chicago longitudinal study. *Prevention Science.* 2009;10(2):175-195.

Mersky and Reynolds analyzed data from a Chicago prospective cohort study that followed 1,539 individuals. Results indicate that high school completion was significantly and inversely associated with tobacco smoking, frequent substance use, depression, and no health insurance coverage. In addition, middle school reading performance was inversely related to depression and student’s expectation to attend college was negatively associated with frequent drug use.

27. Mezuk B, Eaton WW, Golden SH, Ding Y. The influence of educational attainment on depression and risk of type 2 diabetes. *American journal of public health.* 2008;98(8):1480.

Researchers analyzed adult survey data collected in the Baltimore Epidemiological Catchment Area and then conducted follow-up interviews with the survey cohort. Mezuk et al. found a statistically significant association between type 2 diabetes and lower educational attainment. In addition, the data indicate that depression was associated with type 2 diabetes, but each year of education attained decreased the risk of type 2 diabetes for those experiencing depression.

28. Centers for Disease Control and Prevention website. Behavioral Risk Factor Surveillance System Prevalence and Trends Data: Washington. 2012; <http://apps.nccd.cdc.gov/brfss/page.asp?cat=XX&yr=2012&state=WA#XX>. Accessed December 2, 2013.

Recent Behavioral Risk Factor Surveillance System (BRFSS) data from Washington State indicate that as educational attainment increases income level also increases. These data also find correlations between higher income and improved health for a number of indicators including: oral health, tobacco use, women’s health indicators, health screening rates, and physical activity. These data also show correlations between higher educational attainment and positive health outcomes for these same indicators.

29. Reed P KD, Cheng E, Kinne S. Washington State Department of Health. *Health of Washington State Report: Mortality and Life Expectancy*. 2013.

The authors present Washington state data on mortality and life expectancy. The data show that age-adjusted death rates were higher in Washington census tracts with lower college graduation rates and also in census tracts with higher poverty. The state data also show that self-reported health status decreases both as income and as educational attainment decrease.

30. Skodova Z, Nagyova I, Dijk J, et al. Socioeconomic differences in psychosocial factors contributing to coronary heart disease: A review. *Journal of Clinical Psychology in Medical Settings*. 2008;15(3):204-213.

Skodova et al. conducted a meta-analysis of the literature addressing the relationships between SES, coronary heart disease (CHD), and psychosocial factors contributing to coronary heart disease. Researchers identified 12 studies that met their inclusion criteria. They found that higher levels of education are associated with lower rates of CHD, and that decreasing education is associated with factors that are linked to CHD such as depression, anxiety, hostility, and a lack of social supports.

31. Steptoe A, Hamer M, Butcher L, et al. Educational attainment but not measures of current socioeconomic circumstances are associated with leukocyte telomere length in healthy older men and women. *Brain Behavior and Immunity*. 2011;25(7):1292-1298.

Steptoe et al. analyzed data collected from 543 male and female London-based civil servants of white European origin. All participants were between the ages of 53 and 76 and healthy. Researchers looked at blood samples to determine telomere length and telomerase activity. Telomere shortening is associated with aging. Short telomeres are also associated with increased risk of premature heart attack and mortality. Researchers found that lower educational attainment was associated with shorter telomere length after controlling for biological and behavioral covariates. This association remained significant even after adjusting for current SES. Researchers speculated that low educational attainment may be an indicator of long-term lower SES, and may be associated with accumulated stress resulting in telomere shortening. They also postulate that education may promote problem-solving skills leading to reduced responses to stress, thereby impacting aging.

32. Bureau of Labor Statistics website. *Employment projections: Earnings and unemployment rates by educational attainment*. Last updated May 22, 2013; http://www.bls.gov/emp/ep_chart_001.htm. Accessed December 10, 2013.

National data from 2012 indicate that as educational attainment increases median weekly earnings also increase and unemployment rates decrease.

33. Paul KI, Moser K. Unemployment impairs mental health: Meta-analyses. *Journal of Vocational Behavior*. 2009;74(3):264-282.

Paul et al. conducted a meta-analysis of 237 cross-sectional and 87 longitudinal studies that examined the relationship between mental health and unemployment. The meta-analysis of cross-sectional data revealed that unemployed persons showed significantly more symptoms of distress and impaired well-being than did employed persons. The meta-analyses of longitudinal

studies and natural experiments supported the concept that unemployment is not only correlated to distress but also causes it.

34. Prause J, Dooley D, Huh J. Income volatility and psychological depression.

American Journal of Community Psychology. 2009;43(1-2):1-2.

Prause et al. analyzed a sample (n = 4,493) from the National Longitudinal Survey of Youth. Researchers found that income volatility was significantly associated with depression; and downward volatility (frequent losses in income) was significantly associated with depression even after controlling for baseline depression. High income appeared to act as a buffer, so those with lower incomes were more vulnerable to the adverse effects of downward volatility.

35. Spencer N, Thanh TM, Louise S. Low income/socio-economic status in early childhood and physical health in later childhood/adolescence: A systematic review.

Maternal and child health journal. 2013;17(3):424-431.

Spencer et al. conducted a meta-analysis of studies examining the relationship between low SES in the first five years of life and physical health outcomes in later childhood and adolescence. Nine studies met the researchers' strict inclusion criteria. The studies indicated significant associations between early childhood low-income status and a number of adverse health outcomes including: activity-limiting illness, parent-reported poor health status, acute and recurrent infections, increasing BMI, dental caries, and higher rates of hospitalization.

36. Subramanyam M, Kawachi I, Berkman L, Subramanian SV. Relative deprivation in income and self-rated health in the united states. *SSM Social Science & Medicine*. 2009;69(3):327-334.

Subramanyam et al. analyzed data from the Current Population Surveys conducted by the United States Census Bureau. Researchers found that individuals from the lowest income category were over five times more likely to report being in poor health than participants from the highest income category. In addition, they found that relative deprivation (the differences in incomes between an individual and others who have higher incomes than that individual [one measure of income inequality]) appeared to explain a large part of this association.