

# HEALTH NOTE: Expand Child Nutrition School Lunch Protection Act (HB19-1171) 2019 Colorado General Assembly

## Primary Sponsor:

Representative Dafna  
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## Bill Provisions Examined:<sup>a</sup>

The bill clarifies that all students in sixth through eighth grade participating in the federal reduced-price school lunch program are eligible for the Child Nutrition School Lunch Protection program—which uses state funding to eliminate families' co-payment for reduced-price lunch under the National School Lunch Program—and extends the grades of eligibility for the state program to students through the twelfth grade.

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## What is the goal of this health note?

Decisions made in sectors outside of public health and health care, such as in education, housing, and employment, can affect health and well-being. Health notes are intended to provide objective, nonpartisan information to help legislators understand the connections between these various sectors and health. This document provides summaries of evidence analyzed by the Health Impact Project while creating a health note for Colorado House Bill (HB)19-1171. Health notes are not intended to make definitive or causal predictions about how a proposed bill will affect health and well-being of constituents. Rather, legislators can use a health note as one additional source of information to consider during policy-making. The analysis does not consider the fiscal impacts of this bill.

## How and why was this bill selected?

This bill was identified as one of several important policy issues being considered by the Colorado General Assembly in 2019. The health note screening criteria were used to confirm the bill was appropriate for analysis. (See Methodology on Page 6)

## Why was the eligibility provision selected?

One of the Health Impact Project's focus areas for health notes is examining the connection between the educational environment and health. The project selected the provision related to eligibility for Colorado's Child Nutrition School Lunch Protection program in HB19-1171 for analysis because of its potential to affect the nutrition environment in Colorado schools. There is a strong and robust evidence-base linking education and health, with educational attainment creating opportunities for better health over a lifetime and poor student health affecting school attendance and academic achievement. Because children spend much of their time in school, characteristics including the environment, quality, funding, and culture of schools can impact mental and physical health, nutrition and physical activity, and learning.<sup>1</sup>

## SUMMARY OF HEALTH NOTE FINDINGS

Since 2008, the Colorado General Assembly has taken steps to expand access to free lunch among students through its Child Nutrition School Lunch Protection program by using state funding to eliminate families' co-payment for reduced-price lunch under the National School Lunch Program (NSLP). NSLP provides nutritionally balanced, low-cost or free lunches to over 30 million children in the United States each day.<sup>2</sup> This health note explores the evidence base regarding free and reduced-price school lunches and their effects on students' health and well-being, particularly food insecurity. Fifteen percent of children in Colorado—approximately 189,000 youth—live in homes that are food insecure, meaning that their access to adequate food is limited by a lack of money and other resources.<sup>3</sup> Research has consistently demonstrated that food insecurity has negative consequences for children's physical and mental health, behavior, cognitive development, and educational attainment.<sup>4</sup> Below is a summary of the key findings in this health note:

<sup>a</sup> Summary as described by the Colorado General Assembly, <https://leg.colorado.gov/bills/hb19-1171>.

<sup>b</sup> The Health Impact Project is committed to conducting nonpartisan research and analysis.

- The extent to which there are differences in outcomes between children receiving free lunch compared to those receiving reduced-price lunch is not well researched; however, one study found evidence suggesting that NSLP’s protective effect against food insecurity may be stronger for those receiving a free lunch than for those receiving a reduced-price lunch.<sup>5c</sup> Therefore, it is difficult to predict the potential health impacts of expanding eligibility of Colorado’s Child Nutrition School Lunch Protection program to students in ninth through twelfth grades.
- Since the limited available research suggests there may be a more protective effect against food insecurity for students receiving a free lunch, this health note explored the strong body of evidence regarding the effects of participation in NSLP and student health and well-being, with a focus on food insecurity.
- There is strong evidence that participation in school lunch programs reduces children’s risk of food insecurity and food insufficiency, with positive implications for students’ physical and mental health and educational attainment.<sup>6</sup> Data from the United State Department of Agriculture suggest that food insecurity is almost twice as prevalent in households with teenage children than in households in which the oldest child is four or younger.<sup>7</sup> Research for this analysis did not yield any studies specifically examining Colorado’s Child Nutrition School Lunch Protection program and food insecurity.
- Research has also explored the effects of participation in NSLP on dietary intake and diet-related health outcomes. Since the implementation of updated federal nutrition standards authorized by the Healthy, Hunger-Free Kids Act of 2010, there is strong evidence that healthier food options are being offered in schools; however, there is only a fair amount of evidence that school lunch participation is associated with improved dietary intake and mixed evidence regarding the association between school meal programs and obesity.<sup>8</sup>

**Methods Summary:** To complete this health note, Health Impact Project staff conducted an expedited literature review using a systematic approach to minimize bias and identify studies to answer each of the identified research questions. In this note, “health impacts” refer to effects on determinants of health, such as education, employment, and housing, as well as effects on health outcomes, such as injury, asthma, chronic disease, and mental health. The strength of the evidence is qualitatively described and categorized as: not well researched, mixed evidence, a fair amount of evidence, strong evidence, or very strong evidence. It was beyond the scope of analysis to consider the fiscal impacts of this bill or the effects any funds dedicated to implementing the bill may have on other programs or initiatives in the state. To the extent that this bill requires funds to be shifted away from other purposes or would result in other initiatives not being funded, policymakers may want to consider additional research to understand the relative effect of devoting funds for this bill relative to another purpose. A detailed description of the methods is provided in Methodology on Page 6.

## WHY DO THESE FINDINGS MATTER FOR COLORADO?

The strong evidence regarding participation in school lunch programs and decreased risk of food insecurity has important implications for Colorado families. On average, between 2015 and 2017, approximately 9.2 percent of Coloradans experienced food insecurity.<sup>9</sup> In the 2017-2018 school year, a total of 270,405 students were enrolled in high school in Colorado.<sup>10</sup> According to the 2017 Healthy Kids Colorado Survey, 14.1 percent of high school students reported going hungry in the preceding 30 days because of a lack of food at home.<sup>11</sup>

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<sup>c</sup> See definitions of strength of evidence ratings on Page 7.

Food insecurity is more prevalent in households with teenage children. In addition, research suggests that a higher percentage of children ages 9 to 18 miss lunch compared to children ages 4 to 8, which leads to lower intake of essential micro-nutrients.<sup>12</sup> Between 2010 and 2011, the United States Department of Agriculture found that food insecurity was almost twice as prevalent in households with teenage children than households in which the oldest child was four or younger.<sup>13</sup> Children in low-income households and children of color are more likely to experience food insecurity, and food insecurity is also more prevalent in rural communities than in urban areas.<sup>14</sup> More than 15 percent of Colorado's pre-kindergarten to twelfth grade student population attends school in a rural district.<sup>15</sup>

As of 2017, 33.9 percent of school children in Colorado were eligible for free lunches and 7.8 percent were eligible for reduced-price lunch, with significant variation between counties.<sup>16</sup> For example, in Saguache County 89.8 percent of students were eligible for free or reduced-price lunch, while in Elbert County, 21.3 percent of students were eligible.<sup>17</sup>

## **WHAT ARE THE HEALTH EFFECTS OF PARTICIPATING IN SCHOOL MEAL PROGRAMS?**

### **Effects on Food Insufficiency and Food Insecurity**

- Evidence shows that participation in the NSLP reduces the risk of food insecurity, where access to adequate food is limited or uncertain, as well as food insufficiency, where children do not have enough food to eat. One study, using data on a national sample of households with children ages 5 to 18 from the Survey of Income and Program Participation (SIPP), estimated that participation in NSLP is associated with a nearly 14 percent reduction in the risk of food insufficiency.<sup>18</sup> Additional analyses of households with children ages 5 to 11 and those with children ages 12 to 18 showed that the reductions in risk of food insufficiency were statistically significant for children in both age groups. Another study using SIPP data found that compared with peers who were eligible but chose not to participate in the program, NSLP recipients were more likely to suffer from food insufficiency during summer months when school meals are not available, highlighting the program's protective role against food insufficiency.<sup>19</sup>
- Food insecurity and food insufficiency have negative consequences for student physical and mental health, behavior, and educational attainment.<sup>20</sup> Among children ages 6 to 11, food insecurity is linked to lower cognitive functioning, lower test scores, and lower school attendance.<sup>21</sup> For adolescents ages 12 to 16, evidence suggests that food insecurity can affect students' relationships with their peers and likelihood of suspension.<sup>22</sup> Food insecurity is also associated with poorer general health, asthma, anxiety, depression, and behavioral problems in children.<sup>23</sup> Researchers have estimated the health-related costs of food insecurity in the United States to be upwards of \$160 billion.<sup>24</sup>
- Food insecurity can reduce the quality and amount of food children consume and disrupt their eating patterns.<sup>25</sup> Children who are food insecure are more likely to consume cheaper, energy-dense foods and have a higher intake of fats, sweets, and fried foods.<sup>26</sup>
- There is mixed evidence regarding the association between household food insecurity and obesity. One study, using a nationally representative cohort of children from the National Health and Nutrition Examination Survey, found that obesity was significantly associated with personal food insecurity for older children (ages 6 to 11 years), but not in younger children (ages 2 to 5 years).<sup>27</sup> Other studies also suggest that food insecurity is associated with being overweight in older children, not younger children.<sup>28</sup> Research examining the role of the NSLP in modifying the relationship between food insecurity and obesity in children is inconclusive.<sup>29</sup>
- Research suggests that the NSLP increases the food purchasing power of families and can move households into food security. Using simulation modeling software, researchers estimated that one

child receiving free lunches increases the food purchasing power of a family of three—a single adult with two children—by \$513 a year.<sup>30</sup> In households where two children are enrolled in NSLP the food purchasing power increases by over \$1,000 a year, or approximately 5.4 percent of the family's income.<sup>31</sup> The same study estimated that in 2014, the NSLP enabled more than 307,000 students nationwide to become food secure.

### **Effects on Students' Dietary Intake**

- The Dietary Guidelines of 2015-2020 provide recommended fruit and vegetable intakes for children based on age and sex. Nationally and in Colorado, most high school students do not consume the recommended amounts of fruits and vegetables per day.<sup>32</sup> Data from the 2017 Healthy Kids Colorado Survey show that only 42.2 percent of high school students (grades 9-12) consumed fruit one or more times a day in the last seven days.<sup>33</sup> Black or African American students have the lowest percentage of students consuming fruit one or more times a day in the last seven days (30.9 percent), followed by Native Hawaiian or Other Pacific Islander students (35.8 percent) and Hispanic only or Hispanic white students (35.9 percent).<sup>34</sup> The percentage of high school students who consumed vegetables one or more times per day in the past seven days was 44.2 percent. Like fruit consumption, black or African American students saw the lowest consumption (32.5 percent), followed by Hispanic only or Hispanic white students at 35.4 percent.<sup>35</sup>
- Researchers estimate that students participating in school meal programs consume approximately 27 percent of their daily calories through school lunch, and nearly half of their daily energy intake comes from school meals if they consume school breakfast and lunch.<sup>36</sup>
- Research has shown that NSLP participation is associated with improved dietary intake among children.<sup>37</sup> A cross-sectional study of approximately 5,000 children found that eating school breakfast and school lunch every day was associated with modestly healthier dietary intake in children ages 4 to 15.<sup>38</sup> The study found that children who ate school lunch every day consumed significantly more dairy and calcium compared with children who did not eat school lunch every day, and that the benefits of school meal participation on dietary intake and quality may be greater for low-income children because they are more likely to eat both breakfast and lunch at school.<sup>39</sup>
- Research suggests that other aspects of the school environment beyond school meals can affect consumption of healthy foods. For example, a cross-sectional study of seventh and ninth grade students attending 31 schools in predominantly low-income communities in California found that factors including a longer lunch period, better fruit quality, availability of a salad bar, and involving students in food service decisions increased the odds of students eating fruits and vegetables at school.<sup>40</sup>
- Since implementation of the Healthy, Hunger-Free Kids Act of 2010, schools are offering healthier school meal options. These updated nutrition standards will likely play an important role in the relationship between participation in school lunch programs and students' dietary intake. The Act set limits on calories, salt, sugar, and fat contained in all food and beverages provided and sold in schools.<sup>41</sup> Several studies show that the quality of school lunches in elementary, middle, and high schools has significantly improved since implementation of the new standards in 2012-2013, and there is some evidence that these changes have positively affected students' consumption of healthy foods such as fruits and vegetables, low-fat or non-fat milk, and whole grains.<sup>42</sup> For example, one study of middle and high school students in a diverse, urban school district in Washington state found that the school foods selected by students were more nutrient dense and had fewer calories after implementation of the new standards.<sup>43</sup>

### **Effects on Diet-Related Health Outcomes**

- The relationship between school meal programs and health outcomes such as obesity is complex, and evidence suggests that other factors at school in addition to school meals—such as the types of

foods available, rates of physical activity, sedentary behavior, and self-esteem among students—play a role.<sup>44</sup>

- A systematic review and meta-analysis examined the association between school nutrition and physical activity policies on the weight of children ages 4 to 11. The study found that although participating in the National School Breakfast Program is associated with a lower body mass index (BMI) among participants, participating in the NSLP can contribute to weight gain and BMI increases.<sup>45</sup> Another study, using data from the Early Childhood Longitudinal Study, found that eating a school lunch was associated with a 0.65 point higher BMI score for low-income eighth grade girls than for eighth grade girls who did not typically eat school lunch, but researchers did not find an association between participation in the NSLP and BMI for eighth grade boys.<sup>46</sup> A study of school characteristics and BMI that involved 5th and 6th graders from 12 randomly selected schools in New Haven, Connecticut found that being eligible for free or reduced-price lunch at the individual level, or the percent eligible at the school level, were not significantly associated with mean BMI percentile.<sup>47</sup>
- Changes to the meal nutrition standards implemented under the Healthy, Hunger-Free Kids Act of 2010 play an important role in the association between school lunch consumption and diet-related health outcomes. A study using systematic reviews and a microsimulation model of national implementation of the updated nutrition standards for school meals projected that the updated standards will prevent an estimated 1,816,000 cases of childhood obesity.<sup>48</sup> In 2017, 9.5 percent of Colorado high school students were obese.<sup>49</sup>

## **WHICH POPULATIONS ARE MOST LIKELY TO BE AFFECTED BY THIS BILL?**

Participants in the national school lunch and breakfast programs are more likely to come from lower-income households, less likely to live in a household headed by a married couple, and more likely to be black or Hispanic compared with all school-age children.<sup>50</sup> Children who receive free or reduced-price lunches are also more likely to come from a household that has experienced food insecurity compared with children from households with similar income that do not participate in the school lunch program.<sup>51</sup> Compared with other eligible households that do not participate in the program, NSLP recipients have lower household incomes and are more likely to have a head of household that is female, black, unmarried, and unemployed.<sup>52</sup> Additionally, children in low-income households and children of color are more likely to experience food insecurity, and are already experiencing or are at disproportionate risk of negative health outcomes related to diet and nutrition, including obesity.<sup>53</sup> As previously described, food insecurity is also more prevalent in rural communities than in urban areas, and children living in rural areas are at increased risk of obesity compared with children living in urban areas.<sup>54</sup>

## **HOW LARGE MIGHT THE IMPACT BE?**

Where possible, the Health Impact Project describes how large the impact may be based on the bill language and literature, such as describing the size, extent, and population distribution of an effect. The proposed bill would make 1,138,590 and 1,171,825 reduced-price lunches free to eligible students in grades 9 through 12 in Fiscal Year 2019-2020 and FY 2020-21, respectively.<sup>55</sup> Using the required minimum number of instructional days in the Colorado school year of 160, this would translate to approximately 7,116 and 7,324 high school students affected by the expanded program over the next two fiscal years. Overall, participation in the school lunch program is much higher in elementary schools (70% participation rate among students in public schools participating in NSLP) compared with middle schools (62%) and high schools (45%).<sup>56</sup>

It was beyond the scope of this analysis to consider the fiscal impacts of this bill or the effects any funds dedicated to implementing the bill may have on other programs or initiatives in the state. To the extent that this bill requires funds to be shifted away from other purposes or would result in other initiatives not being funded, policymakers may want to consider additional research to understand the relative effect of devoting funds for this bill relative to another purpose.

## **METHODOLOGY**

Once the bill was selected, a research team from the Health Impact Project hypothesized a pathway between the bill, health determinants, and health outcomes. The hypothesized pathway was developed using research team expertise and a preliminary review of the literature. Each bill component was mapped to steps on this pathway, and the team developed research questions and a list of keywords to search. The research team reached consensus on the final conceptual model, research questions, contextual background questions, keywords, and keyword combinations. The conceptual model, research questions, search terms, and list of literature sources were peer-reviewed by an external subject matter expert. Two external subject matter experts reviewed a draft of the note. A copy of the conceptual model is available upon request.

The Health Impact Project developed and prioritized nine research questions related to the bill components examined:

- To what extent does receiving free lunch instead of reduced-price lunch affect student outcomes, and to what extent do these effects differ by age of youth (e.g., K-8 vs. high school age)?
- To what extent does participation in the Child Nutrition School Lunch Protection program affect access to healthful foods, and to what extent do these effects differ by age of youth (e.g., K-8 vs. high school age)?
- To what extent does participation in the Child Nutrition School Lunch Protection program affect consumption of healthful foods, and to what extent do these effects differ by age of youth (e.g., K-8 vs. high school age)?
- To what extent does participation in the Child Nutrition School Lunch Protection program affect food security, and to what extent do these effects differ by age of youth (e.g., K-8 vs. high school age)?
- To what extent does participation in the Child Nutrition School Lunch Protection program affect educational performance and attainment, and to what extent do these effects differ by age of youth (e.g., K-8 vs. high school age)?
- To what extent does participation in the Child Nutrition School Lunch Protection program affect disposable income of students and their households, and to what extent do these effects differ by age of youth (e.g., K-8 vs. high school age)?
- To what extent does participation in the Child Nutrition School Lunch Protection program affect student absenteeism, and to what extent do these effects differ by age of youth (e.g., K-8 vs. high school age)?
- To what extent does participation in the Child Nutrition School Lunch Protection program affect health outcomes such as obesity rates, diabetes, heart disease, cognitive impairment, and behavioral health, and to what extent do any of these effects differ by age of youth (e.g., K-8 vs. high school age)?
- To what extent does participation in the Child Nutrition School Lunch Protection program affect social-emotional functioning and behavior, and to what extent do these effects differ by age of youth (e.g., K-8 vs. high school age)?

Next, the research team conducted an expedited literature review using a systematic approach to minimize bias and answer each of the identified research questions.<sup>d</sup> The team initially limited the search to systematic reviews and meta-analyses of studies, since they provide analyses of multiple studies or address multiple research questions. If no appropriate systematic reviews or meta-analyses were found for a specific question, the team searched for nonsystematic research reviews, original articles, and research reports from U.S. agencies and nonpartisan organizations. The team limited the search to electronically available sources published between January 2014 and January 2019.

The research team searched PubMed and EBSCO databases along with the following leading journals in public health, school health, and nutrition research to explore each research question: American Journal of Public Health, Social Science & Medicine, Health Affairs, Journal of School Health, Journal of Pediatrics, and Journal of the Academy of Nutrition and Dietetics.<sup>e</sup> For all searches, the team used the following keywords: Child Nutrition School Lunch Protection program participation, national school lunch program participation, access to health\* foods, consumption of health\* foods, food security, education\* performance, education\* attainment, disposable income, absenteeism, health outcomes, mental health, adolescent, teen, free lunch, reduced price lunch, and outcomes. Based on expert reviewer feedback, the team conducted additional searches using behavior\* as a keyword. The team also searched Voices for Healthy Kids, Healthy Eating Research, the Clinton Foundation's Healthy Schools Program, Nutrition and Obesity Policy Research and Evaluation Network, and Food Research & Action Center for additional research and resources outside of the peer-reviewed literature.

After following the above protocol, the team screened 239 titles and abstracts,<sup>f</sup> identified 33 abstracts for potential inclusion, and reviewed the full text corresponding to each of these abstracts. After applying the inclusion criteria, 15 articles were excluded. A final sample of 18 peer-reviewed articles and two resources identified outside of the peer-reviewed literature was used to create the health note. In addition, the team used 13 references to provide contextual information and two references identified through the additional keyword searches recommended by expert reviewers.

Of the studies included, the strength of the evidence was qualitatively described and categorized as: not well researched, mixed evidence, a fair amount of evidence, strong evidence, very strong evidence. The evidence categories were adopted from a similar approach from another state.<sup>57</sup>

**Very strong evidence:** the literature review yielded robust evidence supporting a causal relationship with few if any contradictory findings. The evidence indicates that the scientific community largely accepts the existence of the relationship.

**Strong evidence:** the literature review yielded a large body of evidence on 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 some combination of these.

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<sup>d</sup> Expedited reviews streamline traditional literature review methods in order to synthesize evidence within a shortened timeframe. Prior research has demonstrated that conclusions of rapid versus a full systematic review did not vary greatly. Cameron A. et al. "Rapid versus full systematic reviews: an inventory of current methods and practice in Health Technology Assessment," Australia: ASERNIP-S (2007), 1-105, [https://www.surgeons.org/media/297941/rapidvsfull2007\\_systematicreview.pdf](https://www.surgeons.org/media/297941/rapidvsfull2007_systematicreview.pdf).

<sup>e</sup> These journals were selected using results from a statistical analysis completed to determine the leading health research journals between 1990 and 2014. Merigó, José M., and Alicia Núñez. "Influential Journals in Health Research: A Bibliometric Study." *Globalization and Health* 12.1 (2016), accessed Jan. 11, 2018, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4994291/>.

<sup>f</sup> Many of the searches produced duplicate articles. The number of sources screened does not account for duplication across searches in different databases.

**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.

**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.

**Mixed evidence:** the literature review yielded several studies with contradictory findings regarding the association.

## EXPERT REVIEWERS

This document benefited from the insights and expertise of Dr. Jini Puma, Associate Director, Rocky Mountain Prevention Research Center and Assistant Professor, Department of Community and Behavioral Health, Colorado School of Public Health, University of Colorado at Denver, and Dr. Elaine Belansky, Center Director and Research Associate Professor, Center for Rural School Health and Education, Morgridge College of Education, University of Denver. Although they have reviewed the note and found the approach to be sound, neither they nor their organizations necessarily endorse its findings or conclusions.

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<sup>1</sup> Health Impact Project, "Education Is a Strong Predictor of Health" (2017), <https://www.pewtrusts.org/en/research-and-analysis/data-visualizations/2017/education-is-a-strong-predictor-of-health>; Health Impact Project, "The Every Student Succeeds Act Creates Opportunities to Improve Health and Education at Low-Performing Schools" (2017), <https://www.pewtrusts.org/en/research-and-analysis/reports/2017/08/the-every-student-succeeds-act-creates-opportunities-to-improve-health-and-education>.

<sup>2</sup> Colorado Department of Education, "State Funding for Reduced Price Meals: Colorado's Start Smart Program and Child Nutrition School Lunch Protection Program," <https://www.cde.state.co.us/nutrition/osnstatefundingreducedpricemealsfactsheet>, accessed March 1, 2019; United States Department of Agriculture, "The National School Lunch Program," <https://www.fns.usda.gov/sites/default/files/cn/NSLPFactSheet.pdf>, accessed March 1, 2019.

<sup>3</sup> Feeding America, "Child Food Insecurity," accessed March 6, 2019, <https://public.tableau.com/profile/feeding.america.research#!/vizhome/MaptheMealGap-ChildFoodInsecurity/ChildFoodInsecurity>. United States Department of Agriculture Economic Research Service, "Definitions of Food Security," (2018) <https://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/definitions-of-food-security.aspx#ranges>.

<sup>4</sup> Jin Huang, Ellen Barnidge, and Youngmi Kim, "Children Receiving Free or Reduced-Price School Lunch Have Higher Food Insufficiency Rates in Summer," *The Journal of Nutrition* 145 (2015):2161-8, doi: 10.3945/jn.115.214486; Amy Shanafelt et al., "Food insecurity and rural adolescent personal health, home and academic environments," *Journal of School Health* 86 (2017): 472-480, doi:10.1111/josh.12397.

<sup>5</sup> Kabbani, Nader S., and Myra Yazbeck Kmeid. "The Role of Food Assistance in Helping Food Insecure Households Escape Hunger." *Review of Agricultural Economics*, vol. 27, no. 3, 2005, pp. 439-445, [www.jstor.org/stable/3700872](http://www.jstor.org/stable/3700872).

<sup>6</sup> Jin Huang and Ellen Barnidge, "Low-income Children's participation in the National School Lunch Program and household food insufficiency," *Social Science & Medicine* 150 (2016): 8-14, <https://doi.org/10.1016/j.socscimed.2015.12.020>; Jin Huang, Ellen Barnidge, and Youngmi Kim, "Children Receiving Free or Reduced-Price School Lunch Have Higher Food Insufficiency Rates in Summer."

<sup>7</sup> Alisha Coleman-Jensen et al., "Food Insecurity in Households with Children: Prevalence, Severity, and Household Characteristics 2010-2011." Washington, DC: US Department of Agriculture; 2013, <https://www.ers.usda.gov/publications/pub-details/?pubid=43765>.

<sup>8</sup> Food Research & Action Center, "Research Shows that the School Nutrition Standards Improve the School Nutrition Environment and Student Outcomes" (2016), <http://www.frac.org/wp-content/uploads/school-nutrition-brief.pdf>; Jin Huang, Ellen Barnidge, and Youngmi Kim, "Children Receiving Free or Reduced-Price School Lunch Have Higher



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- <sup>9</sup> Alisha Coleman-Jensen, Matthew P. Rabbitt, Christian A. Gregory, and Anita Singh. 2018. *Household Food Security in the United States in 2017*, ERR-256, U.S. Department of Agriculture, Economic Research Service, <https://www.ers.usda.gov/webdocs/publications/90023/err-256.pdf?v=0>
- <sup>10</sup> Colorado Department of Education, "Colorado Education Facts and Figures" (2018), <https://www.cde.state.co.us/communications/coeducationfactsandfigures>, accessed March 1, 2019.
- <sup>11</sup> Colorado Department of Public Health and Environment, "Healthy Kids Colorado Survey Data Tables and Reports, 2017 High School Data, <https://www.colorado.gov/pacific/cdphe/healthy-kids-colorado-survey-data-tables-and-reports>, accessed March 1, 2019.
- <sup>12</sup> Mathias, K. C., Jacquier, E., & Eldridge, A. L. "Missing lunch is associated with lower intakes of micronutrients from foods and beverages among children and adolescents in the United States," *Journal of the Academy of Nutrition and Dietetics*, 116, no. 4(2016), 667-676, <https://doi.org/10.1016/j.jand.2015.12.021>
- <sup>13</sup> Alisha Coleman-Jensen et al., "Food Insecurity in Households with Children: Prevalence, Severity, and Household Characteristics 2010-2011."
- <sup>14</sup> Jasbir Kaur et al., "The Association between Food Insecurity and Obesity in Children – The National Health and Nutrition Examination Survey," *Journal of the Academy of Nutrition and Dietetics* 115 (2015): 751-8, doi: 10.1016/j.jand.2015.01.003; Elizabeth Lundeen et al., "Obesity Prevalence Among Adults Living in Metropolitan and Nonmetropolitan Counties – United States, 2016," *Morbidity and Mortality Weekly Report* 67, no. 23 (2018): 653-658, doi:10.15585/mmwr.mm6723a1; Caitlin Eicher Caspi et al., "School Breakfast Program Participation and Rural Adolescents' Purchasing Behaviors in Food Stores and Restaurants," *Journal of School Health* 87, no. 10 (2017): 723-731, doi:10.1111/josh.12546.
- <sup>15</sup> Colorado Department of Education, "Colorado Education Facts and Figures."
- <sup>16</sup> The Annie E. Casey Foundation, "Kids Count Data Center: Students qualifying for free or reduced price lunch in Colorado," <https://datacenter.kidscount.org/data/tables/3836-students-qualifying-for-free-or-reduced-price-lunch?loc=7&loct=2#detailed/2/any/false/871,870,573,869,36,868,867,133,38,35/109,110,111/10698,10699>.
- <sup>17</sup> The Annie E. Casey Foundation "Kids Count Data Center: Students qualifying for free or reduced price lunch in Colorado."
- <sup>18</sup> Jin Huang and Ellen Barnidge, "Low-income Children's participation in the National School Lunch Program and household food insufficiency."
- <sup>19</sup> Jin Huang, Ellen Barnidge, and Youngmi Kim, "Children Receiving Free or Reduced-Price School Lunch Have Higher Food Insecurity Rates in Summer."
- <sup>20</sup> Ibid; Amy Shanafelt et al., "Food insecurity and rural adolescent personal health, home and academic environments."
- <sup>21</sup> Amy Shanafelt et al., "Food insecurity and rural adolescent personal health, home and academic environments."
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