2015 Dietary Guidelines Advisory Committee:

Systematic Reviews of the Food Environment and Settings Subcommittee

USDA's Nutrition Evidence Library supported the 2015 Dietary Guidelines Advisory Committee as it conducted systematic reviews on diet and health. This document includes archives from www.NEL.gov of the complete evidence portfolios for all NEL systematic reviews conducted by the Food Environment and Settings Subcommittee. The *Scientific Report of the 2015 Dietary Guidelines Advisory Committee* summarizes these systematic review findings and provides interpretations and implications related to these reviews.

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CHAPTER 1. SUBCOMMITTEE OVERVIEW

OVERVIEW

The questions asked and reviewed in this section address place-based environments that influence the foods that individuals, families and households obtain and consume, and on the community settings in which they spend much of their time. The Committee considered several settings, but prioritized four key settings to examine for this report: neighborhood and community food access; child care (early care and education); schools; and worksites. (Two of the settings, food access and child care, were addressed using NEL systematic reviews.) The Committee examined the relationship of these settings to diet quality and weight status. Because of the need to identify effective population-level strategies, the Committee focused specifically on reviewing the scientific literature to determine the impact of place-based obesity prevention and dietary interventions.

For more information, see Scientific Report of the ***2015 Dietary Guidelines Advisory Committee: Part D. Chapter 4: Food Environment and Settings***. Information in the report was vetted by the full committee and presented at public meetings; however, more detailed supporting information on each specific systematic review is available on the NEL website. Below are links to the questions that this Subcommittee answered using a NEL systematic review approach.

For 2015 Dietary Guidelines Advisory Subcommittee work structure and member organization, see ***Scientific Report of the 2015 Dietary Guidelines Advisory Committee Appendix E-9***.

For 2015 Dietary Guidelines Advisory Committee and support staff membership and acknowledgments lists, see: ***Membership*** and ***Appendix E-10: Dietary Guidelines Advisory Committee Report Acknowledgments.***

NEL SYSTEMATIC REVIEW QUESTIONS

Food Access

1. What is the relationship between neighborhood and community access to food retail settings and individuals' dietary intake and quality?
2. What is the relationship between neighborhood and community access to food retail settings and weight status?

Early Care and Education

1. What is the impact of obesity prevention approaches in early care and education programs on the weight status of children ages 2 to 5 years?

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CHAPTER 2. FOOD ACCESS – DIETARY INTAKE

WHAT IS THE RELATIONSHIP BETWEEN NEIGHBORHOOD AND COMMUNITY ACCESS TO FOOD RETAIL SETTINGS AND INDIVIDUALS' DIETARY INTAKE AND QUALITY?

TECHNICAL ABSTRACT

Background

The goal of this systematic review was to determine whether food access (i.e., the availability and affordability of foods) is associated with dietary intake, quality and variety. Food availability was measured in many ways for individuals, families and neighborhoods, including proximity to food outlets, density of food outlets, distance to the outlet closest to a residential location, mean distance traveled to food outlets where participants reported shopping and foods available in stores. Food availability was measured both objectively (e.g., food outlets per capita or within a certain radius of a participant's home using geographic information systems) and subjectively (e.g., perceived availability of healthy vs. unhealthy food outlets and healthy foods in a store or neighborhood).

Conclusion statement

Emerging evidence suggests that the relationship between access to farmers' markets and produce stands and dietary intake and quality is favorable. The body of evidence regarding access to other food outlets, such as supermarkets, grocery stores, convenience and corner stores, and dietary intake and quality is limited and inconsistent.

2015 DGAC Grade: **Not assignable**

Methods

Literature searches were conducted using PubMed, Embase and Cochrane databases to identify studies that evaluated the association between food access and dietary outcomes. Studies that met the following criteria were included in the review: Randomized controlled trials (RCT), non-randomized controlled trials, prospective cohort studies, or cross-sectional studies; humans over the age of two years who were healthy or at elevated chronic disease risk; subjects from the United States; and published in English in peer-reviewed journals. The date range was January 2004 to January 2014. The intervention or exposure was food availability and accessibility compared to different levels of availability and accessibility. The outcomes were dietary intake, quality, behaviors and preferences.

Data from each included article were extracted and risk of bias was assessed. The evidence was qualitatively synthesized, a conclusion statement was developed and the strength of the evidence (grade) was assessed using pre-established criteria including evaluation of the quality and risk of bias, quantity, consistency, magnitude of effect and generalizability of available evidence.

Findings

- This NEL systematic review included 18 articles published since January 2004 that examined the relationship between food access and dietary outcomes. This literature included 15 cross-sectional studies, one longitudinal study and two controlled trials.
- The studies used multiple approaches to assess food access (i.e., the availability and affordability of foods) and dietary intake, quality and variety. The majority of studies

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measured food access by the density of food outlets within a specified distance from a participant's residence and proximity to various food outlets. The majority of studies assessed dietary intake by focusing on fruit and vegetable consumption; diet quality and variety were predominantly determined by various diet indices.

- Although food access was assessed across geographic, ethnic, racial and income groups, due to the wide variation in methods used to determine food access, making comparisons across studies was challenging. Despite this variability, a consistent relationship was identified between farmers' markets and produce stands and diet.
- Two studies found statistically significant, favorable associations between access to farmers' markets and produce stands and dietary intake (assessed by fruit and vegetable consumption) and diet variety and quality [both assessed by the Healthy Eating Index (HEI)]
- Due to the variability of studies and paucity of data, no consistent associations regarding dietary outcomes and access to other food outlets were evident.

Limitations

The ability to draw strong conclusions was limited by the following issues:

- Most studies were of weaker design (i.e., cross-sectional)
- The methodological differences across individual studies were significant
- The myriad retail outlets that sell food vary considerably.

FULL REVIEW

Conclusion statement

Emerging evidence suggests that the relationship between access to farmers' markets and produce stands and dietary intake and quality is favorable. The body of evidence regarding access to other food outlets, such as supermarkets, grocery stores, convenience and corner stores, and dietary intake and quality is limited and inconsistent.

Grade

Not assignable

Key findings

This systematic review included 18 studies published between 2007 and 2013, including 15 cross-sectional studies, by independent investigators with sufficient sample sizes, one longitudinal study and two controlled trials (one RCT and one non-randomized) examining the relationship between food access and dietary intake and quality

The studies used multiple approaches to assess food access and dietary intake, quality and variety. The majority of studies measured food access by the density of food outlets within a specified distance from a participant's residence and proximity to various food outlets. The majority of studies assessed dietary intake by focusing on vegetable and fruit consumption; diet quality and variety were predominantly determined by various validated diet indices including, but not limited to, the HEI.

Although food access was assessed across wide-ranging geographic, ethnic, racial and income groups, due to the wide variation in methods used to determine food access, making comparisons across studies was challenging. Despite this variability, a consistent relationship was identified between farmers' markets and produce stands and dietary intake. Two cross-sectional studies found statistically significant, favorable associations between access to

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farmers' markets and produce stands and dietary intake (assessed by individual vegetable and fruit consumption) and diet variety and quality (both assessed by the HEI). Due to the variability of studies and paucity of data, no consistent associations regarding dietary outcomes and access to other food outlets were evident.

Evidence summary

Description of the Evidence

This systematic review includes 18 studies conducted in the United States, including 15 cross-sectional studies that accessed food access by distance to food outlets (Carroll-Scott, 2013; Caspi, 2012; Dean, 2011; Ding, 2012; Jago, 2007; Jilcott Pitts, 2013; Sharkey, 2010), density of food outlets (An, 2012; Gustafson, 2012a; Jack, 2013; Moore, 2008; Ollberding, 2012; Powell, 2009; Zenk, 2009) or both (Laska, 2010; Zenk, 2009). Some of these studies (Gustafson, 2012a; Powell, 2009; Sharkey, 2010) examined additional measures of food access, including the availability, affordability and quality of foods within various food outlets. One longitudinal study (Boone-Heinonen, 2011) examined the relationship between food availability and food and vegetable intake and overall diet quality among adults. Two controlled trials among low-income populations (Gittelsohn, 2010; Gustafson, 2012b) examined the relationship between food access and dietary intake and quality and the impact of an intervention modifying the food environment and a weight management program, respectively. Most of the included studies had relatively low risk of bias ratings (scores ranged from zero to eight points out of 26 or 28.)

Sample size of these studies ranged from 116 to 15,634 participants; eight studies had 100 to 500 (Ding, 2012; Gittelsohn, 2012; Gustafson, 2012a; Gustafson, 2012b; Jago, 2007; Jillcott Pitts, 2013; Laska, 2010; Ollberding, 2012), three studies had 500 to 1,000 (Caspi, 2012; Sharkey, 2010; Zenk, 2009), five studies had 1,000 to 5,000 (Boone-Heinonen, 2011; Carroll-Scott, 2013; Dean, 2011; Moore, 2008; Powell, 2009) and two studies had more than 10,000 (An, 2012; Jack, 2013).

Population

Most studies examined food access and diet in a general population of adults (Boone-Heinonen, 2011; Caspi, 2012; Dean, 2011; Gustafson, 2012a; Jack, 2013; Moore, 2008; Ollberding, 2012; Powell, 2009; Zenk, 2009); two focused on women (Gustafson, 2012b; Jillcott Pitts, 2013); one study focused on adolescent boys (Jago, 2007) and another focused on seniors (Sharkey, 2010). Five studies focused solely on children and adolescents (An, 2012; Carroll-Scott, 2013; Ding, 2012; Jago, 2007; Laska, 2012); one study assessed the impact of a food environment intervention among children and their caregivers (Gittelsohn, 2012). Where reported, mean age of participants ranged from 8.3 years to 69.9 years, with one study including 6-year-olds to 90-year-olds and multiple studies with no specified upper cut-off for age.

Information related to socioeconomic status (SES) was reported in all studies, and indicators included neighborhood variables (per capita income), household demographics (household income, food assistance participation, percentage of federal poverty level) and individual characteristics (educational achievement, free or reduced lunch eligibility, income level, unemployment rate, type of employment and vehicle ownership). Race was reported in 17 studies with the racial profiles of the samples varying greatly (**refer to the Overview Table for study-specific details**).

Exposures

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Food availability was measured in many ways for individuals, families and neighborhoods, including proximity to food outlets [total and by type (supercenters, supermarkets, large chain grocery stores, medium-sized grocery stores, small or specialty grocery stores, convenience stores, candy stores, bakeries, farmers' markets and produce stands)], density of food outlets (total and by type), distance to the outlet closest to a residential location, mean distance traveled to food outlets where participants reported shopping and foods available in stores.

Within each of these exposures, the measurement of food availability varied as well. Some studies objectively measured the availability of food outlets per capita or within a certain radius of a participant's home using geographic information systems. Others assessed perceived availability of healthy vs. unhealthy food outlets and healthy foods in a store or neighborhood. Foods available in stores also were determined by the Nutrition Environment Measures Survey or subjective assessment of the retail food environment (e.g., whether or not certain foods were available and the variety and quality of fruits and vegetables).

Food outlets were identified through various methods, including the U.S. Census Bureau; the Dun and Bradstreet commercial dataset of U.S. business records; city and county public health records; and InfoUSA, a business and consumer contact database. When the categorization of food outlets was described, Standard Industrial Classification (SIC) codes or the North American Industry Classification System codes, which replaced SIC codes in 1997, were used.

There were also numerous ways in which food affordability was measured, including self-reported amount of money spent on groceries per week, perceived affordability of foods at the store where a participant completed his or her primary shopping), perceived in-store affordability of certain foods (e.g., fruits and vegetables, low-fat meat products, whole grains and low-fat dairy products) and various price indexes by foods or food groups.

The exposure variables for both food availability and affordability were assessed as continuous and categorical variables in the statistical analyses.

Outcomes

Dietary outcomes were measured by self-report surveys, screeners, food frequency questionnaires (FFQ), chart review and 24-hour recalls. Dietary intake was assessed by energy intake and intake of certain foods and food groups (fruits, vegetables, grains, dairy products, meat, juice and soda), nutrients (percentage of energy from fat) and frequency of eating certain foods. Diet quality was assessed by the Healthy Eating Index (HEI) (total and component scores), the Diet Quality Index and author-derived indices (**refer to the Overview Table for study-specific details**).

Evidence Synthesis

This body of evidence includes 18 studies with significant methodological differences (**refer to the Overview Table for study-specific details**). Geography (i.e., rural, urban, suburban) and demographics (i.e., ethnicity, income, age, gender) vary greatly as do as most findings.

Two studies, out of two studies assessing the relationship, found significant, favorable associations between access to farmers' markets and produce stands and dietary outcomes. Four studies showed favorable dietary outcomes and access to supermarkets; two studies showed unfavorable outcomes and three studies did not find a relationship between access to supermarkets and dietary outcomes. Three studies showed favorable outcomes related to diet with grocery stores; one study showed unfavorable outcomes and two studies did not find a

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relationship between access to grocery stores and dietary outcomes. Two studies showed favorable outcomes related to diet and access to convenience stores; two studies showed unfavorable outcomes and one study did not find a relationship between access to convenience stores and dietary outcomes.

Due to the variability of studies and paucity of data, making comparisons across studies and drawing conclusions were difficult. In summary, there were limited, but consistent, favorable associations between access to farmers' markets and produce stands and dietary intake, variety and quality. Furthermore, there were no consistent findings regarding favorable or unfavorable effects on dietary outcomes in relation to access to other food outlets.

Overview table: Summary of primary studies examining the relationship between food access and diet

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Question: What is the relationship between neighborhood and community food access in food retail settings and impact on individuals dietary intake and quality?

Overview Table: Summary of primary studies examining the relationship between food access and diet

Author, Year Study Design Location Risk of Bias*	Sample Size Age Gender Race/Ethnicity SES	Food Accessibility & Food Availability	Results
Controlled Trials			
Gittelsohn, 2010 **Nonrandomized controlled trial** **US** **Risk of bias: 8/26**	N=116 **Caregivers:** 41.0y **Children:** 9.9 y; 8-12y **Caregivers:** 95% female **Children:** 50% female 64% Native Hawaiian or other Pacific Islander **Education:** 12.5y **Employment:** 34% unemployment rate **Food assistance:** 67% of households received at least one form of food assistance	**Intervention**: Healthy Foods Hawaii (HFH) intervention: increased store stocking of targeted Healthy-Eating Index (HEI) foods, point-of-purchase promotions, interactive sessions, and involvement of local producers/distributors.	**Diet Quality** **Caregivers:** *HEI and healthy food consumption scores:* NS **Children:** *HEI grain score:* β=1.83 (SE=0.76); P<0.05 **All other diet variables:** Non-significant (NS)
Gustafson, 2012b **Randomized controlled trial** **US** **Risk of bias: 6/28**	N=156 52y (SD=7.1) 100% female White ~41%, Black ~57%, Other ~2% **Education:** 13y (SD=1.9) **Income (≤$29,000):** 67.5% **Employed:** 29% full-time	**Intervention**: Diet and physical activity behavioral intervention including weekly group sessions focusing on diabetes prevention and weight management concepts.	**Fruit and Vegetable (F/V) Intake** **Participants with perception of low F/V availability, F/V serving increase:** 1.89 (95% CI: 0.48, 3.31); P=0.04 **Participants with perception of low availability of low-fat foods, F/V serving increase:** 1.85 (95% CI: 0.87, 2.82); P=0.03 **Participants who live in an objectively measured area of low density of supermarkets, F/V serving increase:** 1.62 (95% CI: 1.27, 1.96) P=0.03 **All other F/V intake variables or subgroups:** NS

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Author, Year Study Design Location Risk of Bias*	Sample Size Age Gender Race/Ethnicity SES	Food Accessibility & Food Availability	Results
Longitudinal Study			
Boone-Heinonen, 2012 **Longitudinal study** **US** **Risk of bias: 3/26**	N=3,785 24.9y (SE=0.1), 18-30y 54.7% female White ~49% **Education:** Less than or equal to a high school degree (~55%), some college (~9%), college graduates (~34%) **Mean Income:** $61,000 (SD=$1,000)	Food outlet density and distance	**Diet Quality** **Supermarket or grocery store density:** NS for men and women **Meeting fruit or vegetable recommendations** **Supermarket density between 1-2.9km from home:** *Men:* OR=2.14 (95% CI: 1.19, 3.83), P<0.05 *Women:* NS *All other variables or subgroups:* NS
Cross-sectional Studies			
An, 2012 **Cross-sectional study** **US** **Risk of bias: 2/26**	N=13,462 **Children:** 8.3y (SD=2.0); 5-11y **Adolescents:** 14.5y (SD=1.7); 12-17y 49.0% female **Children:** White (46.0%), Black (8.0%), Asian or Pacific Islander (11.0%), Native-American (1.0%), Other or Multi-race (6.0%), Hispanic (27%) **Adolescents:** White (39.0%), Black (8.0%), Asian or Pacific Islander (11.0%), Native-American (1.0%), Other or Multi-race (10.0%),	Food outlet density	**Children's food intake** **Large supermarkets within 0.5 miles:** • *Soda intake (servings/d):* Incidence Rate Ratios (IRR)=1.078 (SE=0.035; P<0.05) • *All other foods:* NS **All other food outlet types and food intake:** NS **Adolescents' food intake** **Convenience stores within 0.5 miles:** • *Fast food intake (servings/d):* IRR=0.935 (SE=0.031;

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Author, Year Study Design Location Risk of Bias*	Sample Size Age Gender Race/Ethnicity SES	Food Accessibility & Food Availability	Results
	Hispanic (31%) **Mean household income:** *Children:* $51,534.2; *Adolescents:* $46,166.1 **Parent's education:** *Children:* Less than high school (12.0%), college graduate (32.0%); *Adolescents:* Less than high school (21.0%), college graduate (28.0%)		P<0.05) • *Soda intake (servings/d):* IRR=0.936 (SE=0.031; P<0.05) **Small food stores within 0.5 miles:** *Fast food intake (servings/d):* IRR=1.017 (SE=0.005; P<0.01) **Grocery stores within 0.5 miles:** • *Fast food intake (servings/d):* IRR=1.083 (SE=0.034; P<0.05) • *Soda intake (servings/d):* IRR=1.088 (SE=0.031; P<0.01) **Large supermarkets within 0.5 miles:** *Fast food intake (servings/d):* IRR=0.930 (SE=0.036; P<0.05) **All other food outlet types and food intake:** NS
Carroll-Scott, 2013 **Cross-sectional study** **US** **Risk of bias: 0/26**	N=1,048 10.9y (SD=0.8) 52.4% female White, other 10.5%, Black 40.7%, Latino 48.9% **Free/reduced lunch eligibility:** Eligible (76.9%), not eligible (12.0%) **Food secure (self-report):** Yes (76.7%), No (10.5%)	1) Walking distance to nearest food outlet 2) Food outlet density	**Diet quality** **Nearest grocery store >0.5 miles:** • *Healthy eating score:* NS • *Unhealthy eating score:* NS **Nearest fast-food restaurant <0.25 miles:** • *Healthy eating score:* NS • *Unhealthy eating score:* NS
Caspi, 2012 **Cross-sectional study**	N=743 18-60y or older	Distance to the supermarket	**Fruit and vegetable intake** **Distance to supermarket:** NS

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Author, Year Study Design Location Risk of Bias*	Sample Size Age Gender Race/Ethnicity SES	Food Accessibility & Food Availability	Results
US **Risk of bias: 2/26**	80.6% female Hispanic 42.8%, Black Non-Hispanic 36.2%, White Non-Hispanic 11.7%, Other 9.3% **Household income:** 100% low-income		
Dean, 2011 **Cross-sectional study** **US** **Risk of bias: 0/26**	N=2,260 53.4y (SD=15.9) 70.7% female **Race:** NR **Poverty:** ≤100% Federal Poverty Level (15.5%), 101-199% Federal Poverty (13.1%)	1) Retail food environment measured by variety, freshness, and price 2) Miles to supermarket.	**Fruit and vegetable intake** **Retail food environment:** • *F/V variety:* NS • *F/V freshness:* NS • *F/V price:* β=-0.310 (95% CI: -0.446, -0.174); P<0.01 **Miles to supermarket:** • *Full sample:* β=-0.011 (95% CI: -0.021, 0); P<0.05 • *Urban area:* NS • *Rural area:* β=-0.013 (95% CI: -0.023, -0.002); P<0.05
Ding, 2012 **Cross-sectional study** **US** **Risk of bias: 5/26**	N=287 **Children:** 8.3y (SD=1.9), 5-11 y **Adolescents:** 14.6 y (SD=1.7), 12-18 y 51.4% female **Children:** Non-Hispanic White (78%), Non-Hispanic Black (10%), Hispanic (8%), Other (14%); **Adolescents:** Non-Hispanic White (53%), Non-Hispanic Black (20%), Hispanic (10%), Other (17%)	1) Proximity to "more-healthful" food outlets (supermarkets, fruit/vegetable markets, non-fast-food restaurants) 2) Proximity to "less-healthful" food outlets (convenience stores, fast-food restaurants).	**Fruit and vegetable intake** *Proximity to more-healthful food outlets or less-healthful food outlets:* NS

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Author, Year Study Design Location Risk of Bias*	Sample Size Age Gender Race/Ethnicity SES	Food Accessibility & Food Availability	Results
	Median annual household income: $60,000-$69,999		
Gustafson, 2012a **Cross-sectional study** **US** **Risk of bias: 1/26**	N=147 37y (SD=13.1) 49% female White 67%, Black 25%, Other 8% **≤130% of federal poverty level:** 100% **Supplemental Nutrition Assistance Program participants:** 100%	1) Retail food environment measure by Nutrition Environment Measures Survey in Stores (NEMS-S) of food outlets within 0.5-miles and 1-mile radius of home 2) Store type within a 0.5-miles and 1-mile radius of home.	**Dietary intake and NEMS-S** **Food stores <0.5 miles:** • *Vegetable intake (ref: <1 serving/day):* OR=3.07 (95% CI: 1.78, 5.31) • *High meat intake (ref: <5 servings/day):* OR=1.58 (95% CI: 1.06, 2.35) • *All other diet variables: fruits, grains, milk, total HEI score:* NS **Food stores <1.0 mile:** All diet variables: NS **Dietary intake and store type within 0.5 miles; 1.0 mile** **Fruit intake** (ref: <1 serving/day): • *Convenience stores:* NS; OR=1.95 (95% CI: 1.11, 3.45) • *Farmers market:* NS; NS • *Grocery stores/supermarkets:* NS; NS **Vegetable intake** (ref: <1 serving/day): • *Convenience stores:* NS; OR=5.00 (95% CI: 2.15, 11.61) • *Farmers market:* OR=6.92 (95% CI: 4.09, 11.69); OR=4.36 (95% CI: 1.85, 10.28) • *Grocery stores/supermarkets*: OR=3.04 (95% CI: 1.13, 8.17); OR=6.91 (95% CI: 4.09, 11.69)

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Question: What is the relationship between neighborhood and community food access in food retail settings and impact on individuals dietary intake and quality?

Overview Table: Summary of primary studies examining the relationship between food access and diet

Author, Year Study Design Location Risk of Bias*	Sample Size Age Gender Race/Ethnicity SES	Food Accessibility & Food Availability	Results
			Milk intake (ref: <1 serving/day): • *Convenience stores:* NS; OR=3.01 (95% CI: 1.42, 6.38) • *Farmers market:* OR=3.79 (95% CI: 2.14, 6.71); OR=3.23 (95% CI: 1.64, 6.37) • *Grocery stores/supermarkets:* OR=2.65 (95% CI: 1.64, 4.28); NS **Grain intake** (ref: <5 servings/day): • *Convenience stores:* NS; NS • *Farmers market:* OR=1.76 (95% CI: 1.01, 3.05); NS • *Grocery stores/supermarkets:* OR=2.13 (95% CI: 1.55, 2.93); OR=1.76 (95% CI: 1.01, 3.05) **Meat intake** (ref: <5 servings/day): • *Convenience stores:* OR=0.46 (95% CI: 0.24, 0.88); OR=3.25 (95% CI: 1.70, 6.22) • *Farmers market:* OR=3.34 (95% CI: 2.06, 5.43); OR=2.82 (95% CI=1.68, 4.73) • *Grocery stores/supermarkets:* OR=2.75 (95% CI: 1.51, 5.01); OR=3.34 (95% CI: 2.06, 5.43) **Diet quality (total HEI scores):** • *Convenience stores:* NS; β=3.69 (95% CI: 0.32, 7.07) • *Farmers market:* NS; NS • *Grocery stores/supermarkets:* NS; NS
Jack, 2013	N=15,634	Healthy food outlet density.	**Fruit and vegetable intake** ≥5 **servings/day**

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Overview Table: Summary of primary studies examining the relationship between food access and diet

Author, Year Study Design Location Risk of Bias*	Sample Size Age Gender Race/Ethnicity SES	Food Accessibility & Food Availability	Results
Cross-sectional study **US** **Risk of bias:**	18y or older 59.5% female White 41.1%, Black 24.1%, Hispanic 25.7%, Asian 6.5%, Other race/ethnicity 2.6% **Income to poverty ratio**: Below poverty line (13.1%), 100-199% of poverty line (18.1%), 200-399% of poverty line (22.2%), 400-599% of poverty line (14.5%), above 600% of poverty line (17.4%) **Education:** Less than high school (16.5%), college graduate (35.8%).		**Density of healthy food stores** (ref: quartile 1): • *Full sample (quartile 4):* NS • *Females (quartile 4):* NS • *Males (quartile 4):* NS • *High income zip codes (quartile 4):* NS • *Low income zip codes (quartile 4):* NS
Jago, 2007 **Cross-sectional study** **US** **Risk of bias: 1/26**	N=204 12.8y (SD=1.1), 10-14y 0% female Euro-American 70.2%, Others 29.8% **Parental education:** GED (7.2%), tech college (21.2%), college (33.7%), postgraduate (38.0%)	Distance to the nearest food outlet by type.	**Fruit and fruit juice intake:** *Distance to small food store:* z=2.63; P=0.008 **Vegetable intake (excludes fried potato, potato salad, coleslaw):** *Distance to small food store:* NS; P=0.06 **Fried potato, potato salad, and coleslaw intake**: *Distance to small food store:* z=3.69; P<0.001
Jillcott Pitts, 2013 **Cross-sectional study** **US**	N=400 26.3y (SD=6.3), 18-44y 100% female	1) Distance to nearest food outlet 2) Space and time accessibility to farmers markets.	**Fruit and vegetable intake** ≥5 **servings/day:** No associations with measures of access or food outlet type

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Overview Table: Summary of primary studies examining the relationship between food access and diet

Author, Year Study Design Location Risk of Bias*	Sample Size Age Gender Race/Ethnicity SES	Food Accessibility & Food Availability	Results
Risk of bias: 2/26	Black 63.8% **Education:** 43.6% below high-school graduate **Income:** 100% low-income **Car owners:** 68%		
Laska, 2010 **Cross-sectional study** **US** **Risk of bias: 1/26**	N=334 [residential-level geographic information system (GIS)-derived independent variables]; 277 (school-level GIS-derived independent variables) 15.4y (SD=1.7) 50.9% female **Caucasian:** 93.4% **Parental education:** 64.4% college education **Median household income:** $76,790	Food outlet proximity.	**Dietary intake** • **Convenience store within 1,600m:** *Sugar-sweetened beverage (SSB) intake*: β=0.24 (95% CI: 0.06, 0.41; P<0.01) • **Distance to nearest grocery store:** *SSB intake:* β=-0.005 (95% CI: -0.01, -0.001; P<0.01) • **Grocery store within 1600m:** *SSB intake:* β=0.31 (95% CI: 0.11, 0.51; P<0.01) • **Any food outlet within 1600m:** *SSB intake:* β=0.24 (95% CI: 0.07, 0.41; P<0.01) **All other food access and dietary intake variables**: NS
Moore, 2008 **Cross-sectional study** **US** **Risk of bias: 1/26**	N=2,384 45-84y 54.2% female Non-Hispanic White 43.5%, Non-Hispanic Black 41.7%, Hispanic 14.7% **Per capita annual income:** $0-$14,999 (25.7%); $15,000-$24,999 (29.8%); $25,000-	Supermarket density.	**Diet quality, supermarket density, quartile 1** (ref: quartile 4) *Healthy diet [top quintile of Alternate Healthy Eating Index (AHEI) diet score]:* RP=0.75 (95% CI: 0.59, 0.95) *Healthy diet (bottom quintile of "fats and processed meats" dietary pattern):* RP=0.54 (95% CI: 0.42, 0.70)

Question: What is the relationship between neighborhood and community food access in food retail settings and impact on individuals dietary intake and quality?

Overview Table: Summary of primary studies examining the relationship between food access and diet

Author, Year Study Design Location Risk of Bias*	Sample Size Age Gender Race/Ethnicity SES	Food Accessibility & Food Availability	Results
	$34,999 (22.7%); ≥$35,000 (21.7%)		
Ollberding, 2012 **Cross-sectional study** **US** **Risk of bias: 1/26**	N=384 18-35y (25.3%), 36-55y (39.6%), ≥ 56y (34.9%) 63.5% female Non-Hispanic White 32.3%, Asian-American 35.9%, Other/mixed race 31.0% **Education:** Less than high school (25.3%), some college (28.9%), college graduate (45.6%) **Annual individual income:** Less than $30,000 (24.5%), $30,000-$59,999 (29.2%), $60,000 or more (36.5%)	"Healthy" and "unhealthy" food outlet density.	**Fruit and vegetable intake servings** **Density of total food outlets within a 0.5km-radius:** Tertile 1=3.91 (SEM=0.13), tertile 2=3.27 (SEM=0.31), tertile 3=4.38 (SEM=0.28); P=0.03; effect size=0.02 **Density of "healthy" food outlets within a 0.5k-radius:** Tertile 1=3.90 (SEM=0.13), tertile 2=3.27 (SEM=0.32), tertile 3=4.62 (SEM=0.32), P=0.01; effect size=0.02 **All outer measures of access, distance, and food outlet type:** NS
Powell, 2009 **Cross-sectional study** **US** **Risk of bias: 1/26**	N=3,739 20.02y (SD=1.43); 18-23 y 47.1% female White 68.3%, Black 12.4%, Asian 2.9%, Hispanic 14.0%, Other race 2.4% **Education:** Not completed high school (17.1%), completed high school (42.6%), some or completed college (40.3), enrolled in college (41.6%) **Income:** Youth income ($7,500; SD=$8,600),	1) Food price index 2) Food outlet density	**Fruit and vegetable intake** **Price of F/V:** β=0.664 (SE=0.032); P<0.05 **Price of food at home:** β=0.680 (SE=0.051); P<0.01 **Price of meat, dairy and bread:** NS **Price of fast food:** NS **Number of grocery stores:** β=0.975 (SE=0.050); P<0.05 **Number of convenience stores:** NS **Number of supermarkets:** NS

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Question: What is the relationship between neighborhood and community food access in food retail settings and impact on individuals dietary intake and quality?

Overview Table: Summary of primary studies examining the relationship between food access and diet

Author, Year Study Design Location Risk of Bias*	Sample Size Age Gender Race/Ethnicity SES	Food Accessibility & Food Availability	Results
	parental income ($8,190; SD=$7,390)		
Sharkey, 2010 **Cross-sectional study** **US** **Risk of bias: 1/26**	N=582 69.92y (SD=6.91); 60-90y 68.2% female **Minority:** 14.4% **Education:** 13.1% less than high school **Household income:** ≤100% Federal Poverty Level (FPL) (17.0%), 101-199% FPL (16.3%)	1) Supermarket proximity 2) Availability and variety of fresh and processed fruits and vegetables in food stores.	**Fruit and vegetable intake** **Distance to nearest food store with fresh fruit or vegetables:** • *Fruit intake:* NS • *Vegetable intake:* NS **Distance to nearest food store with any fruits or vegetables:** • *Fruit intake:* β=-0.027 (SE=0.009; P=0.003) • *Vegetable intake:* NS **Distance to nearest supermarket:** • *Fruit intake:* β=-0.012 (SE=0.004; P=0.003) • *Vegetable intake:* β=-0.008 (SE=0.004; P=0.033) **Has few grocery stores:** • *Fruit intake:* NS • *Vegetable intake:* β=-0.240 (SE=0.119; P=0.002) **Fruit/vegetable variety at primary food outlet:** • *Fruit intake:* β=-0.276 (SE=0.110), P=0.012 • *Vegetable intake:* NS
Zenk, 2009 **Cross-sectional study**	N=919 46.28y (SE=0.84)	1) Food store density 2) Supermarket proximity	**Fruit and vegetable intake** **Presence of a large grocery store:** β=0.691 (SE=0.210; P=0.002)

Question: What is the relationship between neighborhood and community food access in food retail settings and impact on individuals dietary intake and quality?

Overview Table: Summary of primary studies examining the relationship between food access and diet

Author, Year Study Design Location Risk of Bias*	Sample Size Age Gender Race/Ethnicity SES	Food Accessibility & Food Availability	Results
US **Risk of bias: 1/26**	52.3% female Black 56.8%, Latino 22.2%, White 18.8%, Other 2.3% **Education:** 12y (34.1%) **Annual household income:** $35,000 (23.0%)	3) Fresh fruits and vegetable availability 4) Produce variety 5) Fruit and vegetable cost 6) Fruit and vegetable quality.	**All other store type and produce characteristic variables:** NS

*Risk of bias as determined using the Nutrition Evidence Library Bias Assessment Tool (NEL BAT)

Assessment of the Body of Evidence

- **Quality, Quantity and Risk of Bias:** Collectively, the evidence base includes several studies by independent investigators; however, there is limited evidence for each specific food outlet type (e.g., two studies evaluated farmer's markets, while convenience stores and grocery stores were assessed in six studies each). Despite a low risk of bias for most studies [as assessed by the NEL Bias Assessment Tool (BAT)] and sufficient sample sizes (range: 116 to 15,634), most studies were of weaker design (i.e., cross-sectional).
- **Consistency:** The independent variables and findings across studies were inconsistent for all food outlet types, with the exception of farmers' markets; however, only two studies evaluated the relationship between these specific food outlets and dietary outcomes
- **Impact:** The magnitude of the effect as well as the clinical and public health significance cannot be determined due to insufficient research and the use of different measures and methodology.
- **Generalizability:** The findings included in the evidence portfolio are likely generalizable to the US population of interest. The range of studies addressed urban, rural, ethnic, racial and income diversity.
- **Limitations:** The methodological differences across individual studies are significant. In addition, the myriad retail outlets that sell food vary considerably. This variability and the paucity of data on which to compare studies made it difficult to draw conclusions.

Implications

For people to improve their diets and health, they need to have convenient access to nutritious, high-quality and affordable healthy foods in environments where they live, work, learn and play. Limited access to affordable and healthy food is a challenge, particularly for families living in rural areas and low-income communities. Innovative approaches to bring healthy food retail into communities have proliferated, especially in underserved neighborhoods. These include creating financing programs to incentivize grocery store development; improving availability of healthy foods and beverages at corner stores and bodegas, farmers markets and mobile markets, community gardens and youth-focused gardens; creating new forms of wholesale distribution through food hubs; and improving transportation and public safety options. However, most of these approaches lack adequate evaluation. These and other promising equity-oriented efforts need to continue and be evaluated and then successfully scaled up to other communities.

To ensure healthy food access to everyone in America, action is needed across all levels, including Federal, state and local, to create private-public partnerships and business models, with the highest priority on those places with greatest need. Similar efforts are needed to reduce access to and consumption of, calorie-dense nutrient poor foods and sugar-sweetened beverages in community settings. These efforts need to be seamlessly integrated with food assistance programs such as food banks, soup kitchens and Federal nutrition assistance programs such as Women, Infants and Children (WIC), Supplemental Nutrition Assistance Program (SNAP) and elder nutrition programs.

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Research recommendations

1. Develop more valid and reliable methods for measuring all aspects of the food environments including the total food environment of communities. These methods can then be used to assess the impact of the food environment on community health as well as on economic development and growth.

   Rationale: The food environment has become more complex, with more and more retail outlets selling food and beverages. Having valid and reliable methodologies for a variety of food environments and settings (tools and new analytical approaches) will allow more meaningful inquiry into the contributions of various settings in supporting or hindering nutritional health.

2. Identify, implement, evaluate and scale up best practices (including private-public partnerships) for affordable and sustainable solutions to improving the food environment and increasing food access, especially in those environments of greatest need.

   Rationale: The environments in which people live, work, learn and play greatly influence their food intake. To best guide efforts to improve the food environment, research is needed to identify and evaluate best practices to direct available resources to new programs and scale up.

3. Identify, implement, accelerate, evaluate and scale up programs that improve access to healthy food and that can be integrated seamlessly with federal nutrition assistance programs such as SNAP, WIC and elder nutrition.

   Rationale: Federal nutrition assistance programs reach individuals and populations with the greatest health disparities. Identifying and evaluating initiatives that integrate improvements in the food environment with federal programs will help ensure that federal nutrition assistance programs have as great an impact as possible.

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Search plan and results

Inclusion criteria

- Human subjects
- Subject populations from the United States
- Anyone over the age of two years
- Subjects who were healthy or at elevated chronic disease risk
- Randomized controlled trials (RCT), non-randomized controlled trials, prospective cohort studies, cross-sectional studies
- The intervention or exposure in the reviewed articles was food access (availability to food retail settings and affordability)
- The comparator in the reviewed articles was different levels of availability and affordability
- The outcome(s) was (were) dietary intake, dietary quality, dietary behaviors, dietary preferences or weight-related measures.
- In addition, articles were included if they were published in English in a peer-reviewed journal between January 2004 and January 2014. If an author was included on more than one primary research article contained that is similar in content, the paper with the most pertinent data/endpoints was included. If data/endpoints from both papers were appropriate, it was made clear that results were from the same intervention.

Exclusion criteria

- Animals and *in vitro* models
- Subject populations from countries other than the United States
- Subjects who were hospitalized, diagnosed with disease or receiving medical treatment
- Systematic reviews, meta-analyses, literature reviews, editorials, commentaries, before-and-after studies, uncontrolled studies and case-control studies.
- Articles were excluded if they were not published in English, or were published before January 2004. Articles, abstracts and presentations not published in peer-reviewed journals (e.g., websites, magazine articles, Federal reports) also were excluded. Finally, if an author was included on more than one primary research article that was similar in content, the paper with the most pertinent data and endpoints was included and others were excluded.

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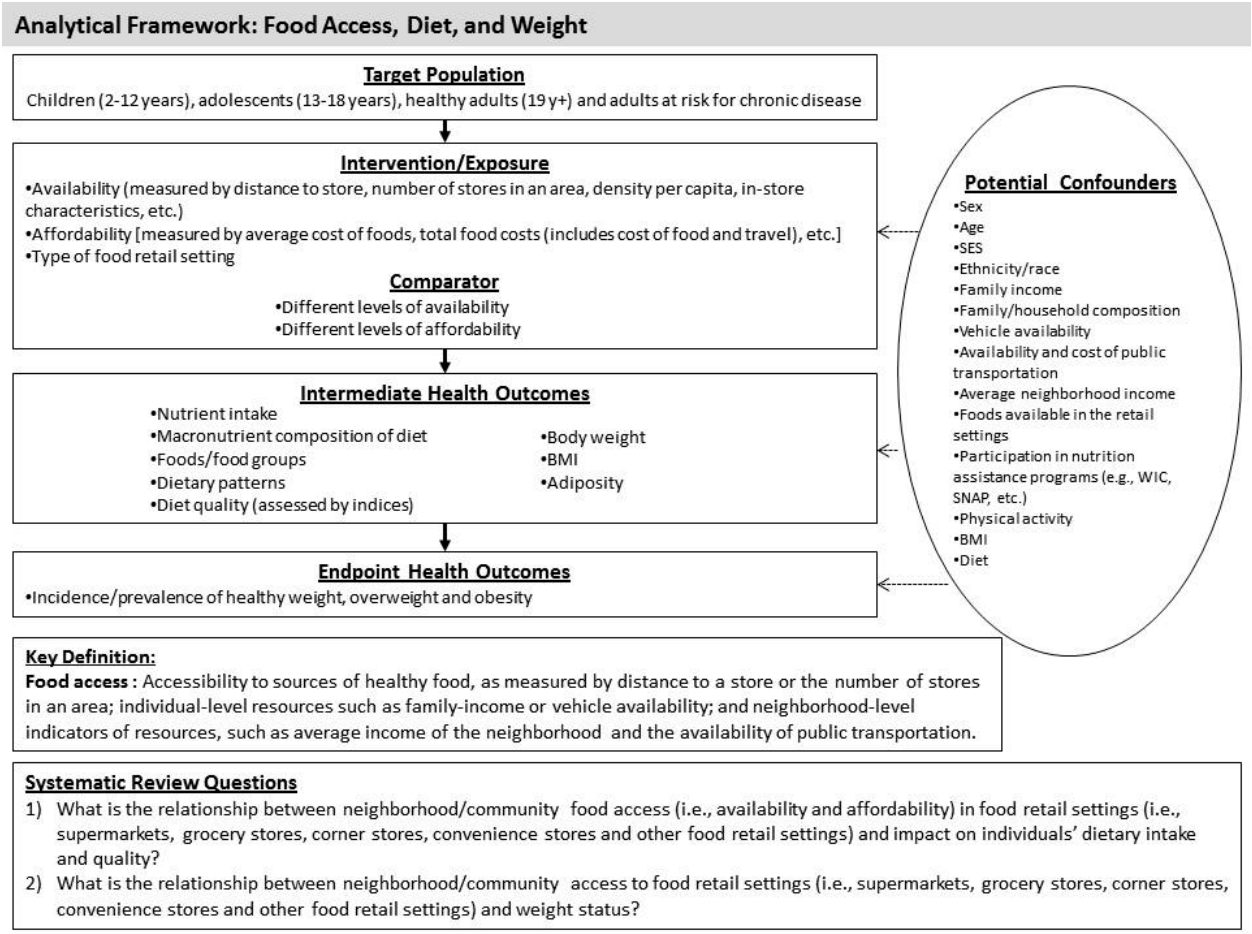
Analytic framework



Search terms and electronic databases used

- ***PubMed***
  - *Date(s) Searched: January 9, 2014*
  - *Search Terms:*

    (((((("food access"[tiab] OR Food/supply and distribution[Majr] OR supermarket[tiab] OR grocery store*[tiab] OR corner store*[tiab] OR convenience store*[tiab] OR food supply[majr] OR food store*[tiab] OR grocer*[tiab] OR "food retail"[tiab] OR "retail food"[ti] OR food mart*[tiab] OR food court*[tiab] OR food outlet*[tiab] OR food environment*[tiab] OR food desert*[tiab] OR food mirage*[tiab] OR "food insecurity"[tiab] OR "fast-food"[tiab] OR "fast food"[tiab] OR "food security"[tiab] OR restaurant*[tiab] OR farmers market*[tiab] OR food retailer*[tiab] OR food market*[tiab] OR "food availability"[tiab] OR food landscape*[tiab] OR "food affordability"[tiab] OR "grocery gap"[tiab] OR ((neighborhood[ti] OR community[ti]) AND (grocer*[ti] OR farmers market*[tiab] OR garden*[tiab])) OR ((fruit*[ti] OR vegetable*[ti]) AND (store*[ti] OR grocer*[ti] OR stores[ti] OR communit*[ti] OR neighborhood*[ti] OR neighbourhood*[ti]))OR food access*[ti] OR food availabil*[ti] OR food*

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affordab[ti]OR (availabil*[ti] AND food[ti]) OR (accessib*[ti] AND food[ti]) OR (affordab*[ti] AND food[ti])))))*

AND

(((((("body size"[tiab] OR body size[mh] OR obesity[tiab] OR obese[tiab] OR obesity[majr] OR overweight [tiab] OR overnutrition[tiab] OR overnutrition[mh] OR adiposity[tiab] OR adiposity[majr] OR "body weight"[tiab] OR body weight[majr] OR "body-weight related"[tiab] OR "weight gain"[tiab] OR weight gain[mh] OR "weight loss"[tiab] OR Body Weights and Measures[Majr] OR overweight[tiab] OR "Body Composition"[majr] OR "body fat"[tiab] OR adipos[tiab] OR weight[ti] OR waist[ti] OR "Anthropometry"[Mesh:noexp] OR "body mass index"[tiab] OR BMI[tiab] OR "weight status"[tiab] OR adipose tissue [mh] OR "healthy weight"[tiab] OR waist circumference[mh] OR "body fat mass"[tiab] OR body weight changes[majr] OR "waist circumference"[tiab] OR "waist gain"[tiab] OR ideal body weight[mh]) OR*

(nutrition[tiab] OR diet[mh] OR diet[tiab] OR dietary[tiab] OR food preferences[mh] OR feeding behavior[mh] OR nutrition surveys[mh] OR food[tiab] OR nutritional status[mh] OR "Food and Beverages"[Mesh] OR "Eating"[Mesh] OR "Energy Intake"[Mesh] OR "caloric density"[tiab] OR "caloric intake"[tiab] OR caloric dens*[tiab] OR high calori*[tiab] OR energy dens*[tiab] OR beverage*[tiab] OR fruit*[tiab] OR vegetable*[tiab] OR food analysis[mh] OR dietary intake*[tiab] OR food intake*[tiab] OR food habits[mh] OR dietary habit*[tiab] OR diet habit*[tiab] OR eating habit*[tiab] OR nutrient intake*[tiab] OR food choice*[tiab] OR portion size*[tiab] OR "diet quality"[tiab] OR dietary choice*[tiab] OR dietary change*[tiab] OR diet records[mh] OR nutritional status[mh] OR nutritional sciences[mh] OR nutrition surveys[mh] OR dietary pattern*[tiab] OR diet pattern*[tiab] OR eating pattern*[tiab] OR food pattern*[tiab] OR eating habit*[tiab] OR dietary habit*[tiab] OR food habit*[tiab] OR dietary profile*[tiab] OR food profile*[tiab] OR diet profile*[tiab] OR eating profile*[tiab] OR dietary guideline*[tiab] OR dietary recommendation*[tiab] OR food intake pattern*[tiab] OR dietary intake pattern*[tiab] OR eating style*[tiab] OR (Macronutrient*[tiab] AND (Proportion*[tiab] OR composition[tiab] OR distribution*[tiab] OR percent*[tiab] OR diet composit*[tiab])) OR (dietary score* OR adequacy index* OR kidmed OR Food Score* OR Diet Score* OR MedDietScore OR Dietary Pattern Score* OR "healthy eating index") OR ((index*[ti] OR score*[ti] OR indexes OR scoring[ti] OR indices[ti]) AND (dietary[ti] OR nutrient*[ti] OR eating[tiab] OR food[ti] OR food[mh] OR diet[ti] OR diet[mh]) AND (pattern* OR habit* OR profile*)))*

- ***Cochrane***
  - *Date Searched: January 9, 2014*
  - *Search Terms:*

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'"food access" OR supermarket* OR grocer* OR "corner store*" OR "convenience store*" OR "food retail*" OR "food mart*" OR "food court" OR "food environment" OR "food outlet*" OR "food desert*" OR "food insecurity" OR "food availability" OR "farmers market*" OR garden* in Title, Abstract, Keywords and diet* OR weight* OR bmi OR "body mass" OR body-mass OR adipos* OR eating OR eat OR overweight OR obesity OR obese in Title, Abstract, Keywords*

- ***Embase***
  - *Date Searched: January 9, 2014*
  - *Search Terms:*

'food access':ab, ti OR supermarket:ab, ti OR 'food purchase':ab, ti OR 'food purchases':ab, ti OR grocer*:ab, ti OR 'fast food':ab, ti OR 'corner store':ab, ti OR 'corner stores':ab, ti OR 'convenience store':ab, ti OR 'convenience stores':ab, ti OR 'food store':ab, ti OR 'food stores':ab, ti OR 'food retail':ab, ti OR 'food mart':ab, ti OR 'food marts':ab, ti OR 'food court':ab, ti OR 'food outlet':ab, ti OR 'food outlets':ab, ti OR 'food environment':ab, ti OR 'food desert':ab, ti OR 'food deserts':ab, ti OR 'food mirage':ab, ti OR 'food mirages':ab, ti OR (food* NEAR/3 (accessibil* OR avail* OR desert OR deserts OR environment OR insecur*)):ti*

AND

('body size'/de OR 'obesity'/exp OR overweight:ab, ti OR adiposity:ab, ti OR 'body weight'/exp OR 'weight gain'/de OR 'weight reduction':ab, ti OR 'body composition'/exp OR 'body fat':ab, ti OR 'anthropometry'/de OR 'body mass'/de OR bmi:ab, ti OR weight:ab, ti OR 'waist circumference'/de OR 'waist circumference':ab, ti OR 'waist hip ratio'/de OR 'body fat'/de OR 'adipose tissue'/exp) OR

'nutrition'/de OR nutrition:ab, ti OR 'diet'/exp OR 'diet':ab, ti OR 'dietary intake'/exp OR 'caloric intake':ab, ti OR 'caloric density':ab, ti OR 'dietary intake':ab, ti OR 'feeding behavior'/exp OR 'eating habit'/de OR 'food preference'/de OR 'child nutrition'/de OR 'food intake'/exp OR 'nutritional assessment'/de OR 'nutritional status'/de OR 'nutrition surveys':ab, ti OR 'fruit'/exp OR 'vegetable'/exp OR 'food'/exp OR 'energy density':ab, ti OR 'dietary quality':ab, ti OR 'eating pattern':ab, ti OR 'food pattern':ab, ti OR 'dietary habit':ab, ti OR 'food habit':ab, ti OR 'food intake':ab, ti OR 'portion size'/de OR 'food choice':ab, ti OR 'diet quality':ab, ti OR 'dietary profile':ab, ti OR 'food profile':ab, ti OR 'diet profile':ab, ti OR 'eating profile':ab, ti OR 'food intake pattern':ab, ti OR 'dietary intake pattern':ab,

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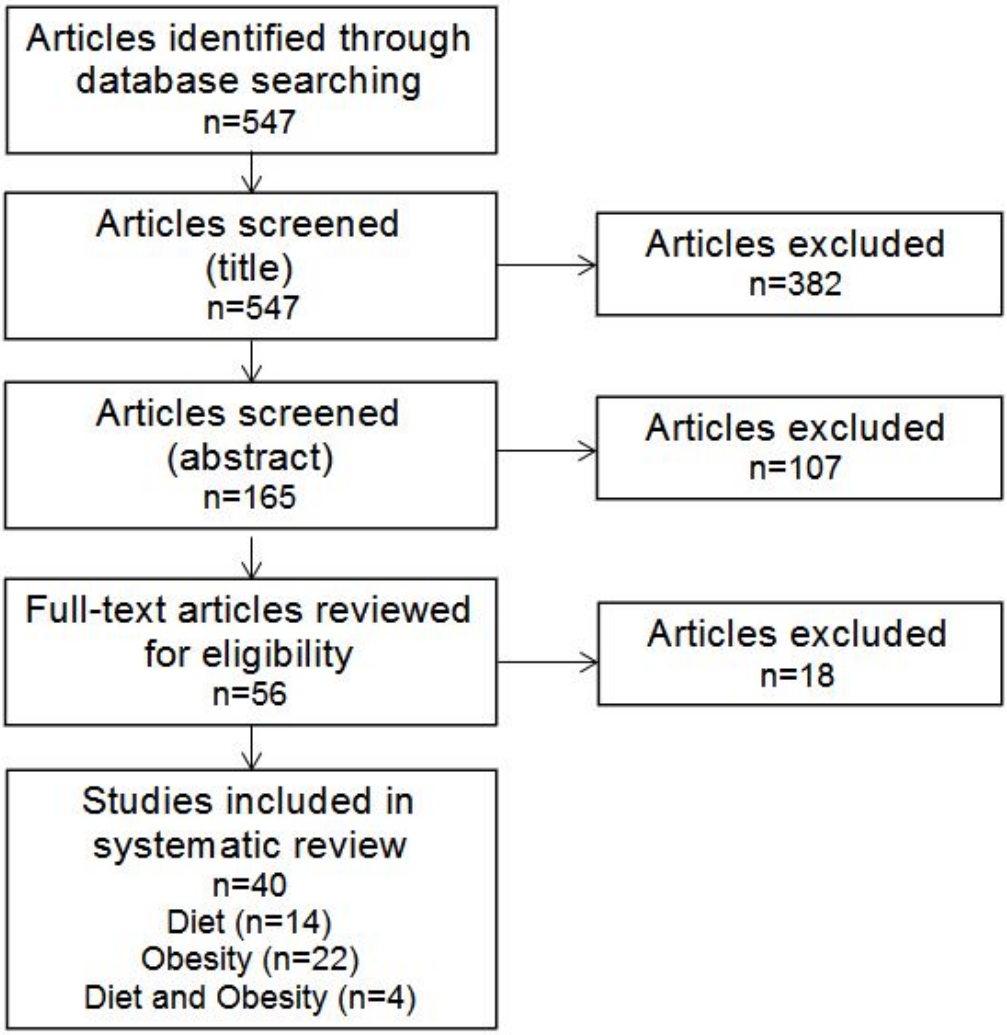
Date range: January 2004 to January 2014

Summary of articles identified to review

- Total hits from all electronic database searches: 547
- Total articles identified to review from electronic databases: 165
- Articles identified via handsearch or other means: 0
- Number of Primary Articles Identified: 40
- Number of Review Articles Identified: 0
- Total Number of Articles Identified: 40
- Number of Articles Reviewed but Excluded: 125



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Excluded articles

See Appendix A for a full list of excluded articles with reason.

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CHAPTER 3. FOOD ACCESS – WEIGHT STATUS

WHAT IS THE RELATIONSHIP BETWEEN NEIGHBORHOOD AND COMMUNITY FOOD ACCESS IN FOOD RETAIL SETTINGS AND WEIGHT STATUS?

TECHNICAL ABSTRACT

Background

The goal of this systematic review was to determine whether food access (i.e., the availability and affordability of foods) is associated with weight status. Food availability was measured in many ways for individuals, families and neighborhoods, including proximity to food outlets, density of food outlets, distance to the outlet closest to a residential location, mean distance traveled to food outlets where participants reported shopping and foods available in stores. Food availability was measured both objectively (e.g., food outlets per capita or within a certain radius of a participant's home using geographic information systems) and subjectively (e.g., perceived availability of healthy vs. unhealthy food outlets and healthy foods in a store or neighborhood).

Conclusion statement

Limited but consistent evidence suggests that the relationship between access to convenience stores and weight status is unfavorable with closer proximity and greater access being associated with significantly higher body mass index (BMI) and increased odds of overweight and obesity.

2015 DGAC Grade: **Limited**

The body of evidence on access to other food outlets, such as supermarkets, grocery stores, farmers' markets and produce stands, and weight status is limited and inconsistent.

2015 DGAC Grade: **Not assignable**

Methods

Literature searches were conducted using PubMed, Embase and Cochrane databases to identify studies that evaluated the association between food access and dietary outcomes. Studies that met the following criteria were included in the review: Randomized controlled trials (RCTs), non-randomized controlled trials, prospective cohort studies, or cross-sectional studies; humans over the age of two years who were healthy or at elevated chronic disease risk; subjects from the United States (US); and published in English in peer-reviewed journals. The date range was January 2004 to January 2014. The intervention or exposure was food availability and accessibility, compared to different levels of availability and accessibility. The outcomes were dietary intake, quality, behaviors and preferences.

Data from each included article was extracted and risk of bias was assessed. The evidence was qualitatively synthesized, a conclusion statement was developed and the strength of the evidence (grade) was assessed using pre-established criteria including evaluation of the quality and risk of bias, quantity, consistency, magnitude of effect and generalizability of

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available evidence.

Findings

- This NEL systematic review included 26 articles published since January 2004 that examined the relationship between food access and dietary outcomes. This literature included 19 cross-sectional studies and seven longitudinal studies
- The studies used multiple approaches to assess food access (i.e., the availability and affordability of foods) and dietary intake, quality and variety. The majority of studies measured food access by the density of food outlets within a specified distance from a participant's residence and proximity to various food outlets. The primary weight status outcome of interest was BMI.
    - Although food access was assessed across geographic, ethnic, racial and income groups, making comparisons across studies was challenging because of the wide variation in methods used to determine food access. Despite this variability, the relationship between convenience stores and weight status was consistent across the evidence.
    - Seven studies found statistically significant associations between access to convenience stores and BMI, as well as increased odds of overweight and obesity. Five of these studies were completed in an adult sample; two assessed this relationship among children.
    - Due to the variability of studies and paucity of data, no consistent associations regarding dietary outcomes and access to other food outlets were evident.

Limitations

The ability to draw strong conclusions was limited by the following issues:

- Most studies were of weaker design (i.e., cross-sectional)
- The methodological differences across individual studies were significant
- The myriad retail outlets that sell food vary considerably.

FULL REVIEW

Conclusion statement

Limited but consistent evidence suggests that the relationship between access to convenience stores and weight status is unfavorable with closer proximity and greater access being associated with significantly higher BMI and increased odds of overweight and obesity.

The body of evidence on access to other food outlets, such as supermarkets, grocery stores, farmers' markets and produce stands, and weight status is limited and inconsistent.

Grade

Limited: Convenience stores and weight

Not assignable: Other food outlets and weight

Key findings

- This systematic review includes 26 studies published between 2005 and 2013, including 19 cross-sectional studies and seven longitudinal studies examining the relationship between

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food access and weight status

- The studies used multiple approaches to assess food access (i.e., the availability and affordability of foods) and measures of weight status. The majority of studies measured food access by the density of food outlets within a specified distance from a participant's residence and proximity to various food outlets. The primary weight status outcome of interest was BMI.
- Due to the wide variation in methods used to determine food access, making comparison across studies was challenging. Despite this variability, the relationship between convenience stores and weight status was consistent across the evidence. Seven studies found statistically significant associations between access to convenience stores and BMI and increased odds of overweight and obesity. Five of these studies were completed in an adult sample; two assessed this relationship among children. Due to the variability of studies and paucity of data, no consistent associations regarding weight status and access to other food outlets were evident.
- The evidence base includes several studies of weaker design, mostly cross-sectional, by independent investigators with sufficient sample sizes. The findings across studies were inconsistent for all food types, except for convenience stores, which were evaluated in only six studies. Although food access was assessed across geographic, ethnic, racial and income groups, the variability in methodology made it difficult to compare studies.

Evidence summary

Description of the Evidence

This systematic review includes 26 studies conducted in the United States, including 19 cross-sectional studies that assessed food access by the presence of food outlets (Moreland, 2006), distance to food outlets (Block, 2011; Carroll-Scott, 2013; Drewnowski, 2012; Fiechtner, 2013; Jilcott Pitts, 2013; Liu, 2007), number of food outlets per neighborhood or census tract, number of residents or road miles (Ahern, 2011; An, 2012; Bodor, 2012; Brown, 2008; Ford, 2010; Galvez, 2009; Gibson, 2011; Lee, 2012; Leung, 2011; Moreland, 2009; Rossen, 2013; Rundle, 2009; Salios, 2012; Shier, 2012; Stark, 2013; Sturm, 2005; Viola, 2013) or both distance and density (Laska, 2010; Wang, 2007). Some of these studies (Drewnowski, 2012; Rossen, 2013; Sturm, 2005) examined additional measures of food access including the availability, affordability and quality of foods within various food outlets and percent of households with no car living more than one mile from a grocery store (Ahern, 2011).

Most of the included studies had relatively low risk of bias ratings (scores ranged from zero to eight points out of 26 or 28).

The sample size of these studies ranged from 237 to 48,014 participants; six studies had 100 to 500 (Fiechtner, 2013; Galvez, 2009; Jillcott Pitts, 2013; Laska, 2010; Leung, 2011; Rossen, 2013), eight studies had 1,000 to 5,000 (Ahern, 2011; Block, 2011; Bodor, 2012; Brown, 2008; Carroll-Scott, 2013; Drewnowski, 2012; Morland, 2009; Salios, 2012), six studies had 5,000 to 10,000 (Gibson, 2011; Lee, 2012; Liu, 2007; Shier, 2012; Sturm, 2005; Wang, 2007), three studies had 10,000 to 15,000 (An, 2012; Morland, 2006; Rundle, 2009) and three studies had more than 20,000 (Ford, 2010; Stark, 2013; Viola, 2013).

Population

Most studies examined food access and weight status in a general population of adults

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(Ahern, 2011; Block, 2011; Bodor, 2012; Brown, 2008; Drewnowski, 2012; Morland 2006; Morland, 2009; Rundle, 2009; Salois, 2012; Stark, 2013; Viola, 2013; Wang 2007); two focused on women (Jillcott Pitts, 2013; Ford, 2010). Eleven studies focused solely on children and adolescents (An, 2012; Carroll-Scott, 2013; Fiechtner, 2013; Galvez, 2009; Laska, 2012; Lee, 2012; Leung, 2011; Liu, 2007; Rossen, 2013; Shier, 2012; Sturm, 2005), one of which only evaluated girls (Leung, 2011). One study assessed adolescents and young adults at baseline and completed follow up during middle age (Gibson, 2011). Where reported, mean age of participants ranged from 4.9 years to 63.0 years; multiple studies did not specify an upper cutoff for age.

Information related to socioeconomic status (SES) was reported in 25 studies and indicators included household demographics (household income, federal poverty level) and individual characteristics (educational achievement, free or reduced lunch eligibility, income level, vehicle ownership). Race was reported in 24 studies, with the racial profiles of the samples varying greatly (refer to the **Overview Table** for study-specific details).

Exposures

Food availability was measured in many ways for individuals, families and neighborhoods, including proximity to food outlets [total and by type (supercenters, supermarkets, large chain grocery stores, medium-sized grocery stores, small or specialty grocery stores, convenience stores, candy stores, bakeries, farmers' markets and produce stands)]; density of food outlets (total and by type); distance to the outlet closest to a residential location; and foods available in stores. Within each of these exposures, the measurement of food availability varied as well. Some studies objectively measured the availability of food outlets *per capita* or within a certain radius of a participant's home using geographic information systems. Foods available in stores were determined by the Nutrition Environment Measures-Survey. Food outlets were identified through various methods, including the U.S. Census Bureau, the Dun and Bradstreet commercial dataset of US business records, city/county/state health/agriculture department records and the USDA's Food Environment Atlas. When the categorization of food outlets was described, Standard Industrial Classification (SIC) codes or the North American Industry Classification System codes, which replaced SIC codes in 1997, were used.

Food affordability was measured by market basket price and various price indexes by foods or food groups. The exposure variables for both food availability and affordability were assessed as continuous and categorical variables in the statistical analyses.

Outcomes

Weight status outcomes included self-reported height and weight, measured height and weight, measured waist circumference and USDA ERS Food Environment Atlas data regarding adult obesity rates per 100 people in a county. Body mass index (BMI) was calculated. BMI percentile and BMI Z-scores were determined using age-specific and gender-specific Centers for Disease Control and Prevention (CDC) growth charts for children.

Evidence Synthesis

This body of evidence includes 26 studies with significant methodological differences (refer to the **Overview Table** for study-specific details). Geography (i.e., rural, urban, suburban) and demographics (i.e., ethnicity, income, age, gender) vary greatly; as well as most findings.

Two studies showed favorable or healthy outcomes related to access to farmer's markets and weight status; one study showed unfavorable weight outcomes related to access to farmer's

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markets and two studies did not find a relationship between access to farmers' markets and weight outcomes. Six studies showed unfavorable outcomes regarding weight outcomes and access to grocery stores; one study showed favorable outcomes and seven studies did not find a relationship between access to grocery stores and weight outcomes. Six studies showed favorable outcomes with weight outcomes and access to supermarkets, five studies showed unfavorable outcomes and seven studies did not find a relationship between access to supermarkets and weight outcomes.

Due to the variability of studies and paucity of data, making comparisons across studies and drawing conclusions was difficult. In summary, there was limited but consistent unfavorable associations between access to convenience stores and weight status, with closer proximity and greater access being associated with significantly higher BMI and increased odds of overweight and obesity. Furthermore, there were no consistent findings regarding the impact of access to other food outlets and weight status.

Overview Table: Summary of studies examining the relationship between food access and weight status

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Question: What is the relationship between neighborhood and community food access in food retail settings and weight status?

Overview Table: Summary of studies examining the relationship between food access and weight status

Author, Year Study Design Location Risk of Bias*	Sample Size Age Gender Race/Ethnicity SES	Food Access Variables	Results
Longitudinal Studies			
Block, 2011 **Prospective longitudinal cohort study** **US** **Risk of bias: 1/26**	N=3,113 50.8y Women provided 52.5% of the observations **Race N:** Not reported **Education:** ~50% high school or less	1) Distance to nearest food store 2) Mean distance to the 5 closest food stores	**Change in BMI** *Distance to closest food establishment:* Non-significant (NS) **Mean distance to closest 5 food establishments:** • *Total sample:* NS • *Women:* β=-0.11 (95% CI: -0.21, -0.01) • *Men:* NS
Gibson, 2011 **Prospective longitudinal cohort study** **US** **Risk of bias: 8/26**	N=8,287 33-48y (at follow-up) 49.5% female **Race:** Not reported **SES:** Not reported	Density per square mile for supermarkets, small grocery store, or convenience and specialty store	**Cross-sectional probability of obesity** *Small grocery store density:* β=0.0022 (SE=0.0013; P=0.05) *Supermarket density:* NS *Convenience/specialty store density:* NS **Prospective change in BMI**: NS
Lee, 2012 **Prospective longitudinal cohort study** **US** **Risk of bias: 3/26**	N=7,730 6.2y (SD=0.36) 50.0% female Non-Hispanic White 62.5%, Non-Hispanic Black 9.7%, Hispanic 17.8%, Asian 6.0%, Other/multi-racial 4.0%	Grocery store/restaurant density by type	**Change in BMI percentile**: NS (for any food outlet type)

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Question: What is the relationship between neighborhood and community food access in food retail settings and weight status?

Overview Table: Summary of studies examining the relationship between food access and weight status

Author, Year Study Design Location Risk of Bias*	Sample Size Age Gender Race/Ethnicity SES	Food Access Variables	Results
	Maternal education: Less than high school (11.3%), high school/GED (27.8%), some college (32.1%), Bachelor's degree or higher (28.8%) **Household income:** <$50,000 (54.5%); $50,000-$100,000 (35.8%), >$100,000 (9.7%)		
Leung, 2011 **Prospective longitudinal cohort study** **US** **Risk of bias: 4/26**	N=353 7.4y (S=0.4) 100.0% female White 47.6%, African American 13.3%, Latino 21.5%, Asian/Mixed/Other 17.6% **Caregiver's education:** Less than high school (16.7%), college or associate degree (27.8%), Bachelor's degree (31.7%), any graduate school (22.7%), missing (1.1%) **Household income:** <$100,000 (52.7%), ≥$100,000 (46.2%), missing (1.1%)	Food stores within 0.25 miles and 1.0 mile	**Risk of overweight/obesity** **Food store density within 0.25 miles:** • *Convenience stores:* OR=3.38 (95% CI: 1.07, 10.68; P<0.05) • *Other store types:* Drug stores, Produce vendors/farmers' markets, Small grocery stores, Specialty stores, Specific food store venues, or Supermarkets: NS **Food store density within 1 mile:** • *Produce vendors/farmers' markets:* OR=0.22 (95% CI: 0.05, 1.06; P<0.01) • *Other store types:* Convenience stores, Drug stores, Small grocery stores, Specialty stores, Specific food store venues, Supercenters, Supermarkets: NS **BMI z-score** **Food store density within 0.25 miles:**

Question: What is the relationship between neighborhood and community food access in food retail settings and weight status?

Overview Table: Summary of studies examining the relationship between food access and weight status

Author, Year Study Design Location Risk of Bias*	Sample Size Age Gender Race/Ethnicity SES	Food Access Variables	Results
			• *Convenience stores:* β=0.13 (95% CI: 0.00, 0.25; P<0.05) • *Drug stores:* β=0.21 (95% CI: 0.00, 0.43; P < 0.01) • *Other store types:* Small grocery stores, Produce vendors/farmers' markets, Specialty stores, Specific food store venues, and Supermarkets: NS **Food store density within 1 mile:** NS (for all store types)
Rossen, 2013 **Prospective longitudinal cohort study** **US** **Risk of bias: 3/26**	N=237 9.6y (SD=1.03), 8-13y 53.6% female Black 86.83%, Other 13.17% **Free/reduced price lunch:** 85.44%	Mean Healthy Food Availability Index (HFAI) scores at food outlets within defined distance (100, 400, 800m) of school route HFAI assessed by modified NEMS	**BMI change** **HFAI:** β=-0.15 (95% CI: -0.26, -0.03; P for trend=0.015). **Waist circumference change** **HFAI:** β=-0.47 (95% CI: -0.91, -0.03, P for trend=0.037)
Shier, 2012 **Prospective longitudinal cohort study** **US** **Risk of bias: 4/26**	N=6,260 14.25y (SD=2.36) (at follow-up) 50.0% female Non-Hispanic White 60.2%, Non-Hispanic Black 15.1%, Non-Hispanic Asian 2.9%, Hispanic 17.8%, Other 3.9% **Mother's education:** Less than high school (9.8%), high school graduate (22.4%), some college (36.6%), college graduate or higher (31.2%)	1) Food outlet density 2) Food environment indices [Retail Food Environment Index (RFEI); Physical Food Environment Index (PFEI)] 3) Types of food stores	**BMI percentile in 8th grade** **Convenience store density:** β=6.99 (SE=1.88; P<0.01) *All other: Food outlets, RFEI, PFEI, Ratio of convenience stores to all food stores, and Ratio of fast food outlets to all restaurants:* NS **Change in BMI percentile (5TH to 8TH grade)** *All variables:* NS

Question: What is the relationship between neighborhood and community food access in food retail settings and weight status?

Overview Table: Summary of studies examining the relationship between food access and weight status

Author, Year Study Design Location Risk of Bias*	Sample Size Age Gender Race/Ethnicity SES	Food Access Variables	Results
	Household income: $0-$25,000 (18.3%), $25,001-$40,000 (17.8%), $40,001-$75,000 (26.6%), $75,001-$100,000 (17.4%), ≥$100,001 (19.9%)		
Sturm, 2005 **Prospective longitudinal cohort study** **US** **Risk of bias: 3/26**	N=6,916 6.2y (SD=0.36) 50.0% female White 59.3%, Black 12.8%, Hispanic 18.4%, Asian 5.8%, Other/multi-racial 3.7% **Maternal education:** Less than high school (11.3%), high school/GED (33.3%), some college (26.9%), Bachelor's degree or higher (28.5%) **Household income:** Less than $15,000 (11.9%), $15,000-$25,000 (11.4%), $25,000-$35,000 (11.4%), $35,000-$50,000 (15.1%), $50,000-$75,000 (22.6%), $75,000 or more (27.6%)	1) Food store/restaurant density 2) Food cost in Metropolitan Statistical Area (MSA)	**Change in BMI percentile from kindergarten to first grade or third grade** *Food outlet density:* NS (for total outlets of by type) **Fruit/vegetable cost in MSA:** *Kindergarten to 1st grade:* β=0.054 (SE=0.022; P=0.016) *Kindergarten to 3rd grade:* β=0.114 (SE=0.033; P<0.001) **Meat cost in MSA:** NS
Cross-sectional Studies			
Ahern, 2011 **Cross-sectional study** **US**	N=3,128 >20y 50.2% female	1) Grocery store density 2) Convenience store density	**Obesity rate** **Grocery density:** • *Full sample:* β=0.62 (SE=0.20; P<0.01)

Question: What is the relationship between neighborhood and community food access in food retail settings and weight status?

Overview Table: Summary of studies examining the relationship between food access and weight status

Author, Year Study Design Location Risk of Bias*	Sample Size Age Gender Race/Ethnicity SES	Food Access Variables	Results
Risk of bias: 6/26	Non-Hispanic Black 9.0%, Native American 1.9%, Hispanic 6.5%, Asian American 0.9%, Non-Hispanic White 81.1% **Education:** Less than high school (22.6%), with college education (16.5%)	3) Per capita direct sales from local farms 4) Percent of households with no car living more than 1 mile from a grocery store	• *Non-metro subsample:* β=0.53 (SE=0.21; P<0.05) • *Metro subsample:* NS **Convenience density:** β=0.30 (SE=0.14; P<0.05) • *Full sample:* β=0.30 (SE=0.14; P<0.05) • *Non-metro subsample:* NS • *Metro subsample:* β=0.85 (SE=0.43; P<0.05) **Direct farm sales per capita:** • *Full sample:* β=-0.01 (SE=0.003; P<0.01) • *Non-metro subsample:* β=-0.01 (SE=0.004; P<0.05) • *Metro subsample:* NS **Percent households with no car living more than 1 mile from a grocery store:** • *Full sample:* NS • *Non-metro subsample:* β -0.05 (SE=0.03; P<0.05) • *Metro subsample:* β=0.15 (SE=0.05; P<0.01)
An, 2012 **Cross-sectional study** **US** **Risk of bias: 2/26**	N=13,462 8.3y (SD=2.0); 5-11y (Children); 14.5y (SD=1.7); 12-17y (Adolescents) 49.0% female **Children:** White (46.0%), Black (8.0%), Asian or Pacific Islander (11.0%), Native-American (1.0%), Other or Multi-race	1) Convenience store density 2) Food store types within a 0.1-mile, 0.5-mile, 1.0-mile and 1.5-mile radius	**BMI** **Children:** *All store type density and ranges:* NS **Adolescents:** • *Mid-size grocery stores within 0.5 miles:* β=-0.0164 (SE=0.0170; P<0.05) • *Large supermarkets within 1.0 mile:* β=0.0094 (SE=0.0040; P<0.05)

Question: What is the relationship between neighborhood and community food access in food retail settings and weight status?

Overview Table: Summary of studies examining the relationship between food access and weight status

Author, Year Study Design Location Risk of Bias*	Sample Size Age Gender Race/Ethnicity SES	Food Access Variables	Results
	(6.0%), Hispanic (27%) **Adolescents:** White (39.0%), Black (8.0%), Asian or Pacific Islander (11.0%), Native-American (1.0%), Other or Multi-race (10.0%), Hispanic (31%) **Parent's education** *Children:* Less than high school (12.0%), high school graduate (23.0%), more than high school (51%); *Adolescents:* Less than high school (21.0%), high school graduate (21.0%), more than high school (46%) **Mean household income** *Children:* $51,534; *Adolescents:* $46,166		• *All other store types/ranges:* NS
Bodor, 2010 **Cross-sectional study** **US** **Risk of bias: 4/26**	N=3,925 8-50y (52.6%), >50y (47.4%) 66% female Non-Hispanic White 35.5%, Non-Hispanic Black 57.9%, Hispanic/Latino 3.0%, Other 3.6% **Education:** Less than high school (11.5%), high school graduate (26.2%), attend some college (24.4%), college graduate or higher (37.9%)	1) Food retailer type stores 2) Food retailer density	**Obesity risk** **Supermarket density:** OR=0.936 (95% CI: 0.882, 0.994; P<0.05) **Convenience store density:** OR=1.013 (95% CI: 1.001, 1.024; P < 0.05)

Question: What is the relationship between neighborhood and community food access in food retail settings and weight status?

Overview Table: Summary of studies examining the relationship between food access and weight status

Author, Year Study Design Location Risk of Bias*	Sample Size Age Gender Race/Ethnicity SES	Food Access Variables	Results
	Poverty index ratio: Below 1.00 (18.7%), 1.00-1.85 (21.7%), >1.85 (59.6%)		
Brown, 2008 **Cross-sectional study** **US** **Risk of bias: 6/26**	N=2,536 ~40y (SD~14y) 59.2% female **Very Deprived Group:** Non-Hispanic White (9.0%), Hispanic/Latino (77.2%), Non-Hispanic Black (11.9%), Asian or Pacific Islander (2.0%) **Deprived Group:** Non-Hispanic White (29.7%), Hispanic/Latino (50.6%), Non-Hispanic Black (6.8%), Asian or Pacific Islander (12.9%) **Non-Deprived Group:** Non-Hispanic White (66.5%), Hispanic/Latino (15.2%), Non-Hispanic Black (5.7%), Asian or Pacific Islander (12.6%) **Education** *Very Deprived:* High school graduate (42.8%), college graduate (4.6%); Deprived: high school graduate (57.1%), college graduate (16.3%); *Non-Deprived:* High school graduate (44.3%), college graduate (49.4%)	Food store density	**BMI** **With chronic condition subsample:** Large supermarket density: β=2.91 (95% CI: 1.28, 4.53, P≤0.001) **All other subsamples and food store types:** NS

Question: What is the relationship between neighborhood and community food access in food retail settings and weight status?

Overview Table: Summary of studies examining the relationship between food access and weight status

Author, Year Study Design Location Risk of Bias*	Sample Size Age Gender Race/Ethnicity SES	Food Access Variables	Results
	Income *Very Deprived:* <$40,000 (63.9%), >$40,000 (12.8%); *Deprived:* <$40,000 (70.1%), >$40,000 (29.9%); *Non-Deprived:* <$40,000 (48.0%), >$40,000 (52.0%)		
Carroll-Scott, 2013 **Cross-sectional study** **US** **0/26**	N=719 10.9y (SD=0.8) 52.4% female White 10.5%, Black 40.7%, Latino 48.9% **Free/reduced lunch eligibility:** Eligible (76.9%), not eligible (12.0%) **Food secure (self-report):** Yes (76.7%), no (10.5%)	Distance to food outlet	**BMI** **Nearest grocery store >0.5mi:** β=1.484 (SE=0.493; P<0.01)
Drewnowski, 2012 **Cross-sectional study** **US** **6/26**	N=1,304 18-54y (50%), >54y (50%) 63% female White 84%, Black 7%, Asian 7% **Education:** Less than high school (19%), some college (26%), college graduate or more (55%)	1) Distance to nearest supermarket 2) Average market basket price at primary supermarket	**Odds of obesity** **Distance to primary supermarket:** NS **High-price supermarket** (ref: low-price supermarket): RR=0.36 (95% CI: 0.20, 0.67; P=0.001)

Question: What is the relationship between neighborhood and community food access in food retail settings and weight status?

Overview Table: Summary of studies examining the relationship between food access and weight status

Author, Year Study Design Location Risk of Bias*	Sample Size Age Gender Race/Ethnicity SES	Food Access Variables	Results
	Household income: >$100,000 (26%)		
Fiechtner, 2013 **Cross-sectional study** **US** **Risk of bias: 1/26**	N=438 4.9y (SD=1.2) 48.2% female White 57.1%, Black 18.7%, Latino 16.4%, Other 7.8% **Parent education:** Some college or below (38.1%), college graduate (61.9%) **Annual household income:** ≤$50,001 (71.8%)	Proximity to type of food outlet	**BMI** **Large supermarkets ≤1 mile (ref: >2mi):** OR=0.77 (95% CI: 0.03, 1.51; P<0.05) **Proximity to all other food outlets:** NS
Ford, 2010 **Cross-sectional study** **US** **Risk of bias: 3/26**	N=21,166 24.8y (SD=5.07) 100% female White 85.0%, Black 11.8%, Other 4.2% **Ethnicity:** Non-Hispanic (72.0%), Hispanic (28.0%) **Education:** 11.46 y (SD=2.67) **Monthly household income:** $1,328 (SD=$1,611)	Density of food stores within a 1-, 3-, and 5-mile radius	**Obesity risk** **Supermarkets within 1 mile:** • *Micropolitan:* OR=1.07 (95% CI: 1.01, 1.14; P<0.01) • *Metropolitan or Rural subsamples*: NS **Supermarkets within 3 miles:** • *Micropolitan or Rural subsamples:* NS • *Metropolitan:* OR=0.99 (95% CI: 0.97, -0.99; P<0.05) **Supermarkets within 5 miles:** • *Micropolitan or Rural subsamples:* NS

Question: What is the relationship between neighborhood and community food access in food retail settings and weight status?

Overview Table: Summary of studies examining the relationship between food access and weight status

Author, Year Study Design Location Risk of Bias*	Sample Size Age Gender Race/Ethnicity SES	Food Access Variables	Results
			• *Metropolitan:* OR=0.99 (95% CI: 0.99, 0.99; P<0.05) **Grocery within 1 mile:** • *Micropolitan:* OR=1.05 (95% CI: 1.01, 1.09; P<0.05) • *Metropolitan or Rural subsamples:* NS **Grocery within 3 miles:** *Metropolitan, Micropolitan, or Rural subsample:* NS **Grocery within 5 miles:** *Metropolitan, Micropolitan, or Rural subsamples:* NS **Convenience within 1 mile:** • *Micropolitan:* OR=1.03 (95% CI: 1.01, 1.05; P<0.05) • *Metropolitan or Rural subsamples:* NS **Convenience within 3 or 5 miles:** *Metropolitan, Micropolitan, or Rural subsample:* NS
Galvez, 2009 **Cross-sectional study** **US** **Risk of bias: 1/26**	N=323 6-8y 71% female Hispanic/Latino 67.0%, Non-Hispanic Black 3.0% **Income:** <$12,000 (20.0%), $12,000-$24,999 (40.0%), $25,000-$49,999 (31.0%),	Food store density	**Risk of BMI in highest tertile** **Convenience stores ≥1** (Ref: 0): OR=1.90 (95% CI: 1.15, 3.15; P=0.01) **Other food store types:** *Specialty stores, grocery stores, supermarkets:* NS

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Overview Table: Summary of studies examining the relationship between food access and weight status

Author, Year Study Design Location Risk of Bias*	Sample Size Age Gender Race/Ethnicity SES	Food Access Variables	Results
	$50,000-$74,999 (5.0%), $75,000-$99,999 (3.0%), >$100,000 (1.0%)		
Jillcott Pitts, 2013 **Cross-sectional study** **US** **Risk of bias: 2/26**	N=400 26.3y (SD=6.3) 100% female Black (63.8%) **Education:** 43.6% below high-school graduate **Income:** 100% low-income **Car owners:** 68%	1) Distance to nearest food outlet 2) Space and time accessibility to farmers markets	No associations with weight outcomes
Laska, 2010 **Cross-sectional study** **US** **Risk of bias: 1/26**	N=334 (residential-level GIS-derived independent variables); 277 (school-level GIS-derived independent variables) 15.4y (SD=1.7) 50.9% female Caucasian 93.4% **Parental education:** 64.4% college education **Median household income:** $76,790	Food outlet proximity	**BMI z-score** **Convenience stores within 1,600m:** β=0.26 (95% CI: 0.05, 0.48; P<0.01) **Other variables:** *Distance to nearest food outlet (per 100m), presence within 800m, or presence within 3,000m:* NS **Percent body fat** **Convenience stores within 1,600m:** β=2.17 (95% CI: 0.44, 3.91; P<0.01) **Other variables:** *Distance to nearest food outlet (per*

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Author, Year Study Design Location Risk of Bias*	Sample Size Age Gender Race/Ethnicity SES	Food Access Variables	Results
			100m), presence within 800m, presence within 3000m: NS
Liu, 2007 **Cross-sectional study** **US** **Risk of bias: 3/26**	N=7334 8.1y (SD=3.8) 48.9% female **Higher population townships:** Non-Hispanic White (22.8%), Non-Hispanic Black (60.7%), Hispanic (14.9%), Other (1.7%) **Lower population townships:** Non-Hispanic White (21.1%), Non-Hispanic Black (45.1%), Hispanic (28.2%), Other (5.7%) **Mean family income** *Higher population townships:* $40,200 (SD=$10,029); *Lower population townships:* $52,700 (SD=$8,550)	Nearest food outlet	**Overweight risk** **Distance to nearest supermarket:** • *Low population township subsample:* Odds=1.038 (SE=0.019, P=0.03) • *High population township subsample:* NS **All other food outlet types and township types:** NS
Morland, 2006 **Cross-sectional study** **US** **Risk of bias: 3/26**	N=10,763 49-73y 56% female White 77%, Black American 23% **Education:** Less than high school graduate	1) Food outlet density by type 2) Food access environment	**Prevalence of overweight** **Supermarket density:** PR=0.94 (95% CI: 0.90, 0.98) **Convenience store density:** PR=1.06 (95% CI: 1.02, 1.10) **Grocery store density:** NS

Question: What is the relationship between neighborhood and community food access in food retail settings and weight status?

Overview Table: Summary of studies examining the relationship between food access and weight status

Author, Year Study Design Location Risk of Bias*	Sample Size Age Gender Race/Ethnicity SES	Food Access Variables	Results
	(20.9%), high school graduate (31.9%), some college (10.4%), advanced degree (36.8%) **Income:** ≥$40,000 (25.4%)		**Food outlet access environment (ref: only has access to supermarket)** • *Grocery store access:* PR=1.14 (95% CI: 1.01, 1.27) • *Convenience store access:* PR=1.12 (95% CI: 1.02, 1.23) • *Grocery store and convenience store access:* PR=1.18 (95% CI: 1.08, 1.30) • *Other access types:* Supermarkets and grocery stores, Supermarkets and convenience stores, Supermarkets, grocery stores and convenience stores, or No stores: NS **Prevalence of obesity** **Supermarket density:** PR=0.83 (95% CI: 0.75, 0.92) **Convenience store density:** PR=1.16 (95% CI: 1.05, 1.27) **Grocery store density:** NS **Food outlet access environment** (ref: only has access to supermarket): • *Supermarket and convenience stores:* PR=1.35 (95% CI: 1.05, 1.3) • *Grocery stores:* PR=1.48 (95% CI: 1.12, 1.94) • *Convenience stores:* PR=1.45 (95% CI: 1.16, 1.82) • *Grocery stores and convenience stores:* PR=1.60 (95% CI: 1.28, 2.00)

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Overview Table: Summary of studies examining the relationship between food access and weight status

Author, Year Study Design Location Risk of Bias*	Sample Size Age Gender Race/Ethnicity SES	Food Access Variables	Results
			• *Other access types:* Supermarkets and grocery stores, Supermarkets, grocery stores and convenience stores, or No stores: NS
Morland, 2009 **Cross-sectional study** **US** **Risk of bias: 3/26**	N=1,295 48y (SD=17) 64.7% female White 61.5%, Black 38.5% **Education:** Less than high school (8.7%), high school grad/GED (23.5%), some tech school/college (25.5%), college graduated (42.3%)	1) Food outlet/restaurant presence in an area 2) Nearest food outlet/restaurant	**Prevalence of obesity** **Chain supermarket presence:** PR=0.78 (95% CI: 0.63,0.95) **Grocery Store presence:** PR=1.31 (95% CI: 1.05, 1.62) **Other variables:** *Convenience store, Convenience store with gas station, Specialty food stores, Unknown sore, Distance to nearest supermarket, or Distance to nearest fast food:* NS
Rundle, 2009 **Cross-sectional study** **US** **Risk of bias: 2/26**	N=13,102 46.2y (SD=10.6) 64% female Caucasian 47%, African American 14%, Caribbean 5%, Hispanic/Latino 20%, Asian 12%, Other 2% **Education:** Some high school or less (13%), high school graduate (22%), vocational school (2%), some college (21%), college graduate (24%), graduate school (18%)	**Food outlet/restaurant density by type** *"BMI-healthy":* Supermarkets/large grocery stores, fruit and vegetable markets and natural food stores *"BMI-intermediate":* Non-fast food restaurants, medium-sized grocery stores, specialty stores and	**BMI** **Food outlet density:** • *BMI-healthy density:* Quintile 5 mean BMI=27.26 vs. Quintile 1 mean BMI=28.06; P=0.003 • *BMI-intermediate density:* Q5 vs. Q1=NS • *BMI-unhealthy density:* Q5 vs. Q1=NS **Prevalence of overweight:** Density of BMI-healthy outlets (ref: Quintile 1+2): *Quintile 5:* NS **Prevalence of overweight:** Density of BMI-healthy outlets (ref: Quintile 1+2): *Quintile 5:* PR=0.87 (96% CI: 0.78, 0.97, P<0.05)

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Overview Table: Summary of studies examining the relationship between food access and weight status

Author, Year Study Design Location Risk of Bias*	Sample Size Age Gender Race/Ethnicity SES	Food Access Variables	Results
		fish markets *"BMI-unhealthy":* Fast-food restaurants, convenience stores, meat markets, pizzerias, bodegas, bakeries, candy stores and nut stores	
Salois, 2012 **Cross-sectional study** **US** **Risk of bias: 3/26**	N=3,051 >20y Gender NR White 79.5%, Black 9.0%, Asian 0.98% **Median household income of counties:** $44,034 (SD=$11,376) **Mean poverty rate for counties:** 15.3% **Percent residents without a car and >1mi to store:** 4% **Percent low income and >1mi to store:** 22.8%	1) Grocery store density 2) Percent of farms with direct-sales to consumers 3) Value of direct farm sales per capita 4) Farmers market density	**Obesity risk** **Percent low income and >1mi to store:** β=0.027 (P<0.01) **Supercenters/club stores density:** β=8.737 (P<0.01) **Percent of farms with direct sales:** β=-0.032 (P<0.01) **Direct farm sales per capita (dollars):** β=-0.011 (P<0.01) **Other variables:** *Percent of households no car and >1mi to store, supermarket/grocery store density, convenience stores (no gas) density, convenience stores (with gas) density, farmers market density:* NS
Stark, 2013 **Cross-sectional study**	N=44,282 18-24y (8.5%), 25-44y (40.2%), 45-64y (32.5%), ≥65y (18.8%)	1) Food outlet density 2) Diversity of food outlets	**BMI** **Proportion of BMI-unhealthy food outlets:**

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US **Risk of bias: 3/26**	58.45% female Non-Hispanic White 40.8%, Non-Hispanic Black 24.9%, Non-Hispanic Asian 6.9%, Hispanic/Latino 24.7%, Other 2.8% **Education:** Less than high school (16.0%), high school graduate (25.2%), some college (22.3%), college graduates (36.5%) **Income to poverty ratio:** >600 (21.4%)	3) The proportion of food outlets classified as "BMI-unhealthy"*; "BMI-intermediate"*; "BMI-healthy"* * see Rundle, 2009	• *Total sample:* β=0.261 (95% CI: 0.093,0.429; P<0.01) • *Low-percent poor zip code subsample*: β=0.507 (95% CI: 0.284, 0.731; P<0.001) • *High-percent poor zip code subsample:* NS **Food store density:** • *Total sample:* β=-0.324 (95% CI: -0.446, -0.202; P<0.001) • *Low-percent poor zip code subsample:* β=-0.273 (95% CI: -0.444, -0.102; P<0.01) • *High-percent poor zip code subsample:* β=-0.305 (95% CI: -0.496, -0.113; P<0.01) **Food outlet diversity:** • *Total sample:* NS • *Low-percent poor zip code subsample:* NS • *High-percent poor zip code subsample:* NS
Viola, 2013 **Cross-sectional study** **US** **Risk of bias: 2/26**	N=48,014 >18y 53% female **Non-Hispanic White** 38%, Non-Hispanic Black 24%, Hispanic 25%, Non-Hispanic Other 14% **Income:** Or=200% federal poverty limit (63%)	Supermarket and fast-food density	**Overweight risk** *Total supermarkets:* β=-0.09 (95% CI: -0.12, -0.03) **Obesity risk** *Total supermarkets:* β=-0.11 (95% CI: -0.17, -0.03)

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Overview Table: Summary of studies examining the relationship between food access and weight status

Author, Year Study Design Location Risk of Bias*	Sample Size Age Gender Race/Ethnicity SES	Food Access Variables	Results
	Education: Less than or equal to high school diploma or GED (52%), some college or beyond (48%)		
Wang, 2007 **Cross-sectional study** **US** **Risk of bias: 2/26**	N=7,595 ~44.8y (SD~14.2) 55% female **High SES Neighborhood:** Non-Hispanic white (95.6%), Hispanic (4.4%) **Middle SES Neighborhood:** Non-Hispanic white (89.3%), Hispanic (10.7%) **Low SES Neighborhood:** Non-Hispanic white (65.8%), Hispanic (34.2%) **Mean education (years):** High SES (14.4), Middle SES (13.3), Low SES (10.3) **Mean income:** High SES >$50,000 (17.7%), Middle SES >$50,000 (8.5%), Low SES >$50,000 (4.9%)	1) Nearest food store 2) Food store density 3) Food store type	**BMI, low SES neighborhoods** (ref: High SES): • *Convenience store proximity:* β=0.684 (SE=0.197; P<0.01) • *Convenience store density:* β=0.624 (SE=0.198; P<0.05) • *Small grocery store proximity:* β=0.706 (SE=0.204; P<0.01) • *Small grocery store density:* β=0.574 (SE=0.206; P<0.05) • *Ethnic market proximity:* β=0.639 (SE=0.196; P<0.05) • *Ethnic market density:* β=0.631 (SE=0.200; P<0.05) • *Supermarket proximity:* β=0.621 (SE=0.196; P<0.05) • *Supermarket density:* β=0.619 (SE=0.199; P<0.05) **BMI, middle SES neighborhoods** (ref: High SES): *All store type, density, and proximity variables:* NS

*Risk of bias as determined using the Nutrition Evidence Library Bias Assessment Tool (NEL BAT)

Assessment of the Body of Evidence

- *Quality, Quantity and Risk of Bias:* Collectively, the evidence base includes several studies by independent investigators; however, there is limited evidence for some food outlet types (e.g., five studies evaluated farmer's markets) yet moderate evidence for others (e.g., 14 studies evaluated grocery stores and 18 studies assessed supermarkets). Despite a low risk of bias for most studies [as assessed by the NEL Bias Assessment Tool (BAT)] and sufficient sample sizes (range of 237 to 48,014), most studies were of weaker design (i.e., cross-sectional).
- *Consistency:* The independent variables and findings across studies were inconsistent for all food outlet types with the exception of convenience stores; however, only six studies evaluated the relationship between these specific food outlets and outcomes related to weight status
- *Impact:* The magnitude of the effect, as well as the clinical and public health significance cannot be determined due to different measures and methodology
- *Generalizability:* The findings included in the evidence portfolio are likely generalizable to the US population of interest. The range of studies addressed urban, rural, ethnic, racial and income diversity
- *Limitations:* The methodological differences across individual studies are significant. In addition, the myriad retail outlets that sell food vary considerably. This variability and the paucity of data on which to compare studies, made it difficult to draw conclusions.

Implications

For people to improve their diets and health, they need to have convenient access to nutritious, high quality and affordable healthy foods in environments where they live, work, learn and play. Limited access to affordable and healthy food is a challenge, particularly for families living in rural areas and low-income communities. Innovative approaches to bring healthy food retail into communities have proliferated, especially in underserved neighborhoods. These include creating financing programs to incentivize grocery store development; improving availability of healthy food at corner stores and bodegas, farmers markets and mobile markets, community gardens and youth-focused gardens; creating new forms of wholesale distribution through food hubs; and improving transportation and public safety options. However, most of these approaches lack adequate evaluation. These and other promising equity-oriented efforts need to continue and be evaluated and then successfully scaled up to other communities.

To ensure healthy food access to everyone in America, action is needed across all levels—federal, state and local—to create private-public partnerships and business models, with the highest priority on those places with greatest need. Similar efforts are needed to reduce access to and consumption of calorie-dense, nutrient-poor foods and sugar-sweetened beverages in community settings. These efforts need to be seamlessly integrated with food assistance programs such as food banks, soup kitchens and federal nutrition assistance programs such as Women, Infants and Children (WIC) and Supplemental Nutrition Assistance Program (SNAP), as well as elder nutrition.

Research recommendations

1. Develop better valid and reliable methods for measuring the total food environment of communities. These methods can then be used to assess the impact of the food environment on community health as well as economic development and growth.

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Rationale: The food environment has become more complex with more and more retail outlets selling food and beverages. Having valid and reliable methodologies (tools and new analytical approaches) will allow more meaningful inquiry into the contributions of various retail outlets in supporting or hindering nutritional health.

2. Identify, implement, evaluate and scale up best practices (including private-public partnerships) for affordable and sustainable solutions to improving the food environment and increasing food access, especially in those environments of greatest need

   Rationale: The environments that people live, work, learn and play in greatly influence their food intake. In order to best guide efforts to improve the food environment research will be needed to identify and evaluate best practices in order to direct available resources to scale up.

3. Identify, implement, accelerate and evaluate and scale up healthy food access programs that integrate seamlessly with federal nutrition assistance programs such as Supplemental Nutrition Assistance Program (SNAP), Women, Infants and Children (WIC), as well as elder nutrition.

   Rationale: Federal nutrition assistance programs reach individuals and populations with the greatest health disparities. Identifying and evaluating initiatives that integrate improvements in the food environment with federal programs will help insure that our federal nutrition assistance programs are as impactful as possible.

Search plan and results

Inclusion criteria

- Human subjects
- Subject populations from the United States
- Anyone over the age of two years
- Subjects who were healthy or at elevated chronic disease risk
- Randomized controlled trials (RCT), non-randomized controlled trials, prospective cohort studies, cross-sectional studies
- The intervention or exposure in the reviewed articles was food access (availability to food retail settings and affordability)
- The comparator in the reviewed articles was different levels of availability and affordability
- The outcome(s) was (were) dietary intake, dietary quality, dietary behaviors, dietary preferences or weight-related measures.
- In addition, articles were included if they were published in English in a peer-reviewed journal between January 2004 and January 2014. If an author was included on more than one primary research article contained that is similar in content, the paper with the most pertinent data/endpoints was included. If data/endpoints from both papers were appropriate, it was made clear that results were from the same intervention.

Exclusion criteria

- Animals and *in vitro* models
- Subject populations from countries other than the United States

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- Subjects who were hospitalized, diagnosed with disease or receiving medical treatment
- Systematic reviews, meta-analyses, literature reviews, editorials, commentaries, before-and-after studies, uncontrolled studies and case-control studies.
- Articles were excluded if they were not published in English, or were published before January 2004. Articles, abstracts and presentations not published in peer-reviewed journals (e.g., websites, magazine articles, Federal reports) also were excluded. Finally, if an author was included on more than one primary research article that was similar in content, the paper with the most pertinent data and endpoints was included and others were excluded.

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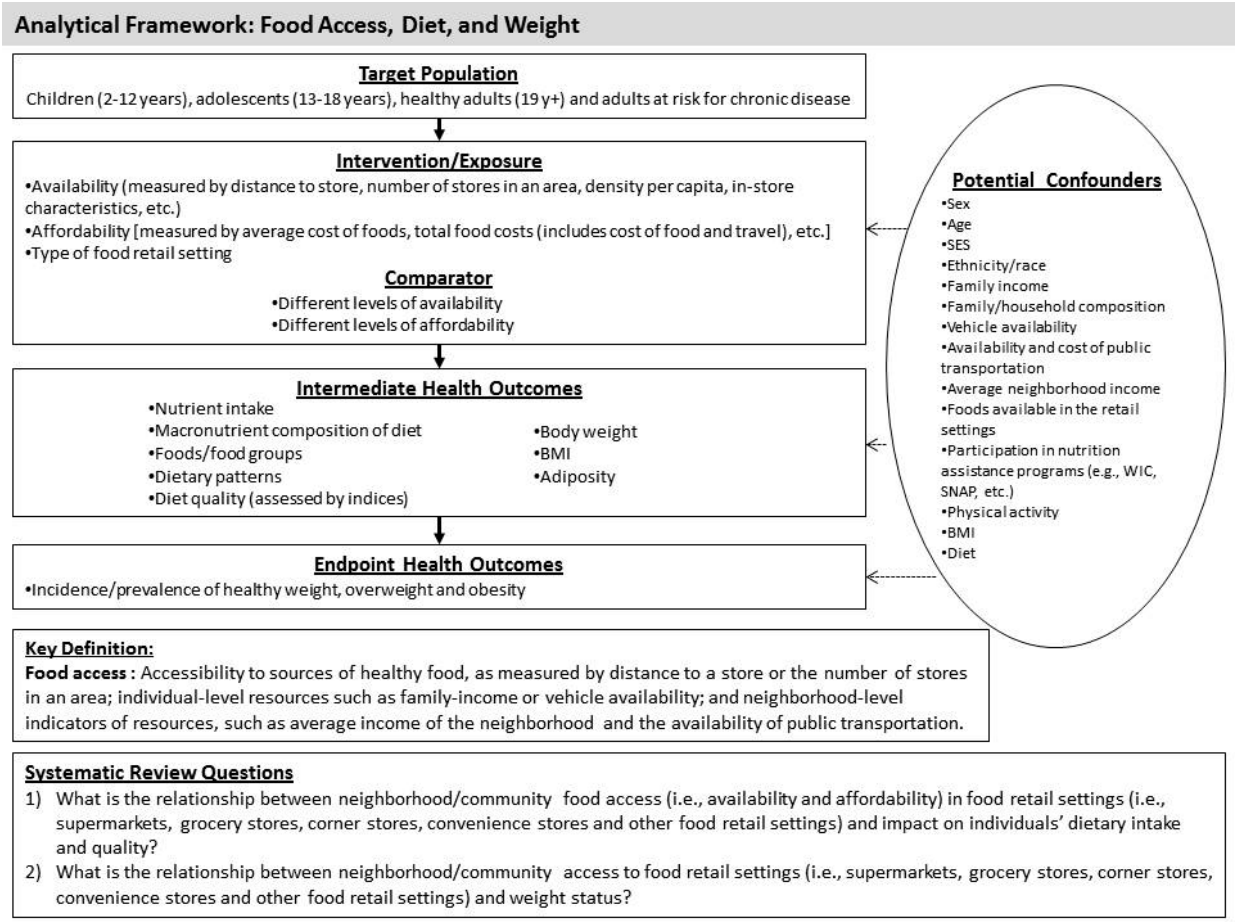
Analytic framework



Search terms and electronic databases used

- ***PubMed***
  - *Date(s) Searched: January 9, 2014*
  - *Search Terms:*

    (((((("food access"[tiab] OR Food/supply and distribution[Majr] OR supermarket[tiab] OR grocery store*[tiab] OR corner store*[tiab] OR convenience store*[tiab] OR food supply[majr] OR food store*[tiab] OR grocer*[tiab] OR "food retail"[tiab] OR "retail food"[ti] OR food mart*[tiab] OR food court*[tiab] OR food outlet*[tiab] OR food environment*[tiab] OR food desert*[tiab] OR food mirage*[tiab] OR "food insecurity"[tiab] OR "fast-food"[tiab] OR "fast food"[tiab] OR "food security"[tiab] OR restaurant*[tiab] OR farmers market*[tiab] OR food retailer*[tiab] OR food market*[tiab] OR "food availability"[tiab] OR food landscape*[tiab] OR "food affordability"[tiab] OR "grocery gap"[tiab] OR ((neighborhood[ti] OR community[ti]) AND (grocer*[ti] OR farmers market*[tiab] OR garden*[tiab])) OR ((fruit*[ti] OR vegetable*[ti]) AND (store*[ti] OR grocer*[ti] OR stores[ti] OR communit*[ti] OR neighborhood*[ti] OR neighbourhood*[ti]))OR food access*[ti] OR food availabil*[ti] OR food affordab*[ti]OR (availabil*[ti] AND food[ti]) OR (accessib*[ti] AND food[ti])*

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OR (affordab[ti] AND food[ti])))))*

AND

(((((("body size"[tiab] OR body size[mh] OR obesity[tiab] OR obese[tiab] OR obesity[majr] OR overweight [tiab] OR overnutrition[tiab] OR overnutrition[mh] OR adiposity[tiab] OR adiposity[majr] OR "body weight"[tiab] OR body weight[majr] OR "body-weight related"[tiab] OR "weight gain"[tiab] OR weight gain[mh] OR "weight loss"[tiab] OR Body Weights and Measures[Majr] OR overweight[tiab] OR "Body Composition"[majr] OR "body fat"[tiab] OR adipos[tiab] OR weight[ti] OR waist[ti] OR "Anthropometry"[Mesh:noexp] OR "body mass index"[tiab] OR BMI[tiab] OR "weight status"[tiab] OR adipose tissue [mh] OR "healthy weight"[tiab] OR waist circumference[mh] OR "body fat mass"[tiab] OR body weight changes[majr] OR "waist circumference"[tiab] OR "waist gain"[tiab] OR ideal body weight[mh]) OR*

(nutrition[tiab] OR diet[mh] OR diet[tiab] OR dietary[tiab] OR food preferences[mh] OR feeding behavior[mh] OR nutrition surveys[mh] OR food[tiab] OR nutritional status[mh] OR "Food and Beverages"[Mesh] OR "Eating"[Mesh] OR "Energy Intake"[Mesh] OR "caloric density"[tiab] OR "caloric intake"[tiab] OR caloric dens*[tiab] OR high calori*[tiab] OR energy dens*[tiab] OR beverage*[tiab] OR fruit*[tiab] OR vegetable*[tiab] OR food analysis[mh] OR dietary intake*[tiab] OR food intake*[tiab] OR food habits[mh] OR dietary habit*[tiab] OR diet habit*[tiab] OR eating habit*[tiab] OR nutrient intake*[tiab] OR food choice*[tiab] OR portion size*[tiab] OR "diet quality"[tiab] OR dietary choice*[tiab] OR dietary change*[tiab] OR diet records[mh] OR nutritional status[mh] OR nutritional sciences[mh] OR nutrition surveys[mh] OR dietary pattern*[tiab] OR diet pattern*[tiab] OR eating pattern*[tiab] OR food pattern*[tiab] OR eating habit*[tiab] OR dietary habit*[tiab] OR food habit*[tiab] OR dietary profile*[tiab] OR food profile*[tiab] OR diet profile*[tiab] OR eating profile*[tiab] OR dietary guideline*[tiab] OR dietary recommendation*[tiab] OR food intake pattern*[tiab] OR dietary intake pattern*[tiab] OR eating style*[tiab] OR (Macronutrient*[tiab] AND (Proportion*[tiab] OR composition[tiab] OR distribution*[tiab] OR percent*[tiab] OR diet composit*[tiab])) OR (dietary score* OR adequacy index* OR kidmed OR Food Score* OR Diet Score* OR MedDietScore OR Dietary Pattern Score* OR "healthy eating index") OR ((index*[ti] OR score*[ti] OR indexes OR scoring[ti] OR indices[ti]) AND (dietary[ti] OR nutrient*[ti] OR eating[tiab] OR food[ti] OR food[mh] OR diet[ti] OR diet[mh]) AND (pattern* OR habit* OR profile*)))*

- ***Cochrane***
  - *Date Searched: January 9, 2014*
  - *Search Terms:*

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'"food access" OR supermarket* OR grocer* OR "corner store*" OR "convenience store*" OR "food retail*" OR "food mart*" OR "food court" OR "food environment" OR "food outlet*" OR "food desert*" OR "food insecurity" OR "food availability" OR "farmers market*" OR garden* in Title, Abstract, Keywords and diet* OR weight* OR bmi OR "body mass" OR body-mass OR adipos* OR eating OR eat OR overweight OR obesity OR obese in Title, Abstract, Keywords*

- ***Embase***
  - *Date Searched: January 9, 2014*
  - *Search Terms:*

'food access':ab, ti OR supermarket:ab, ti OR 'food purchase':ab, ti OR 'food purchases':ab, ti OR grocer*:ab, ti OR 'fast food':ab, ti OR 'corner store':ab, ti OR 'corner stores':ab, ti OR 'convenience store':ab, ti OR 'convenience stores':ab, ti OR 'food store':ab, ti OR 'food stores':ab, ti OR 'food retail':ab, ti OR 'food mart':ab, ti OR 'food marts':ab, ti OR 'food court':ab, ti OR 'food outlet':ab, ti OR 'food outlets':ab, ti OR 'food environment':ab, ti OR 'food desert':ab, ti OR 'food deserts':ab, ti OR 'food mirage':ab, ti OR 'food mirages':ab, ti OR (food* NEAR/3 (accessibil* OR avail* OR desert OR deserts OR environment OR insecur*)):ti*

AND

('body size'/de OR 'obesity'/exp OR overweight:ab, ti OR adiposity:ab, ti OR 'body weight'/exp OR 'weight gain'/de OR 'weight reduction':ab, ti OR 'body composition'/exp OR 'body fat':ab, ti OR 'anthropometry'/de OR 'body mass'/de OR bmi:ab, ti OR weight:ab, ti OR 'waist circumference'/de OR 'waist circumference':ab, ti OR 'waist hip ratio'/de OR 'body fat'/de OR 'adipose tissue'/exp) OR

'nutrition'/de OR nutrition:ab, ti OR 'diet'/exp OR 'diet':ab, ti OR 'dietary intake'/exp OR 'caloric intake':ab, ti OR 'caloric density':ab, ti OR 'dietary intake':ab, ti OR 'feeding behavior'/exp OR 'eating habit'/de OR 'food preference'/de OR 'child nutrition'/de OR 'food intake'/exp OR 'nutritional assessment'/de OR 'nutritional status'/de OR 'nutrition surveys':ab, ti OR 'fruit'/exp OR 'vegetable'/exp OR 'food'/exp OR 'energy density':ab, ti OR 'dietary quality':ab, ti OR 'eating pattern':ab, ti OR 'food pattern':ab, ti OR 'dietary habit':ab, ti OR 'food habit':ab, ti OR 'food intake':ab, ti OR 'portion size'/de OR 'food choice':ab, ti OR 'diet quality':ab, ti OR 'dietary profile':ab, ti OR 'food profile':ab, ti OR 'diet profile':ab, ti OR 'eating profile':ab, ti OR 'food intake pattern':ab, ti OR 'dietary intake pattern':ab,

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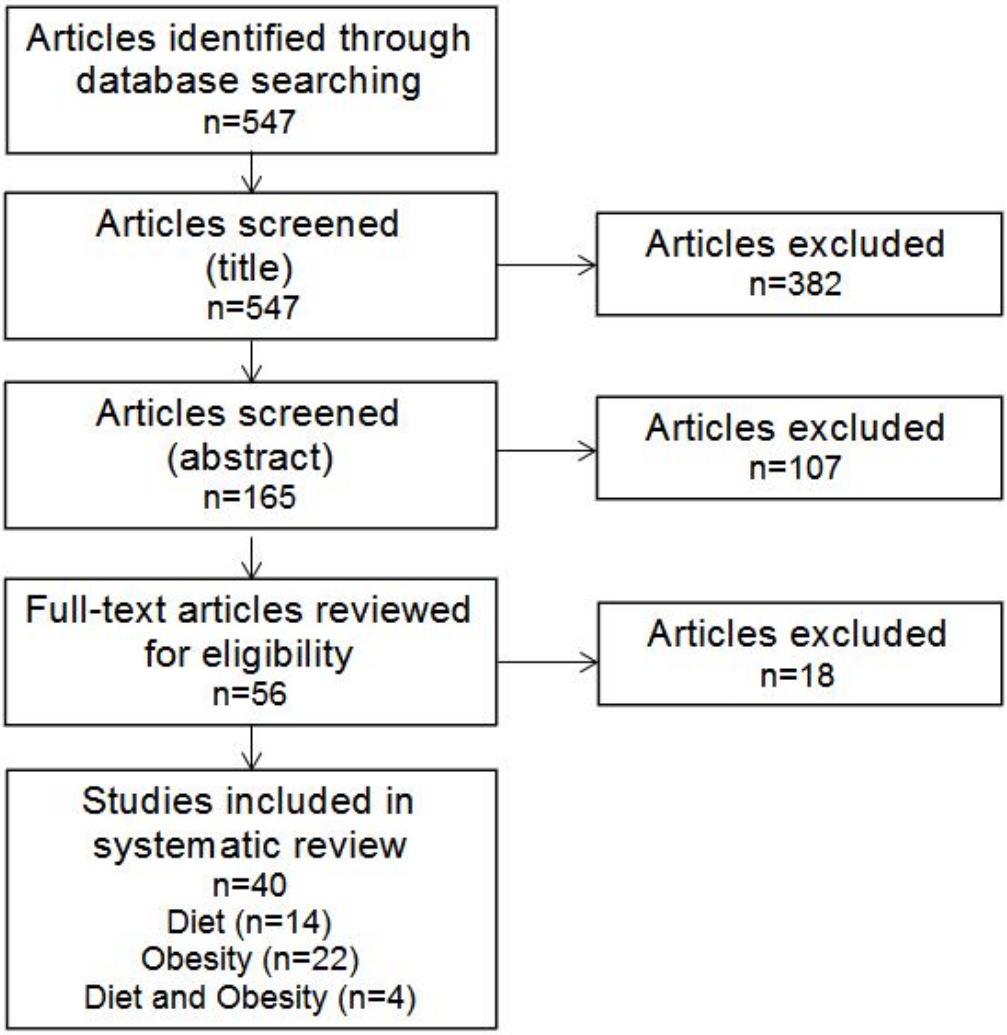
ti OR 'eating style':ab, ti OR 'macronutrient':ab, ti OR 'macronutrient'/de OR 'dietary score':ab, ti OR kidmed:ab, ti OR 'food score':ab, ti OR 'diet score':ab, ti OR 'meddietscore':ab, ti OR 'dietary pattern score':ab, ti OR 'healthy eating index':ab, ti OR (index:ab, ti OR score:ab, ti OR scoring:ab, ti OR indices:ab, ti AND (dietary:ab, ti OR nutrient:ab, ti OR eating:ab, ti OR food:ab, ti OR diet:ab, ti) AND (pattern:ab, ti OR habit:ab, ti OR profile:ab, ti))

Date range: January 2004 to January 2014

Summary of articles identified to review

- Total hits from all electronic database searches: 547
- Total articles identified to review from electronic databases: 165
- Articles identified via handsearch or other means: 0
- Number of Primary Articles Identified: 40
- Number of Review Articles Identified: 0
- Total Number of Articles Identified: 40
- Number of Articles Reviewed but Excluded: 125



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Excluded articles

See Appendix B for a full list of excluded articles with reason.

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CHAPTER 4. EARLY CARE AND EDUCATION

WHAT IS THE IMPACT OF OBESITY PREVENTION APPROACHES IN EARLY CARE AND EDUCATION PROGRAMS ON WEIGHT STATUS OF CHILDREN TWO YEARS TO FIVE YEARS OF AGE?

TECHNICAL ABSTRACT

Background

The goal of this systematic review was to determine the impact of obesity prevention approaches in early care and education programs on the weight status of children aged two years to five years. A variety of intervention strategies targeting behaviors that impact body weight were utilized across the body of evidence. Most approaches were multicomponent, with a combination of interventions targeting children, their parents and staff of early care and education programs.

Conclusion statement

Moderate evidence suggests that multicomponent obesity prevention approaches implemented in child care settings improve weight-related outcomes in preschoolers. A combination of dietary and physical activity interventions is effective for preventing or slowing excess weight gain and reducing the proportion of young children aged two years to five years who are overweight or obese.

2015 DGAC Grade: Moderate

Methods

Literature searches were conducted using PubMed, EMBASE and Cochrane databases to identify studies that evaluated the obesity prevention approaches in early care and education settings. Studies that met the following criteria were included in an original Nutrition Evidence Library (NEL) systematic review used to update the evidence base included in a systematic review conducted by Zhou, 2014: Randomized controlled trials (RCTs), non-randomized controlled trials and before-and-after studies; humans between the ages of two years and five years who were healthy or at elevated chronic disease risk; subjects from the United States; and published in English in peer-reviewed journals. The date range used to identify existing systematic reviews was January 2009 to February 2014. The date range used to update the evidence base with primary articles was January 2012 to March 2014. The intervention or exposure was an obesity prevention approach conducted in an early care and education setting. The outcomes were weight-related measures.

Data from each included article were extracted and risk of bias was assessed. The evidence was qualitatively synthesized, a conclusion statement was developed and the strength of the evidence (grade) was assessed using pre-established criteria including evaluation of the quality and risk of bias, quantity, consistency, magnitude of effect and generalizability of available evidence.

Findings

- This evidence portfolio included one existing systematic review (Zhou, 2014) and a *de novo* NEL systematic review to update the evidence base. The Zhou, 2014 review included 15 controlled trials published between 2000 and 2012; the NEL review included seven studies (eight publications) published between 2012 and 2014.

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- The studies used a variety of intervention strategies targeting behaviors which impact body weight. Most approaches were multicomponent, with a combination of interventions targeting children, their parents and staff of early care and education programs. The primary weight status outcomes of interest were body mass index (BMI) and BMI Z-score.
- In the body of evidence available, there is a large diversity in obesity prevention approaches, making comparison across studies challenging. Despite this variability, multicomponent interventions were effective in reducing BMI and preventing excess weight gain.
    - Seven of 10 multicomponent studies included in the Zhou, 2014 review demonstrated improvements in weight-related outcomes. Six of the seven interventions included in the NEL review demonstrated that multicomponent interventions effectively reduce BMI or prevent excess weight gain in children aged two to five years.

Limitations

The ability to draw strong conclusions was limited by the following issues:

- Differences in the populations sampled, outcome measures, duration or exposure of interventions
- Interventions of short duration and with a short follow-up period.

FULL REVIEW

Conclusion statement

Moderate evidence suggests that multicomponent obesity prevention approaches implemented in child care settings improve weight-related outcomes in preschoolers. A combination of dietary and physical activity interventions is effective for preventing or slowing excess weight gain and reducing the proportion of young children aged two years to five who are overweight or obese.

Grade

Moderate

Key findings

- This evidence portfolio included one existing systematic review from Zhou, 2014 and a *de novo* NEL systematic review updating the evidence base. The Zhou, 2014 review included 15 controlled trials published between 2000 and 2012; the NEL review included seven studies (eight publications) published between 2012 and 2014. Both reviews examined the impact of obesity prevention approaches on the weight status of children ages two years to five years.
- The studies used a variety of intervention strategies targeting behaviors that affect body weight. Most approaches were multicomponent, with a combination of interventions targeting children, their parents and staff of early care and education programs. The primary weight status outcomes of interest were BMI and BMI Z-score.
- The body of available evidence describes a large variation in excessive weight gain

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prevention approaches, making comparison across studies challenging. Despite this variability, multicomponent interventions were effective in reducing BMI and preventing excess weight gain. Seven of 10 multicomponent studies included in the Zhou, 2014 review demonstrated improvements in weight-related outcomes. Six of the seven interventions included in the NEL review demonstrated that multi-component interventions effectively reduce BMI or prevent excess weight gain in children ages two years to five years.

- The evidence base included several studies of strong design by independent investigators, specifically controlled trials, with sufficient sample sizes. Some inconsistency was evident across studies and may be explained by differences in the populations sampled, outcome measures, duration or exposure of intervention and follow-up periods. Although the majority of the studies included in the evidence portfolio effectively reduced BMI or prevented excess weight gain, the magnitude of the effect as well as the clinical and public health significance was difficult to assess because of the differences in measures and methodology.

Evidence summary

Description of the Evidence

The Zhou, 2014 review includes 15 controlled studies; five were conducted in the United States, three in Israel, two in Germany and one each in France, Scotland, Australia, Switzerland and China.

The NEL review includes seven studies. Five were cluster randomized trials; one study was a before-and-after study; and another was a non-controlled trial. Four of the studies were conducted in the United States (Alkon, 2014; Herman, 2012; Natale, 2014; Yin, 2012) and one each in Columbia (Cespedes, 2013a; Cespedes, 2013b), Belgium (De Coen, 2012) and Germany (De Bock, 2012). The risk of bias scores ranged from six to 16 points out of 26.

Sample size of these studies ranged from 112 to 1,102 participants; five studies had 100 to 500 (Alkon, 2014; De Bock, 2012; Herman, 2012; Natale, 2014; Yin, 2012), one study had 500- to 1,000 (Cespedes, 2013a; Cespedes, 2013b) and one study had more than 1,000 participants (De Coen, 2012).

Population

All studies included in the Zhou, 2014 review examined the impact of various obesity prevention approaches on the weight status of children aged two to six years in child care. Thirteen of the studies included dietary components; 12 included physical activity components; 10 included both nutrition and physical activity components.
All studies included in the NEL review examined the impact of various obesity prevention approaches on the weight status of children aged two to five years. When reported, mean age ranged from 3.7 years to 4.3 years. Six of the studies included both nutrition and physical activity components; one study only targeted dietary behaviors (De Bock, 2012). Information related to socioeconomic status (SES) was reported in all studies. Most child care centers served lower income neighborhoods. Race/ethnicity was reported for the four studies completed in the United States and the child care centers served diverse audiences (**refer to Overview Table 1 and 2 for study-specific details**).

Exposures

A variety of intervention strategies targeting behaviors that impact body weight were utilized

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across the body of evidence. Most approaches were multicomponent, with a combination of interventions targeting children, their parents and staff of early care and education programs. Modes of education varied across studies and included informational workshops, hands-on activities, health fairs and cooking demonstrations. Education topics related to healthy eating and physical activity. Common messages were to increase fruit, vegetable, and water intake; decrease intake of sugar-sweetened beverages, sweets and snacks; increase the amount of time being active; and decrease amount of time being sedentary and watching television.

Outcomes

Weight outcomes reported in the Zhou, 2014 review include body mass index (BMI), BMI percentile, body fat percentage and waist circumference. The weight status outcomes addressed in the NEL review were based on measured height and weight for all seven studies. Some studies also calculated BMI and determined BMI percentile and BMI Z-scores being age-specific and gender-specific Centers for Disease Control and Prevention (CDC) growth charts for children.

Evidence Synthesis

Despite the variability in obesity prevention approaches, multicomponent interventions were effective in reducing BMI and preventing excess weight gain. Seven of 15 studies included in the Zhou, 2014 review demonstrated improvements in weight-related outcomes; all of these studies included multicomponent interventions. Six of these studies completed follow-up at or after nine months; one study completed follow-up at four months. Of the eight studies that saw no effect on weight-related outcomes, five targeted only diet or physical activity. Two of the three multicomponent interventions that did not impact weight status were of short duration (i.e., 14 weeks); the other intervention had variable follow up (i.e., 12 to 20 months for Sample One and three to nine months for Sample Two).

Six of the seven interventions included in the NEL review demonstrated that multicomponent interventions effectively reduce BMI or prevent excess weight gain in children aged two years to five years. The one study that did not see an impact of weight status targeted only dietary behaviors, which significantly improved (i.e., fruit and vegetable intake increased).

Overview Tables 1 and 2: Examining the relationship between early care and education programs and weight status

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Question: What is the impact of obesity prevention approaches in early care and education programs on weight status of children two to five years of age?

Overview Tables: Relationship Between Early Care and Education Programs and Weight Status

Table 1. Summary of systematic review examining the relationship between early care and education programs and weight status (page 1)

Author, Year AMSTAR Score* Number of Included Studies	Purpose of Review Subject Population Location of Included Studies	Independent Variable Outcomes	Results
Zhou, 2013 **AMSTAR score: 9/11** **15 controlled trials:** • **13 with dietary components** o **12 cluster randomized trials** o **1 cluster controlled trial** • **12 cluster randomized trials with physical activity components**	Reviewed controlled trials of obesity prevention interventions in childcare settings Pre-school children, age 2-6y at baseline **Location:** 5 studies in US 3 studies in Israel 2 studies in Germany 1 study in France 1 study in Scotland 1 study in Australia 1 study in Switzerland 1 study in China	**Independent variables:** Education or games that addressed nutrition, physical activity, sedentary behaviors; aerobic activity; fresh fruit and vegetable snacks and non-sugared beverages; parental education via take-home materials, internet sessions, or workshops; childcare faculty/staff training. **Outcomes:** Weight status (overweight, obese), adiposity, BMI z-score.	**Weight-Related Outcomes** **7 studies saw improvements:** • All included both nutrition and physical activity components • 6 completed follow-up at or after 9mo. **8 studies did not see an effect:** • 5 included only nutrition or physical activity components, not both • 3 included both nutrition and physical activity components yet did not see improvements in weight-related outcomes: o 2 of short duration (i.e., 14wks) o *1 with variable follow-up:* 12-20mo for sample 1 (N=1,340), 3-9mo for sample 2 (N=1,318). **Interventions including only nutrition or physical activity components achieved significant improvements in behaviors related to their target:** • 6 of the 13 interventions with dietary components reported improved intake or eating behaviors • 8 of the 12 interventions with physical activity components reported improved activity levels or fitness.

Question: What is the impact of obesity prevention approaches in early care and education programs on weight status of children two to five years of age?

Overview Tables: Relationship Between Early Care and Education Programs and Weight Status

*Quality assessed by Assessment of Multiple Systematic Reviews (Shea, 2007. Development of AMSTAR: a measurement tool to assess the methodological quality of systematic reviews.)

Question: What is the impact of obesity prevention approaches in early care and education programs on weight status of children two to five years of age?

Overview Tables: Relationship Between Early Care and Education Programs and Weight Status

Table 2. Summary of primary studies examining the relationship between early care and education programs and weight status (pages 3-9)

Author, Year Study Design Location Risk of Bias*	Sample Size Age Gender Race/Ethnicity SES	Description of Intervention	Results
Alkon, 2014 **Cluster randomized trial** **US** **Risk of bias: 6/26**	N=211 3.9y; 3-5y 45.7% female White 45.5%, African American 16.4%, Hispanic/Latino 17.1%, Asian 14.0%, Other 6.9% **Parent education:** Less than high school (34.1%), high school or more (65.9%) **Government subsidies:** Receive any subsidies (49.8%), food stamps (15.9%), WIC (19.6%), Medicaid (23.2%), child support (8.2%), Temporary Assistance for Needy Families (2.5%), Housing (4.5%), Other (7.8%) **Family poverty:** <100% of federal poverty guidelines (28.4%), 100-200% (32.3%), >200% (39.3%)	**Intervention:** Child care health consultants provided five 1-hr workshops on childhood obesity, healthy eating and physical activity for young children, personal health and wellness and working with families to promote healthy behaviors to child care center child care providers and staff; centers received pre-study and monthly on-site consultations for updating center nutrition and wellness policies and parents at 7 of 9 centers received a "Raising Healthy Kids" workshop. **Control:** Delayed intervention.	**Change in BMI z-score** **Intervention vs. control:** *Individual-level:* β=-0.14 (SE=0.06, 95% CI: -0.26, -0.02; P=0.02) *Center-level:* β=-0.26 (SE=0.1, 95% CI: -0.47, -0.04; P=0.02) *Non-significant (NS):* Within group change in BMI z-score; prevalence of underweight, healthy weight, overweight or obese.

Question: What is the impact of obesity prevention approaches in early care and education programs on weight status of children two to five years of age?

Overview Tables: Relationship Between Early Care and Education Programs and Weight Status

Author, Year Study Design Location Risk of Bias*	Sample Size Age Gender Race/Ethnicity SES	Description of Intervention	Results
Cespedes, 2013a **Cluster randomized trial** **Colombia** **Risk of bias: 8/26**	N=578 3.72y (SD=0.69); 3-5y 47.0% female **Race/ethnicity:** Not reported **SES status of preschool neighborhood, low (1) to high (6):** 1-2 (58.5%), 3-4 (41.5%)	**Intervention:** Focused on healthy eating and physical activity in 3 areas (body and heart, nutrition and physical activity), children received 1hr/d interactive classroom educational activities, a 1-hr "healthy family day" workshop and weekly health notes; parents received 3 nutrition/activity workshops and weekly nutrition/activity newsletters; teachers received three 2-hr group training sessions, 4hr/month personalized training and a teacher's guide. **Control:** Delayed intervention implemented over the 8mo, after the initial 5-mo study ended.	**BMI at 6mo and 18mo:** *Intervention vs. control, Model 1:* NS **Weight status at 6mo and 18mo:** *Intervention vs. control, Model 1:* NS
Cespedes, 2013b **Non-controlled trial** **Colombia** **Risk of bias: 6/26**	N=540 3.72y (SD=0.69); 3-5y 47.0% female **Race/ethnicity:** Not reported **SES status of preschool neighborhood, low (1) to high (6):** 1-2 (58.5%), 3-4 (41.5%)	**Intervention:** Focused on healthy eating and physical activity in 3 areas (body and heart, nutrition and physical activity); children received 1hr/d interactive classroom educational activities, a 1-hr "healthy family day" workshop and weekly health notes; parents received 3 nutrition/activity workshops and weekly nutrition/activity newsletters; teachers received three 2-hr group training sessions, 4hr/mo personalized training and a teacher's guide. **Delayed-intervention:** "Similar" to intervention, implemented over the 8mo after the initial 5-mo RCT ended.	**Prevalence of underweight:** *Baseline vs. 36mo, Model 1:* 15.48% vs. 3.33%, P≤0.001 **Prevalence of normal-weight:** *Baseline vs. 36mo, Model 1:* 62.11% vs. 75.00%, P≤0.001 **NS:** Prevalence of underweight and normal-weight, baseline vs. 18mo; prevalence of overweight and obese, baseline vs. 18mo and vs. 36mo
DeBock, 2012 **Cluster randomized trial**	N=348 4.3y (SD=0.78); 3-6y 46.8% female	15 standardized, 2-h nutrition sessions, conducted once weekly over a 6-mo period, 5 sessions actively involving parents by targeting them alone (discussions on parents modeling role and nutritional needs of children) or together	**NS:** BMI, waist-to-hip ratio, total body fat

Question: What is the impact of obesity prevention approaches in early care and education programs on weight status of children two to five years of age?

Overview Tables: Relationship Between Early Care and Education Programs and Weight Status

Author, Year Study Design Location Risk of Bias*	Sample Size Age Gender Race/Ethnicity SES	Description of Intervention	Results
Germany **Risk of bias: 7/26**	**Race/ethnicity**: Not reported **Maternal education (defined by International Standard Classification of Education levels):** *Low (level 1, 2, 3):* 16.3%, *middle (level 4):* 55.7%, *high (level 5, 6):* 21.2%, missing: 6.6%	with their children; activities consisted of familiarizing with different foods and preparation methods and cooking and eating meals together.	
DeCoen, 2012 **Cluster randomized trial** **Belgium** **Risk of bias: 16/26**	N=1,102 4.95y (SD=1.31); 3-6y 50% female **Race/ethnicity:** Not reported **Community-level SES:** 33% low, 33% medium, 33% high **School-level SES:** 52% low, 29% medium, 19% high **Individual-level SES:** 48% low, 26% medium, 26% high	**Intervention:** Goals included increasing water, milk, fruit and vegetable intake, decreasing soda and savory snack intake and increasing physical activity. **Community:** Organizations and non-profits were approached to support intervention and provide publicity; yearly brochures/posters were distributed. **School:** Received 7 manuals each describing objectives and implementation strategies for separate intervention components (i.e., school and classroom implementation, diet and physical activity policy changes, educational strategies for parents), were requested to implement ≥5hr/year of classroom time and activities devoted to intervention components, received support from regional health boards, teachers received 3 meetings/year to discuss implementation and troubleshoot. **Parents:** Received a poster, 5 mailed letters, personalized advice on their child's eating habits	**Mean BMI z-score** Low-SES intervention vs. low-SES control Post-intervention=0.00 (SD=1.11) vs. 0.16 (SD=0.88), P≤0.01. **NS:** BMI z-score, intervention vs. control for total sample and within medium-SES and high-SES groups.

Question: What is the impact of obesity prevention approaches in early care and education programs on weight status of children two to five years of age?

Overview Tables: Relationship Between Early Care and Education Programs and Weight Status

Author, Year Study Design Location Risk of Bias*	Sample Size Age Gender Race/Ethnicity SES	Description of Intervention	Results
		based off of FFQ, access to website describing intervention topics. **Control:** NR	
Herman, 2012 **Before-after study** **US** **Risk of bias: 2/26**	N=412 adults; not reported for children **Staff:** 40.1y (SD=12.7); **Parents:** 33.9y (SD=11.2); **Children:** 3-5y **Staff:** 96% female; **Parents:** 84.3% female; **Children:** NR **Staff:** White (56%), Hispanic/Latino (17.5%), African-American (14.3%), Asian/Pacific Islander (1.4%), Native American (3.6%), Other (2.4%); **Parents:** White (33.3%), Hispanic/Latino (32.4%), African-American (14.8%), Asian/Pacific Islander (1%), Native American (9%), Other (2.5%); **Children:** Not reported **Staff** **Education:** Less than high school (1.4%), high school graduates or GED (15%), associate degree (17%), Bachelor's degree (65%); Unknown (1.6%) **Employment:** Full time (4%), part time (91%), unemployed (0%), missing data (5%)	Low-health literacy training program for obesity prevention ("Eat Healthy, Stay Active") included materials on MyPyramid, food groups, portion control, shopping on a budget and integrating physical activity into daily life; Staff, parents and children were trained using the same curriculum; Head Start staff were trained using 3 webinars over a 6-mo intervention period and provided with technical assistance; Staff members were trained first and then conducted parent education sessions on evenings and weekends during the initial 3 months; Parents were exposed to a minimum of 6hr of activities; Classroom lessons for the children were aligned by topic with the parent lessons and conducted concurrently; Children were exposed to a minimum of 1 activity per day.	**Mean BMI** **Overall:** Baseline=30.1 (SD=7.3), Follow-up=29.2 (SD=6.8), Pre/post difference=-0.9 (95% CI: -1.1, -0.8; P≤0.001) **Staff:** Baseline=29.5 (SD=7.4), Follow-up=28.7 (SD=6.7), Pre/post difference=-0.8 (95% CI: -1.0, -0.6; P≤0.001) **Parents:** Baseline=31.2 (SD=7.1), Follow-up=30.1 (SD=6.7), Pre/post difference=-1.2 (95% CI: -1.4, -0.9; P≤0.001) **Children:** Baseline=17.0 (SD=2.4), Follow-up=16.6 (SD=2.2), Pre/post difference=-0.4 (95% CI: -0.6, -0.2; P≤0.001). **% Obese** **Overall:** Baseline=45.1, Follow-up=39.8, Pre/post difference=-5.3 (P≤0.001) **Staff:** Baseline=41.4, Follow-up=36.8, Pre/post difference=-4.6 (P≤0.001) **Parents:** Baseline=51.7, Follow-up=45.0,

Question: What is the impact of obesity prevention approaches in early care and education programs on weight status of children two to five years of age?

Overview Tables: Relationship Between Early Care and Education Programs and Weight Status

Author, Year Study Design Location Risk of Bias*	Sample Size Age Gender Race/Ethnicity SES	Description of Intervention	Results
	Parents **Education:** Less than high school (16.2%), high school graduates or GED (40.4%), associate degree (7.3%), Bachelor's degree (35.2%); Unknown (0.9%) **Employment:** Full time (17%), part time (29%), unemployed (47%), missing data (7%).		Pre/post difference=-6.7 (P≤0.001) **Children:** Baseline=30.4, Follow-up=20.5, Pre/post difference =-9.9 (P≤0.001). **Effect on weight change** **Obese at baseline:** OR=-7.66 (95% CI: -9.11, -6.21; P≤0.001); Male (vs. female), OR=-3.70 (95% CI: -6.71, -0.68; P=0.03) **Diet behaviors:** OR=-13.19 (95% CI: -18.43, -7.96; P=0.002) **NS:** Age, parent vs. staff, race/ethnicity, education, employment, change in knowledge, physical activity
Natale, 2014 **Cluster randomized trial** **US** **Risk of bias: 13/26**	N=239 (6mo); 185 (12mo) 3.9y; 2-5y 49% female **Intervention** **Race:** Non-Hispanic White (33.6%), Non-Hispanic Black (33.6%), Asian (0.4%), Other (18.5%), Unknown (13.9%) **Ethnicity:** Hispanic/other (35.7%), Hispanic/Cuban (24%), Hispanic/Puerto Rican (3.8%), Hispanic/Mexican (2.1%),	Intervention used multidimensional approach with a teacher-based component, family-based component and environmental changes vs a visit from an injury prevention educational mobile at the control center **Teachers:** Two trainings on rationale, implementation and lesson plans for the Healthy Inside-Healthy Outside (HI-HO) program; weekly technical assistance to ensure implementation of a low-fat, high fiber diet including more fruits and vegetables **Parents:** Monthly educational dinners where nutrition and physical activity were discussed;	**BMI percentile baseline vs. 12 months** **Total sample:** 97% of normal-weight children remained normal-weight, 4% overweight to normal-weight, N=2 obese to overweight. **NS:** Change in weight z-score or BMI z-score, intervention vs. control from 0mo to 3mo, 6mo and 12mo; association between BMI z-score at baseline, 6mo or 12mo and parent attendance, parent perception of helpfulness, newsletters read by parents, parent perception of newsletter helpfulness, at-home activities

Question: What is the impact of obesity prevention approaches in early care and education programs on weight status of children two to five years of age?

Overview Tables: Relationship Between Early Care and Education Programs and Weight Status

Author, Year Study Design Location Risk of Bias*	Sample Size Age Gender Race/Ethnicity SES	Description of Intervention	Results
	African American (19.3%), Haitian (1.3%), Other Caribbean Black (2.5%), Caucasian (0.8%), Other (4.2%), Unknown (6.3%) **Control** **Race:** Non-Hispanic White (33.3%), Non-Hispanic Black (42.0%), Asian (0%), Other (15.9%), Unknown (8.7%) **Ethnicity:** Hispanic/other (20.3%), Hispanic/Cuban (27.5%), Hispanic/Puerto Rican (1.5%), Hispanic/Mexican (1.4%), African American (30.4%), Haitian (7.5%), Other Caribbean Black (0%), Caucasian (4.4%), Other (1.5%), Unknown (5.8%) **Centers served low-income children; County high-school graduation rate:** 45%	monthly newsletters; recommendations for in-home activities **Centers:** Received assistance in developing policies to increase physical activity and healthy eating assistance of a nutritionist to develop USDA-compliant menus; drink policy (water is primary beverage, juice and sweetened beverages available 1x per week, change milk from whole to 1%); snack policy (substitute healthy snacks, like fruits and vegetables, for less healthy snacks, like cookies and high-fat snack) and physical activity policy (increase to >1hr/d, decrease TV viewing to <60min 2x per week).	completed, parent perception of at-home activities helpfulness.
Yin, 2012 **Non-randomized controlled trial** **US** **Risk of bias: 8/26**	N=338 4.1y (SD=0.6); 3-5y 52% female **Hispanic:** 90% Centers located in "economically disadvantaged neighborhoods"	**Center-based intervention**: Centers received gross motor skills development program including recommendations to provide ≥60min/d physical activity and materials for developing gross motor skills, supplemental classroom materials/activities including audiovisual/print materials for 9 healthy eating and physical activity modules based on the Sesame Street Workshop Healthy Habits for Life resource kit and food-tasting activities; center staff received a 6-hr pre-intervention training and 4hr of follow-up trainings focused on intervention	**Mean difference in weight z-score change:** *Center- and home-based intervention vs. control, Model 2:* -0.06; P<0.04 **Mean difference in weight and BMI z-score change:** *Center- and home-based intervention vs. control, Model 2:* NS **NS:** Mean difference in weight, weight z-score, BMI z-score, center-based intervention vs. control.

Question: What is the impact of obesity prevention approaches in early care and education programs on weight status of children two to five years of age?

Overview Tables: Relationship Between Early Care and Education Programs and Weight Status

Author, Year Study Design Location Risk of Bias*	Sample Size Age Gender Race/Ethnicity SES	Description of Intervention	Results
		implementation and developing healthy literacy and teaching skills, health education newsletters, and access to a voluntary wellness program (>75% participation in all wellness program components); parents received 8 newsletters about intervention activities and tips for supporting healthy habits at home. **Center- and home-based intervention**: Included all components of the center-based intervention plus parents received 6 optional peer educator-led educational poster sessions providing information on obesity, physical activity and healthy eating (80% participation) and take-home materials including healthy snacks and intervention-related in-home activities. **Control**: Post-study training and materials relating to intervention.	

*Risk of bias as determined using the Nutrition Evidence Library Bias Assessment Tool

Assessment of the Body of Evidence

The evidence base includes several studies of strong design by independent investigators, specifically controlled studies within the Zhou, 2014 review and randomized trials in the NEL review. Sample sizes for the studies were sufficient, ranging from 112 to 1,102. Some inconsistency is evident across studies and may be explained by differences in the populations sampled, outcome measures and duration or exposure of interventions. Specifically, obesity prevention approaches with an intervention of short duration, a short follow up period and limited strategies may be limited in their ability to achieve sufficient intervention exposure and lack the time needed to detect changes in weight-related outcomes beyond any intermediate behavioral changes. Of the 22 intervention studies, the combined total of studies included in the Zhou review and NEL review, 13 effectively reduced BMI or prevented excess weight gain. The magnitude of the effect as well as the clinical and public health significance is difficult to assess because of different measures and methodology.

Implications

Existing evidence indicates that multicomponent interventions that incorporate both nutrition and physical activity are effective in reducing excessive weight gain in preschool children. Successful strategies include curricular enhancements of classroom education for children on both nutrition education and physical activity, outreach engagement to parents about making positive changes in the home, improvements in the nutrition quality of meals and snacks served in the child care program, modifying food service practices, improving the mealtime environment, increasing physical activity play, reducing sedentary behaviors and improving outdoor playground environments. Evidenced-based healthy eating and physical activity practices should be implemented in child care settings with training and technical assistance for staff. At the Federal, state and local levels, policies are needed that create strong nutrition and physical activity standards and guidelines in child care settings. There is a need to strengthen policies at the federal, state, and local levels for strong nutrition and physical activity standards and guidelines in child care settings.

It is important that child care facilities provide meals and snacks that are consistent with the meal patterns in the Federal Child and Adult Care Food Program (CACFP) to ensure that young children have access to healthy meals and snacks at age-appropriate portions. Drinking water also needs to be readily available and accessible to children. Government agencies should ensure access to affordable, nutritious foods through CACFP and maximize participation in the program.

Research recommendations

1. Conduct additional obesity prevention intervention research in child care settings (e.g., child-care centers, family child-care homes) to: 1) Identify the most potent components of the interventions and the optimal combinations for improving diet quality, physical activity and weight outcomes; 2) Assess implementation and translation costs and benefits of the intervention, including impact, cost-effectiveness, generalizability and reach, sustainability and feasibility; 3) Develop and evaluate culturally appropriate and tailored interventions for preschool children in low-income and racial/ethnic communities, given the disproportionate impact of obesity in these groups; 4) Explore intervention strategies on how to use child care settings as access points to create linkages to parents, caretakers and health care providers as partners in health promotion; 5) Evaluate the impact of federal, state and local policies, regulations and support (e.g., provider training and technical assistance) for child care programs on the eating and physical activity practices and behaviors, and weight status of young children.

   Rationale: Early care and education settings are an important venue for interventions targeting young children. A strong evidence base is essential to identify and support

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evidence-based practices and policies that can be implemented at federal, state and local levels and to mobilize efforts to improve healthy eating and physical activity, leading to healthy weight development in these settings. Interventions found to effectively reduce risk of obesity in one setting need to be appropriately adapted for diverse groups and different settings.

2. Improve intervention research methods by the use of stronger study designs and the development of standardized assessments of body composition, weight status. Develop enhanced validated measures of diet quality, feeding and physical activity practices, and physical activity and eating behaviors and policies. Create standardized measures to assess the nutrition quality of meals and snacks in child care settings, as well as the food and physical activity environments. Create standardized methods for assessing the relationship of child care food, nutrition and physical activity-related measures to similar measures representing non-child-care time are needed to provide greater consistency in determining the contributors to the development and progression of childhood overweight and obesity.

   Rationale: Although many of the studies included in these evidence reviews were methodologically strong and were controlled studies, some were limited by small sample size, lack of adequate control for confounding factors and different outcome measures and different tools used to measure the outcome variables.

3. Examine the effect of the recommended CACFP through ongoing periodic evaluations and fill gaps in the knowledge regarding participation, demand, food procurement and practices, nutrient intake and food security.

   Rationale: Improvements in school meals and the school food environment have been fostered by national data from periodic studies such as the USDA/FNS School Nutrition Dietary Assessment Studies (SNDA), the Health and Human Services (HHS)/CDC School Health Policies and Practices Studies (SHPPS) and the HHS/NIH C.L.A.S.S. In contrast, considerably fewer periodic national studies are conducted of meals and dietary intake in child care settings and their relation to the child care food and physical activity environment.

Search plan and results

Inclusion criteria

- Human subjects
- Subject populations from the United States
- Children between the ages of two years and five years old
- Subjects who were healthy or at elevated chronic disease risk
- Randomized controlled trials (RCTs), non-randomized controlled trials, and before-and-after studies
- The intervention or exposure in the reviewed articles was an early care and education program, policy or practice targeting weight status
- The comparator in the reviewed articles was different levels of intervention, different types of intervention or no intervention/policy (a control group)
- The outcomes were weight-related measures.

In addition, articles were included if they were published in English in a peer-reviewed journal between January 2012 and March 2014. If an author was included on more than one primary research article similar in content, the paper with the most pertinent data and endpoints was included. If data and endpoints from both papers were appropriate, it was made clear that results were from the same intervention.

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Exclusion criteria

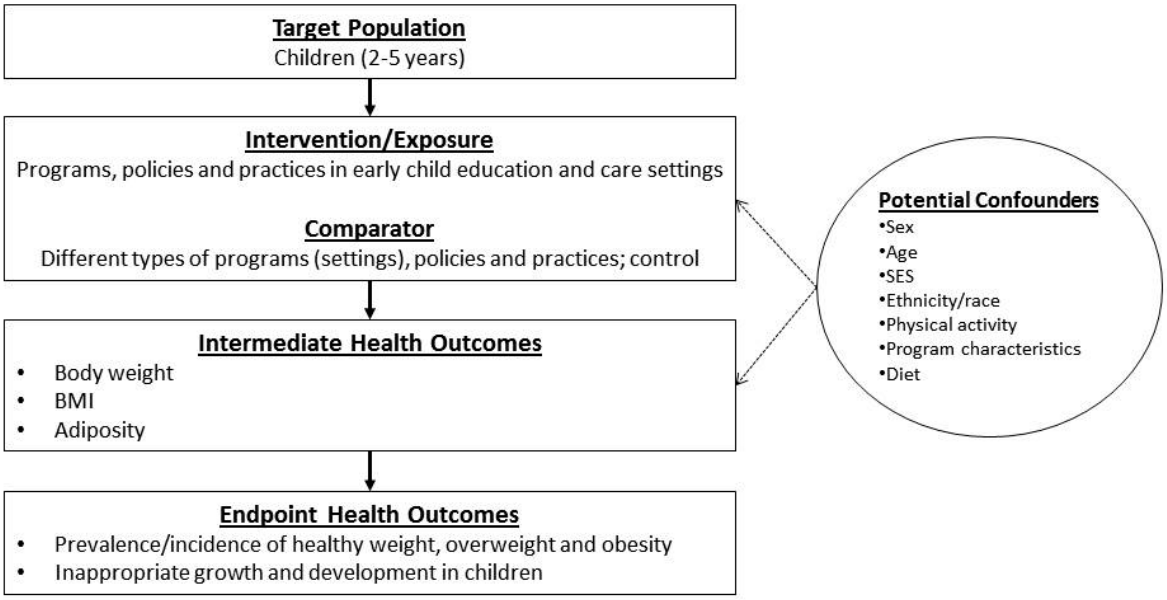
- Animals and *in vitro* models
- Subject populations from countries with medium or low human development, according to the Human Development Index [1]
- Adults
- Subjects who were hospitalized, diagnosed with disease and receiving medical treatment
- Systematic reviews, meta-analyses, literature reviews, editorials, commentaries and case-control studies.

Articles were excluded if they were not published in English, or were published before January 2012. Articles, abstracts and presentations not published in peer-reviewed journals (e.g., websites, magazine articles, Federal reports) were also excluded. Finally, if an author was included on more than one primary research article that was similar in content, the paper with the most pertinent data and endpoints was included, and others were excluded.

[1] United Nations Development Programme. Human Development Report 2013, The Rise of the South: Human Progress in a Diverse World 2013. Available from: http://hdr.undp.org/sites/default/files/reports/14/hdr2013_en_complete.pdf.

Analytic framework

Analytical Framework:
What is the impact of obesity prevention approaches in early care and education programs on the weight status of children two to five years of age?



Key Definition
Child-care settings: Locations that include child-care centers and child-care provided in homes. Early childhood education settings, such as preschool and Head Start programs, also are included.

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Search terms and electronic databases used

- ***PubMed***
  - *Date(s) Searched: March 26, 2014*
  - *Search Terms:*

    child, preschool[mh] OR preschool[tiab] OR pre-school*[tiab] OR child day care centers[mh] OR "early childhood"[tiab] OR pre-k[tiab] OR pre-primary[tiab] OR "preschool children"[tiab] OR "preschool child"[tiab] OR schools, nursery[mh] OR "nursery school"[tiab] OR kindergarten*[tiab] OR "child care"[ti] OR childcare center*[tiab] OR "Child Care"[Mesh] OR childcare[ti] OR "child day care"[ti] OR under five*[ti] OR young child*[ti] OR "head start"[tiab] OR WIC[ti] OR prekindergarten[tiab] OR pre-kindergarten[tiab] OR limit to child, preschool in PubMED*

    Child nutrition sciences[mh] OR child nutritional physiological phenomena[mh:noexp] OR nutrition[tiab] OR diet[mh] OR diet[tiab] OR dietary[tiab] OR food preferences[mh] OR feeding behavior[mh:noexp] OR nutrition surveys[mh] OR food[tiab] OR Food and Beverages[mh] OR eating behavior*[tiab] OR eating behaviour*[tiab] OR meals[ti] OR meal[ti] OR breakfast[tiab] OR lunch[tiab] OR dinner[tiab] OR snacks[tiab] OR snack[tiab] OR caloric intake*[tiab] OR caloric dens*[tiab] OR high calori*[tiab] OR energy dens*[tiab] OR fruit*[tiab] OR vegetable*[tiab] OR dietary intake*[tiab] OR food intake*[tiab] OR energy intake*[tiab] OR food habits[mh] OR dietary habit*[tiab] OR diet habit*[tiab] OR eating habit*[tiab] OR nutrient intake*[tiab] OR food choice*[tiab] OR portion size*[tiab] OR "diet quality"[tiab] OR dietary choice*[tiab] OR dietary change*[tiab] OR diet records[mh] OR nutritional status[mh] OR nutritional sciences[mh:noexp] OR dietetics[mh] OR dietary pattern*[tiab] OR diet pattern*[tiab] OR eating pattern*[tiab] OR food pattern*[tiab] OR eating habit*[tiab] OR food habit*[tiab] OR dietary profile*[tiab] OR food profile*[tiab] OR diet profile*[tiab] OR eating profile*[tiab] OR dietary guideline*[tiab] OR dietary recommendation*[tiab] OR food intake pattern*[tiab] OR dietary intake pattern*[tiab] OR eating style*[tiab]) AND (physical fitness[mh] OR motor activity[mh] OR exercise*[ti] OR exercise[mh]OR fitness[ti] OR "Play and Playthings"[Mesh] OR "Recreation"[Mesh]*

    body weight[mh] OR child development[mh] OR weight[tiab] OR growth[tiab] OR growth[mh:noexp] OR "body size"[tiab] OR "body height"[tiab] OR "Body Height"[Mesh] OR "body weight"[ti] OR "weight gain"[ti] OR weight gain[mh] OR "weight loss"[tiab] OR Body Weights and Measures[Majr] OR obesity[tiab] OR obese[tiab] OR obesity[mh] OR overweight [tiab] OR overnutrition[tiab] OR adiposity[tiab] OR adiposity[mh] OR overweight[tiab] OR "Body Composition"[mh] OR "body fat"[tiab] OR adipos[tiab] OR weight[ti] OR "Anthropometry"[Mesh:noexp] OR "body mass index"[tiab] OR BMI[tiab] OR "weight status"[tiab] OR adipose tissue [mh] OR "healthy weight"[tiab] OR waist circumference[mh] OR "body fat mass"[tiab] OR body weight*

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changes[mh] OR "waist circumference"[tiab] OR ideal body weight[mh]

Limiters: ("Study Characteristics" [Publication Type] OR "clinical trial"[ptyp] OR "Epidemiologic Studies"[Mesh] OR "Support of Research"[ptyp] OR cohort[ti] OR prospective[ti] OR cross-sectional[ti] OR random[tiab] OR trial[tiab] OR study[tiab]) NOT (editorial[ptyp] OR comment[ptyp] OR news[ptyp] OR letter[ptyp] OR review[ptyp] OR systematic[sb])*

- ***Embase***
  - *Date(s) Searched: March 20, 2014*
  - *Search Terms:*

    'preschool child'/exp/mj OR preschool:ab, ti OR preschooler:ab, ti OR 'pre-schooler':ab, ti OR 'pre-school':ab, ti OR preschools:ab, ti OR 'day care'/mj OR 'day care':ab, ti OR 'early childhood':ab, ti OR 'early childhood intervention'/de OR 'pre-k':ab, ti OR 'pre-primary':ab, ti OR 'preschool children':ab, ti OR 'preschool child':ab, ti OR 'nursery school':ab, ti OR 'nursery school'/de OR kindergarten*:ab, ti OR 'kindergarten'/de OR 'child care':ti OR 'child care'/mj OR childcare:ti OR 'under five':ti OR 'young children':ti OR 'young child':ab, ti OR [preschool]/lim OR limit to child, preschool in PubMED*

    'nutrition education'/mj OR 'child nutrition'/mj OR 'nutritional science'/mj OR nutrition:ab, ti OR 'nutrition'/exp/mj OR diet:ti OR dietary:ti OR 'food preferences':ab, ti OR 'food preference':ti OR 'feeding behavior':ab, ti OR food:ti OR eating:ab, ti OR 'eating habit':ab, ti OR 'eating behavior':ab, ti OR 'eating behaviour':ab, ti OR 'eating behaviors':ti OR meals:ti OR meal:ti OR breakfast:ab, ti OR lunch:ab, ti OR dinner:ab, ti OR snacks:ab, ti OR snack:ab, ti OR 'caloric density':ab, ti OR 'caloric intake':ab, ti OR 'calorie dense':ab, ti OR 'high calorie':ab, ti OR 'energy dense':ab, ti OR fruit*:ab, ti OR vegetable*:ab, ti OR 'dietary intake':ab, ti OR 'food intake':ab, ti OR 'energy intake':ab, ti OR 'diet habits':ab, ti OR 'eating habits':ab, ti OR 'nutrient intake':ab, ti OR 'nutrient intakes':ab, ti OR 'food choice':ab, ti OR 'food choices':ab, ti OR 'portion size':ab, ti OR 'portion sizes':ab, ti OR 'diet quality':ab, ti OR 'dietary choice':ab, ti OR 'dietary choices':ab, ti OR 'dietary change':ab, ti OR 'nutritional status':ti OR 'dietary pattern':ab, ti OR 'dietary patterns':ab, ti OR 'diet pattern':ab, ti OR 'diet patterns':ab, ti OR 'eating pattern':ab, ti OR 'eating patterns':ab, ti OR 'food pattern':ab, ti OR 'food patterns':ab, ti OR 'food habit':ab, ti OR 'food habits':ab, ti OR 'dietary profile':ab, ti OR 'food profile':ab, ti OR 'diet profile':ab, ti OR 'eating profile':ab, ti OR 'eating profiles':ti OR 'dietary guideline':ab, ti OR 'dietary recommendation':ab, ti OR 'food intake pattern':ab, ti OR 'food intake patterns':ab, ti OR 'dietary intake pattern':ab, ti OR 'dietary intake patterns':ab, ti OR 'eating style':ab, ti OR 'eating styles':ab, ti OR (macronutrient*:ab, ti AND (proportion*:ab, ti OR composition:ab, ti OR distribution*:ab, ti OR percent*:ab, ti OR 'diet composition':ab, ti)) OR 'dietary score':ab, ti OR 'adequacy index':ab, ti OR kidmed:ab, ti OR 'food score':ab, ti OR 'diet*

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score':ab, ti OR meddietscore:ab, ti OR 'dietary pattern score':ab, ti OR 'healthy eating index':ab, ti AND 'fitness'/mj OR exercis:ti OR 'exercise'/mj OR 'physical fitness':ti, ab OR 'recreation'/exp OR play:ti, ab OR 'physical activity'/exp*

'body weight'/exp/mj OR 'child development'/de OR 'child development':ab, ti OR 'weight'/mj OR 'weight height ratio'/mj OR 'body mass':ab, ti OR 'body mass'/de OR weight:ab, ti OR growth:ab, ti OR 'growth'/de OR 'body growth'/exp OR 'anthropometric parameters'/exp OR 'physical development'/de OR 'body size':ab, ti OR 'body height':ab, ti OR 'body height'/de OR 'body weight':ti OR 'weight gain':ab, ti OR 'weight loss':ab, ti OR obesity:ab, ti OR obese:ab, ti OR 'overnutrition'/de OR adiposity:ab, ti OR overweight:ab, ti OR 'body composition'/mj OR 'body fat':ab, ti OR adipos:ab, ti OR weight:ti OR 'body mass index':ab, ti OR bmi:ab, ti OR 'weight status':ab, ti OR 'healthy weight':ab, ti OR 'body fat mass':ab, ti OR 'weight change':ab, ti OR 'waist circumference':ab, ti*

Limiters: *'cohort analysis'/de OR cohort:ab, ti OR 'cross-sectional study'/de OR 'cross-sectional':ab, ti OR longitudinal:ab, ti OR observational:ab, ti OR prospective:ab, ti OR 'comparative study'/de OR 'randomized controlled trial'/exp OR 'crossover procedure'/exp OR [controlled clinical trial]/lim OR [randomized controlled trial]/lim OR 'placebo'/de OR 'clinical trial'/exp OR 'clinical trial (topic)'/exp OR 'controlled study'/exp OR 'controlled study':ab OR random*:ab, ti OR trial*:ab, ti OR ((singl* OR doubl* OR trebl* OR tripl*) NEAR/3 (blind* OR mask*)):ab, ti*

Date range: January 2012 and March 2014

Summary of articles identified to review

- Total hits from all electronic database searches: 1056
- Total articles identified to review from electronic databases: 364
- Articles identified via handsearch or other means: 0
- Number of Primary Articles Identified: 8
- Number of Review Articles Identified: 0
- Total Number of Articles Identified: 8
- Number of Articles Reviewed but Excluded: 356

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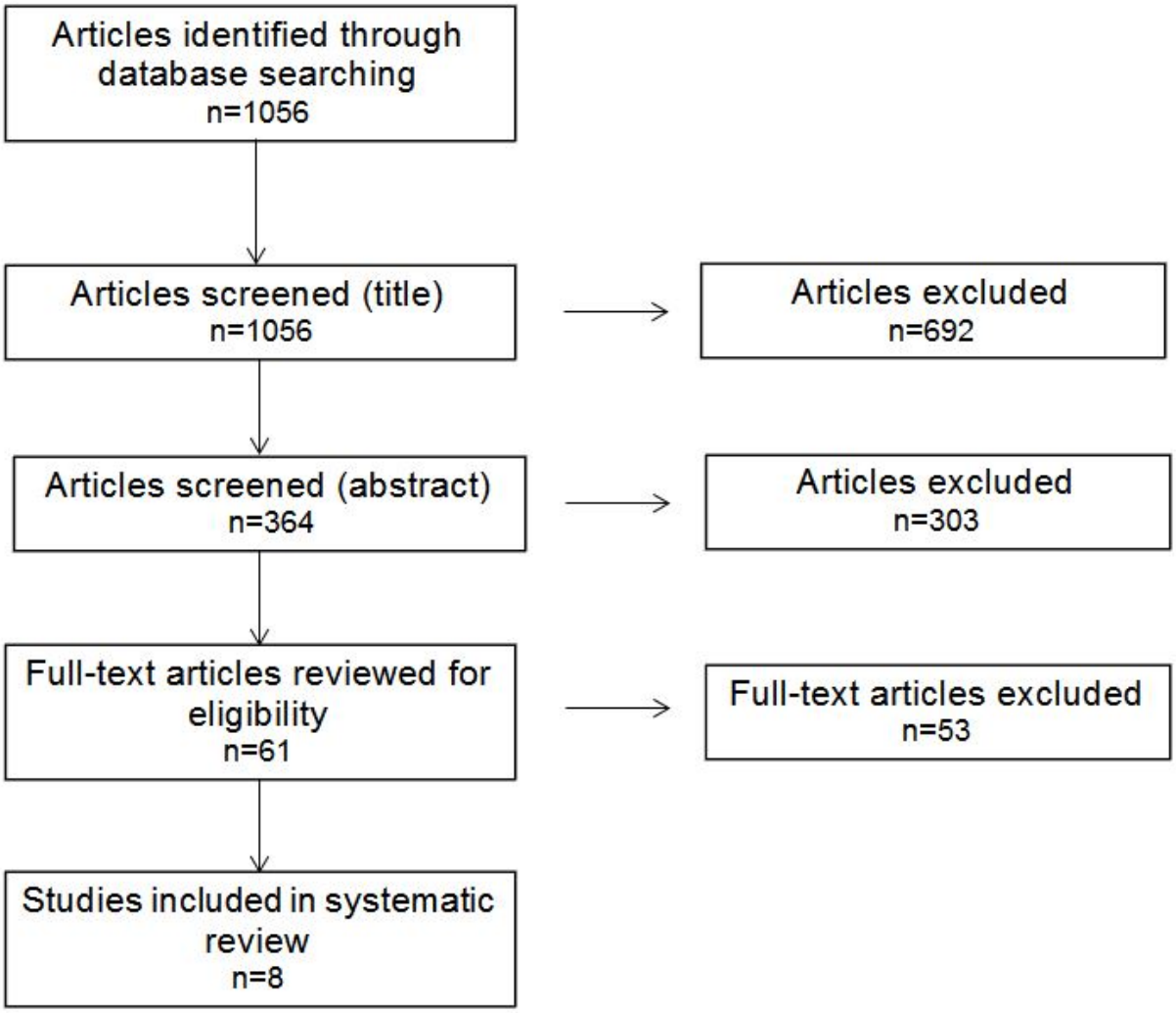

Included articles (References)

1. Alkon A, Crowley AA, Neelon SE, Hill S, Pan Y, Nguyen V, Rose R, Savage E, Forestieri N, Shipman L, Kotch JB. Nutrition and physical activity randomized control trial in child care centers improves knowledge, policies, and children's body mass index. *BMC Public Health.* 2014;14(1):215. PMID:24580983. http://www.ncbi.nlm.nih.gov/pubmed/24580983
2. Cespedes J, Briceno G, Farkouh ME, Vedanthan R, Baxter J, Leal M, Boffetta P, Woodward M, Hunn M, Dennis R, Fuster V. Targeting preschool children to promote cardiovascular health: cluster randomized trial. *Am J Med.* 2013;126(1):27-35.e3. PMID:23062403. http://www.ncbi.nlm.nih.gov/pubmed/23062403
3. Cespedes J, Briceno G, Farkouh ME, Vedanthan R, Baxter J, Leal M, Boffetta P, Hunn M, Dennis R, Fuster V. Promotion of cardiovascular health in preschool children: 36-month cohort follow-up. *Am J Med.* 2013;126(12):1122-6. PMID:24262725. http://www.ncbi.nlm.nih.gov/pubmed/24262725
4. De Bock F, Breitenstein L, Fischer JE. Positive impact of a pre-school-based nutritional intervention on children's fruit and vegetable intake: results of a cluster-randomized trial. *Public Health Nutr.* 2012;15(3):466-75. PMID:21859516. http://www.ncbi.nlm.nih.gov/pubmed/21859516

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5. De Coen V, De Bourdeaudhuij I, Vereecken C, Verbestel V, Haerens L, Huybrechts I, Van Lippevelde W, Maes L. Effects of a 2-year healthy eating and physical activity intervention for 3-6-year-olds in communities of high and low socio-economic status: the POP (Prevention of Overweight among Pre-school and school children) project. *Public Health Nutr.* 2012;15(9):1737-45. PMID:22397833. http://www.ncbi.nlm.nih.gov/pubmed/22397833
6. Herman A, Nelson BB, Teutsch C, Chung PJ. "Eat Healthy, Stay Active!": a coordinated intervention to improve nutrition and physical activity among Head Start parents, staff, and children. *Am J Health Promot.* 2012;27(1):e27-36. PMID:22950932. http://www.ncbi.nlm.nih.gov/pubmed/22950932
7. Natale RA, Lopez-Mitnik G, Uhlhorn SB, Asfour L, Messiah SE. Effect of a Child Care Center-Based Obesity Prevention Program on Body Mass Index and Nutrition Practices Among Preschool-Aged Children. *Health Promot Pract.* 2014; Epub (ahead of print). PMID:24662896. http://www.ncbi.nlm.nih.gov/pubmed/24662896
8. Yin Z, Parra-Medina D, Cordova A, He M, Trummer V, Sosa E, Gallion KJ, Sintes-Yallen A, Huang Y, Wu X, Acosta D, Kibbe D, Ramirez A. Miranos! Look at us, we are healthy! An environmental approach to early childhood obesity prevention. *Child Obes.* 2012;8(5):429-39. PMID:23061498. http://www.ncbi.nlm.nih.gov/pubmed/23061498

Excluded articles

See Appendix C for a full list of excluded articles with reason.

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APPENDIX A. FOOD ACCESS – DIETARY INTAKE

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Excluded Articles: Food Access

The table below lists the excluded articles with at least one reason for exclusion, but may not reflect all possible reasons.

	Excluded Citations	Reason for Exclusion
1	Alves L, Silva S, Severo M, Costa D, Pina MF, Barros H, et al. Association between neighborhood deprivation and fruits and vegetables consumption and leisure-time physical activity: a cross-sectional multilevel analysis. BMC Public Health. 2013;13:1103. PMID: 24289151.	Location
2	An R. Effectiveness of subsidies in promoting healthy food purchases and consumption: a review of field experiments. Public Health Nutr. 2012;16:1215-28. PMID: 23122423.	Study design, Location
3	Angelo HD, Suratkar S, Song HJ, Stauffer E, Gittelsohn J. Access to food source and food source use are associated with healthy and unhealthy food-purchasing behaviours among low-income African-American adults in Baltimore City. Public Health Nutr. 2011;14:1632-9. PMID: 21450140.	Outcome
4	Auchincloss AH, Mujahid MS, Shen M, Michos ED, Whitt-Glover MC, Roux AVD. Neighborhood health-promoting resources and obesity risk (the multi-ethnic study of atherosclerosis). Obesity (Silver Spring). 2013;21:621-8. PMID: 23592671.	Independent Variable
5	Bader MD, Schwartz-Soicher O, Jack D, Weiss CC, Richards CA, Quinn JW, et al. More neighborhood retail associated with lower obesity among New York City public high school students. Health Place. 2013;23:104-10. PMID: 23827943.	Independent Variable
6	Ball K, McNaughton SA, Mhurchu CN, Andrianopoulos N, Inglis V, McNeilly B, et al. Supermarket Healthy Eating for Life (SHELf): protocol of a randomised controlled trial promoting healthy food and beverage consumption through price reduction and skill-building strategies. BMC Public Health. 2011;11:715. PMID: 21936957.	Location, Independent Variable
7	Ball K, Thornton L. Food environments: measuring, mapping, monitoring and modifying. Public Health Nutr. 2013;16:1147-50. PMID: 23714417.	Study design
8	Bezerra IN, Curioni C, Sichieri R. Association between eating out of home and body weight. Nutr Rev. 2012;70:65-79. PMID: 22300594.	Study design
9	Bhargava A, Jolliffe D, Howard LL. Socio-economic, behavioural and environmental factors predicted body weights and household food insecurity scores in the Early Childhood Longitudinal Study-Kindergarten. Br J Nutr. 2008;100:438-44. PMID: 18275621.	Independent Variable
10	Black C, Moon G, Baird J. Dietary inequalities: What is the evidence for the effect of the neighbourhood food environment? Health Place. 2013. PMID: 24200470.	Study design
11	Boehmer TK, Lovegreen SL, Haire-Joshu D, Brownson RC. What constitutes an obesogenic environment in rural communities? Am J Health Promot. 2006;20:411-21. PMID: 16871821.	Independent Variable
12	Bower KM, Thorpe RJ, Rohde C, Gaskin DJ. The intersection of neighborhood racial segregation, poverty, and urbanicity and its impact on food store availability in the United States. Prev Med. 2013;58:33-9. PMID: 24161713.	Outcome

Excluded Articles: Food Access

The table below lists the excluded articles with at least one reason for exclusion, but may not reflect all possible reasons.

	Excluded Citations	Reason for Exclusion
13	Breyer B, Voss-Andreae A. Food mirages: Geographic and economic barriers to healthful food access in Portland, Oregon. Health Place. 2013;24:131-9. PMID: 24100236.	Independent Variable, Outcome
14	Budzynska K, West P, Savoy-Moore RT, Lindsey D, Winter M, Newby PK. A food desert in Detroit: associations with food shopping and eating behaviours, dietary intakes and obesity. Public Health Nutr. 2013;16:2114-23. PMID: 23651835.	Independent Variable
15	Burgoine T, Alvanides S, Lake AA. Creating 'obesogenic realities'; do our methodological choices make a difference when measuring the food environment? Int J Health Geogr. 2013;12:33. PMID: 23816238.	Location
16	Burgoine T, Lake AA, Stamp E, Alvanides S, Mathers JC, Adamson AJ. Changing foodscapes 1980-2000, using the ASH30 Study. Appetite. 2009;53:157-65. PMID: 19467279.	Location
17	Bustillos B, Sharkey JR, Anding J, McIntosh A. Availability of more healthful food alternatives in traditional, convenience, and nontraditional types of food stores in two rural Texas counties. J Am Diet Assoc. 2009;109:883-9. PMID: 19394475.	Independent Variable, Outcome
18	Campbell MK, McLerran D, Turner-McGrievy G, Feng Z, Havas S, Sorensen G, et al. Mediation of adult fruit and vegetable consumption in the National 5 A Day for Better Health community studies. Ann Behav Med. 2008;35:49-60. PMID: 18347904.	Independent Variable
19	Chaix B, Bean K, Daniel M, Zenk SN, Kestens Y, Charreire H, et al. Associations of supermarket characteristics with weight status and body fat: a multilevel analysis of individuals within supermarkets (RECORD study). PLoS One. 2012;7:e32908. PMID: 22496738.	Location
20	Christiansen KM, Qureshi F, Schaible A, Park S, Gittelsohn J. Environmental Factors That Impact the Eating Behaviors of Low-income African American Adolescents in Baltimore City. J Nutr Educ Behav. 2013;45:652-60. PMID: 23916684.	Outcome
21	Cole K, McNees M, Kinney K, Fisher K, Krieger JW. Increasing access to farmers markets for beneficiaries of nutrition assistance: evaluation of the farmers market access project. Prev Chronic Dis. 2013;10:E168. PMID: 24135392.	Independent Variable, Outcome
22	Crawford DA, Ball K, Cleland VJ, Campbell KJ, Timperio AF, Abbott G, et al. Home and neighbourhood correlates of BMI among children living in socioeconomically disadvantaged neighbourhoods. Br J Nutr. 2011;107:1028-36. PMID: 21824445.	Location
23	Cullen KW, Smalling AL, Thompson D, Watson KB, Reed D, Konzelmann K. Creating healthful home food environments: results of a study with participants in the expanded food and nutrition education program. J Nutr Educ Behav. 2009;41:380-8. PMID: 19879493.	Independent Variable
24	Cutler GJ, Flood A, Hannan P, Neumark-Sztainer D. Multiple sociodemographic and socioenvironmental	Independent Variable

Excluded Articles: Food Access

The table below lists the excluded articles with at least one reason for exclusion, but may not reflect all possible reasons.

	Excluded Citations	Reason for Exclusion
	characteristics are correlated with major patterns of dietary intake in adolescents. J Am Diet Assoc. 2011;111:230-40. PMID: 21272697.	
25	Dammann KW, Smith C. Food-related environmental, behavioral, and personal factors associated with body mass index among urban, low-income African-American, American Indian, and Caucasian women. Am J Health Promot. 2011;25:e1-e10. PMID: 21721954.	Independent Variable
26	Deierlein AL, Morland KB, Scanlin K, Wong S, Spark A. Diet Quality of Urban Older Adults Age 60 to 99 Years: The Cardiovascular Health of Seniors and Built Environment Study. J Acad Nutr Diet. 2013. PMID: 24262516.	Independent Variable
27	DeLong AJ, Larson NI, Story M, Neumark-Sztainer D, Weber-Main AM, Ireland M. Factors associated with overweight among urban American Indian adolescents: findings from Project EAT. Ethn Dis. 2008;18:317-23. PMID: 18785446.	Independent Variable
28	Dressler H, Smith C. Environmental, personal, and behavioral factors are related to body mass index in a group of multi-ethnic, low-income women. J Acad Nutr Diet. 2013;113:1662-8. PMID: 24119531.	Independent Variable
29	Dressler H, Smith C. Health and eating behavior differs between lean/normal and overweight/obese low-income women living in food-insecure environments. Am J Health Promot. 2013;27:358-65. PMID: 23398131.	Independent Variable
30	Drewnowski A, Moudon AV, Jiao J, Aggarwal A, Charreire H, Chaix B. Food environment and socioeconomic status influence obesity rates in Seattle and in Paris. Int J Obes (Lond). 2013. PMID: 23736365.	Study design, Location
31	Dubowitz T, Ghosh-Dastidar MB, Steiner E, Escarce JJ, Collins RL. Are our actions aligned with our evidence? The skinny on changing the landscape of obesity. Obesity (Silver Spring). 2013;21:419-20. PMID: 23592652.	Study design
32	Dubowitz T, Subramanian SV, Acevedo-Garcia D, Osypuk TL, Peterson KE. Individual and neighborhood differences in diet among low-income foreign and U.S.-born women. Womens Health Issues. 2008;18:181-90. PMID: 18222706.	Independent Variable
33	Eagle TF, Sheetz A, Gurm R, Woodward AC, Kline-Rogers E, Leibowitz R, et al. Understanding childhood obesity in America: linkages between household income, community resources, and children's behaviors. Am Heart J. 2012;163:836-43. PMID: 22607862.	Independent Variable
34	Erinosho TO, Oh AY, Moser RP, Davis KL, Nebeling LC, Yaroch AL. Association between perceived food environment and self-efficacy for fruit and vegetable consumption among US adults, 2007. Prev Chronic Dis. 2011;9:E10. PMID: 22172177.	Independent Variable
35	Frank L, Kerr J, Rosenberg D, King A. Healthy aging and where you live: community design relationships with physical activity and body weight in older Americans. J Phys Act Health. 2010;7 Suppl 1:S82-90. PMID: 20440017.	Independent Variable, Outcome
36	Franklin B, Jones A, Love D, Puckett S, Macklin J, White-Means S. Exploring mediators of food insecurity and	Study design

Excluded Articles: Food Access

The table below lists the excluded articles with at least one reason for exclusion, but may not reflect all possible reasons.

	Excluded Citations	Reason for Exclusion
	obesity: a review of recent literature. J Community Health. 2011;37:253-64. PMID: 21644024.	
37	Gary-Webb TL, Baptiste-Roberts K, Pham L, Wesche-Thobaben J, Patricio J, Pi-Sunyer FX, et al. Neighborhood and weight-related health behaviors in the Look AHEAD (Action for Health in Diabetes) study. BMC Public Health. 2010;10:312. PMID: 20525373.	Independent Variable, Unhealthy Subjects
38	Gittelsohn J, Kim EM, He S, Pardilla M. A food store-based environmental intervention is associated with reduced BMI and improved psychosocial factors and food-related behaviors on the Navajo nation. J Nutr. 2013;143:1494-500. PMID: 23864511.	Independent Variable
39	Gooding HC, Walls CE, Richmond TK. Food insecurity and increased BMI in young adult women. Obesity (Silver Spring). 2011;20:1896-901. PMID: 21779092.	Independent Variable
40	Gorin AA, Raynor HA, Niemeier HM, Wing RR. Home grocery delivery improves the household food environments of behavioral weight loss participants: results of an 8-week pilot study. Int J Behav Nutr Phys Act. 2007;4:58. PMID: 18001469.	Independent Variable
41	Gose M, Plachta-Danielzik S, Willie B, Johannsen M, Landsberg B, Muller MJ. Longitudinal influences of neighbourhood built and social environment on children's weight status. Int J Environ Res Public Health. 2013;10:5083-96. PMID: 24132135.	Location
42	Grigsby-Toussaint DS, Zenk SN, Odoms-Young A, Ruggiero L, Moise I. Availability of commonly consumed and culturally specific fruits and vegetables in African-american and Latino neighborhoods. J Am Diet Assoc. 2010;110:746-52. PMID: 20430136.	Independent Variable, Outcome
43	Grossman M, Tekin E, Wada R. Food prices and body fatness among youths. Econ Hum Biol. 2013. PMID: 24246131.	Independent Variable
44	Gustafson A, Hankins S, Jilcott S. Measures of the consumer food store environment: a systematic review of the evidence 2000-2011. J Community Health. 2011;37:897-911. PMID: 22160660.	Study design
45	Gustafson AA, Lewis S, Wilson C, Jilcott-Pitts S. Validation of food store environment secondary data source and the role of neighborhood deprivation in Appalachia, Kentucky. BMC Public Health. 2012;12:688. PMID: 22914100.	Outcome
46	Hardin-Fanning F. Adherence to a Mediterranean diet in a rural Appalachian food desert. Rural Remote Health. 2013;13:2293. PMID: 23331293.	Independent Variable
47	He M, Tucker P, Irwin JD, Gilliland J, Larsen K, Hess P. Obesogenic neighbourhoods: the impact of neighbourhood restaurants and convenience stores on adolescents' food consumption behaviours. Public Health Nutr. 2012;15:2331-9. PMID: 22390896.	Location
48	Heller MC, Keoleian GA, Willett WC. Toward a Life Cycle-Based, Diet-level Framework for Food Environmental	Study design

Excluded Articles: Food Access

The table below lists the excluded articles with at least one reason for exclusion, but may not reflect all possible reasons.

	Excluded Citations	Reason for Exclusion
	Impact and Nutritional Quality Assessment: A Critical Review. Environ Sci Technol. 2013;47:12632-47. PMID: 24152032.	
49	Hendershot W, Turmel P. Is food grown in urban gardens safe? Integr Environ Assess Manag. 2007;3:463-4. PMID: 17695120.	Location, Independent Variable, Outcome
50	Hollywood LE, Cuskelly GJ, Brien MO, McConnon A, Barnett J, Raats MM, et al. Healthful grocery shopping. Perceptions and barriers. Appetite. 2013;70:119-26. PMID: 23831013.	Independent Variable
51	Holsten JE, Compher CW. Children's food store, restaurant, and home food environments and their relationship with body mass index: a pilot study. Ecol Food Nutr. 2012;51:58-78. PMID: 22292712.	Independent Variable
52	Holsten JE. Obesity and the community food environment: a systematic review. Public Health Nutr. 2008;12:397-405. PMID: 18477414.	Study design
53	Iacovou M, Pattieson DC, Truby H, Palermo C. Social health and nutrition impacts of community kitchens: a systematic review. Public Health Nutr. 2012;16:535-43. PMID: 22647382.	Study design
54	Inagami S, Cohen DA, Brown AF, Asch SM. Body mass index, neighborhood fast food and restaurant concentration, and car ownership. J Urban Health. 2009;86:683-95. PMID: 19533365.	Independent Variable
55	Izumi BT, Zenk SN, Schulz AJ, Mentz GB, Wilson C. Associations between neighborhood availability and individual consumption of dark-green and orange vegetables among ethnically diverse adults in Detroit. J Am Diet Assoc. 2011;111:274-9. PMID: 21272702.	Independent Variable, Outcome
56	Jago R, Baranowski T, Baranowski JC. Fruit and vegetable availability: a micro environmental mediating variable? Public Health Nutr. 2007;10:681-9. PMID: 17381953.	Study design
57	Jennings A, Welch A, Jones AP, Harrison F, Bentham G, Sluijs EMv, et al. Local food outlets, weight status, and dietary intake: associations in children aged 9-10 years. Am J Prev Med. 2011;40:405-10. PMID: 21406273.	Location
58	Jones-Smith JC, Karter AJ, Warton EM, Kelly M, Kersten E, Moffet HH, et al. Obesity and the food environment: income and ethnicity differences among people with diabetes: the Diabetes Study of Northern California (DISTANCE). Diabetes Care. 2013;36:2697-705. PMID: 23637355.	Unhealthy Subjects
59	Laraia BA, Siega-Riz AM, Kaufman JS, Jones SJ. Proximity of supermarkets is positively associated with diet quality index for pregnancy. Prev Med. 2004;39:869-75. PMID: 15475018.	Unhealthy Subjects
60	Larson C, Haushalter A, Buck T, Campbell D, Henderson T, Schlundt D. Development of a community-sensitive strategy to increase availability of fresh fruits and vegetables in Nashville's urban food deserts, 2010-2012. Prev Chronic Dis. 2013;10:E125. PMID: 23886044.	Independent Variable
61	Larson N, Laska MN, Story M, Neumark-Sztainer D. Predictors of fruit and vegetable intake in young adulthood. J Acad Nutr Diet. 2012;112:1216-22. PMID: 22698924.	Independent Variable

Excluded Articles: Food Access

The table below lists the excluded articles with at least one reason for exclusion, but may not reflect all possible reasons.

	Excluded Citations	Reason for Exclusion
62	Lear SA, Gasevic D, Schuurman N. Association of supermarket characteristics with the body mass index of their shoppers. Nutr J. 2013;12:117. PMID: 23941309.	Location
63	Lee RE, Heinrich KM, Medina AV, Regan GR, Reese-Smith JY, Jokura Y, et al. A picture of the healthful food environment in two diverse urban cities. Environ Health Insights. 2010;4:49-60. PMID: 20706621.	Independent Variable
64	Li F, Harmer PA, Cardinal BJ, Bosworth M, Acock A, Johnson-Shelton D, et al. Built environment, adiposity, and physical activity in adults aged 50-75. Am J Prev Med. 2008;35:38-46. PMID: 18541175.	Independent Variable
65	Liese AD, Bell BA, Barnes TL, Colabianchi N, Hibbert JD, Blake CE, et al. Environmental influences on fruit and vegetable intake: results from a path analytic model. Public Health Nutr. 2013:1-10. PMID: 24192274.	Study design, Independent Variable
66	Lopez-Class M, Hosler AS. Assessment of community food resources: A Latino neighborhood study in upstate New York. J Poverty. 2010;14:369-81. PMID: 22065468.	Outcome
67	Lovasi GS, Hutson MA, Guerra M, Neckerman KM. Built environments and obesity in disadvantaged populations. Epidemiol Rev. 2009;31:7-20. PMID: 19589839.	Study design
68	Maas J, Ridder DTd, Vet Ed, Wit JBd. Do distant foods decrease intake? The effect of food accessibility on consumption. Psychol Health. 2011;27 Suppl 2:59-73. PMID: 21678172.	Independent Variable
69	Martin KS, Havens E, Boyle KE, Matthews G, Schilling EA, Harel O, et al. If you stock it, will they buy it? Healthy food availability and customer purchasing behaviour within corner stores in Hartford, CT, USA. Public Health Nutr. 2012;15:1973-8. PMID: 22230347.	Independent Variable, Outcome
70	Martin KS, Wu R, Wolff M, Colantonio AG, Grady J. A novel food pantry program: food security, self-sufficiency, and diet-quality outcomes. Am J Prev Med. 2013;45:569-75. PMID: 24139769.	Independent Variable
71	McDermott AJ, Stephens MB. Cost of eating: whole foods versus convenience foods in a low-income model. Fam Med. 2010;42:280-4. PMID: 20373171.	Independent Variable
72	Mercille G, Richard L, Gauvin L, Kestens Y, Shatenstein B, Daniel M, et al. Associations between residential food environment and dietary patterns in urban-dwelling older adults: results from the VoisiNuAge study. Public Health Nutr. 2012;15:2026-39. PMID: 22789436.	Location
73	Mhurchu CN, Blakely T, Jiang Y, Eyles HC, Rodgers A. Effects of price discounts and tailored nutrition education on supermarket purchases: a randomized controlled trial. Am J Clin Nutr. 2010;91:736-47. PMID: 20042528.	Location
74	Miller LJ, Joyce S, Carter S, Yun G. Associations Between Childhood Obesity and the Availability of Food Outlets in the Local Environment: A Retrospective Cross-Sectional Study. Am J Health Promot. 2013. PMID: 24200247.	Location
75	Millstein RA, Yeh HC, Brancati FL, Batts-Turner M, Gary TL. Food availability, neighborhood socioeconomic status, and dietary patterns among blacks with type 2 diabetes mellitus. Medscape J Med. 2009;11:15. PMID: 19295936.	Unhealthy Subjects

Excluded Articles: Food Access

The table below lists the excluded articles with at least one reason for exclusion, but may not reflect all possible reasons.

	Excluded Citations	Reason for Exclusion
76	Minaker LM, Raine KD, Wild TC, Nykiforuk CI, Thompson ME, Frank LD. Objective food environments and health outcomes. Am J Prev Med. 2013;45:289-96. PMID: 23953355.	Location
77	Mojtahedi MC, Boblick P, Rimmer JH, Rowland JL, Jones RA, Braunschweig CL. Environmental barriers to and availability of healthy foods for people with mobility disabilities living in urban and suburban neighborhoods. Arch Phys Med Rehabil. 2008;89:2174-9. PMID: 18996247.	Independent Variable, Outcome
78	Moore K, Roux AVD, Auchincloss A, Evenson KR, Kaufman J, Mujahid M, et al. Home and work neighbourhood environments in relation to body mass index: the Multi-Ethnic Study of Atherosclerosis (MESA). J Epidemiol Community Health. 2013;67:846-53. PMID: 23868527.	Independent Variable, Outcome
79	Nackers LM, Appelhans BM. Food insecurity is linked to a food environment promoting obesity in households with children. J Nutr Educ Behav. 2013;45:780-4. PMID: 24021456.	Independent Variable
80	Nalty CC, Sharkey JR, Dean WR. School-based nutrition programs are associated with reduced child food insecurity over time among Mexican-origin mother-child dyads in Texas Border Colonias. J Nutr. 2013;143:708-13. PMID: 23486977.	Independent Variable
81	Oka M, Link CL, Kawachi I. Area-based variations in obesity are more than a function of the food and physical activity environment : area-based variations in obesity. J Urban Health. 2012;90:442-63. PMID: 22700325.	Study design, Independent Variable
82	Oreskovic NM, Kuhlthau KA, Romm D, Perrin JM. Built environment and weight disparities among children in high- and low-income towns. Acad Pediatr. 2009;9:315-21. PMID: 19477705.	Independent Variable
83	Oreskovic NM, Winickoff JP, Kuhlthau KA, Romm D, Perrin JM. Obesity and the built environment among Massachusetts children. Clin Pediatr (Phila). 2009;48:904-12. PMID: 19487763.	Independent Variable
84	Osei-Assibey G, Dick S, Macdiarmid J, Semple S, Reilly JJ, Ellaway A, et al. The influence of the food environment on overweight and obesity in young children: a systematic review. BMJ Open. 2012;2. PMID: 23253872.	Study design
85	Pearson AL, Wilson N. Optimising locational access of deprived populations to farmers' markets at a national scale: one route to improved fruit and vegetable consumption? PeerJ. 2013;1:e94. PMID: 23862107.	Location
86	Pearson T, Russell J, Campbell MJ, Barker ME. Do 'food deserts' influence fruit and vegetable consumption?--A cross-sectional study. Appetite. 2005;45:195-7. PMID: 15927303.	Location
87	Pelletier JE, Laska MN. Campus food and beverage purchases are associated with indicators of diet quality in college students living off campus. Am J Health Promot. 2013;28:80-7. PMID: 23631451.	Independent Variable
88	Phipps EJ, Stites SD, Wallace SL, Braitman LE. Fresh fruit and vegetable purchases in an urban supermarket by low-income households. J Nutr Educ Behav. 2012;45:165-70. PMID: 23084071.	Independent Variable
89	Pitts SB, Bringolf KR, Lawton KK, McGuirt JT, Wall-Bassett E, Morgan J, et al. Formative evaluation for a healthy	Study design,

Excluded Articles: Food Access

The table below lists the excluded articles with at least one reason for exclusion, but may not reflect all possible reasons.

	Excluded Citations	Reason for Exclusion
	corner store initiative in Pitt County, North Carolina: assessing the rural food environment, part 1. Prev Chronic Dis. 2013;10:E121. PMID: 23866165.	Independent Variable, Outcome
90	Pitts SB, Bringolf KR, Lloyd CL, McGuirt JT, Lawton KK, Morgan J. Formative evaluation for a healthy corner store initiative in Pitt County, North Carolina: engaging stakeholders for a healthy corner store initiative, part 2. Prev Chronic Dis. 2013;10:E120. PMID: 23866164.	Study design, Independent Variable
91	Poti JM, Slining MM, Popkin BM. Solid fat and added sugar intake among U.S. children: The role of stores, schools, and fast food, 1994-2010. Am J Prev Med. 2013;45:551-9. PMID: 24139767.	Independent Variable
92	Poti JM, Slining MM, Popkin BM. Where Are Kids Getting Their Empty Calories? Stores, Schools, and Fast-Food Restaurants Each Played an Important Role in Empty Calorie Intake among US Children During 2009-2010. J Acad Nutr Diet. 2013. PMID: 24200654.	Independent Variable
93	Potter SC, Schneider D, Coyle KK, May G, Robin L, Seymour J. What works? Process evaluation of a school-based fruit and vegetable distribution program in Mississippi. J Sch Health. 2011;81:202-11. PMID: 21392012.	Study design, Independent Variable
94	Powell LM. Fast food costs and adolescent body mass index: evidence from panel data. J Health Econ. 2009;28:963-70. PMID: 19732982.	Independent Variable
95	Robaina KA, Martin KS. Food insecurity, poor diet quality, and obesity among food pantry participants in Hartford, CT. J Nutr Educ Behav. 2012;45:159-64. PMID: 23219294.	Independent Variable
96	Rose D, Bodor JN, Hutchinson PL, Swalm CM. The importance of a multi-dimensional approach for studying the links between food access and consumption. J Nutr. 2010;140:1170-4. PMID: 20410084.	Study design, Independent Variable
97	Rose D, Hutchinson PL, Bodor JN, Swalm CM, Farley TA, Cohen DA, et al. Neighborhood food environments and Body Mass Index: the importance of in-store contents. Am J Prev Med. 2009;37:214-9. PMID: 19666158.	Independent Variable
98	Sadler RC, Gilliland JA, Arku G. A food retail-based intervention on food security and consumption. Int J Environ Res Public Health. 2013;10:3325-46. PMID: 23921626.	Independent Variable
99	Sallis JF, Glanz K. Physical activity and food environments: solutions to the obesity epidemic. Milbank Q. 2009;87:123-54. PMID: 19298418.	Study design
100	Scully M, Wakefield M, Niven P, Chapman K, Crawford D, Pratt IS, et al. Association between food marketing exposure and adolescents' food choices and eating behaviors. Appetite. 2011;58:1-5. PMID: 22001023.	Location, Independent Variable
101	Sharkey JR, Dean WR, Nalty CC, Xu J. Convenience stores are the key food environment influence on nutrients available from household food supplies in Texas Border Colonias. BMC Public Health. 2013;13:45. PMID: 23327426.	Outcome
102	Sikic NI, Erbstein N, Welch K, Grundberg E, Miller E. Initial evaluation of a student-run fruit and vegetable business in urban high schools. J Health Care Poor Underserved. 2012;23:1590-9. PMID: 23698673.	Study design

Excluded Articles: Food Access

The table below lists the excluded articles with at least one reason for exclusion, but may not reflect all possible reasons.

	Excluded Citations	Reason for Exclusion
103	Silveira BM, Kliemann N, Silva DP, Colussi CF, Proenca RP. Availability and price of food products with and without trans fatty acids in food stores around elementary schools in low- and medium-income neighborhoods. Ecol Food Nutr. 2013;52:63-75. PMID: 23282191.	Location
104	Singh GK, Siahpush M, Kogan MD. Neighborhood socioeconomic conditions, built environments, and childhood obesity. Health Aff (Millwood). 2010;29:503-12. PMID: 20194993.	Independent Variable
105	Slack T, Myers CA, Martin CK, Heymsfield SB. The geographic concentration of U.S adult obesity prevalence and associated social, economic, and environmental factors. Obesity (Silver Spring). 2013. PMID: 23630100.	Independent Variable
106	Smith C, Parnell WR, Brown RC, Gray AR. Providing additional money to food-insecure households and its effect on food expenditure: a randomized controlled trial. Public Health Nutr. 2012;16:1507-15. PMID: 22877571.	Location
107	Svastisalee CM, Holstein BE, Due P. Fruit and vegetable intake in adolescents: association with socioeconomic status and exposure to supermarkets and fast food outlets. J Nutr Metab. 2012;2012:185484. PMID: 22988491.	Location
108	Taber DR, Chriqui JF, Powell L, Chaloupka FJ. Association between state laws governing school meal nutrition content and student weight status: implications for new USDA school meal standards. JAMA Pediatr. 2013;167:513-9. PMID: 23567869.	Independent Variable
109	Tak NI, Velde SJt, Kamphuis CB, Ball K, Crawford D, Brug J, et al. Associations between neighbourhood and household environmental variables and fruit consumption: exploration of mediation by individual cognitions and habit strength in the GLOBE study. Public Health Nutr. 2012;16:505-14. PMID: 22691612.	Location
110	Tester JM, Yen IH, Pallis LC, Laraia BA. Healthy food availability and participation in WIC (Special Supplemental Nutrition Program for Women, Infants, and Children) in food stores around lower- and higher-income elementary schools. Public Health Nutr. 2011;14:960-4. PMID: 21205402.	Independent Variable, Outcome
111	Thompson OM, Ballew C, Resnicow K, Must A, Bandini LG, Cyr H, et al. Food purchased away from home as a predictor of change in BMI z-score among girls. Int J Obes Relat Metab Disord. 2003;28:282-9. PMID: 14647177.	Independent Variable
112	Timperio AF, Ball K, Roberts R, Andrianopoulos N, Crawford DA. Children's takeaway and fast-food intakes: associations with the neighbourhood food environment. Public Health Nutr. 2009;12:1960-4. PMID: 19243674.	Independent Variable
113	Valdez Z, Dean WR, Sharkey JR. Mobile and home-based vendors' contributions to the retail food environment in rural South Texas Mexican-origin settlements. Appetite. 2012;59:212-7. PMID: 22531289.	Independent Variable, Outcome
114	Walker RE, Block J, Kawachi I. Do residents of food deserts express different food buying preferences compared to residents of food oases? A mixed-methods analysis. Int J Behav Nutr Phys Act. 2012;9:41. PMID: 22490237.	Study design, Outcome
115	Walker RE, Keane CR, Burke JG. Disparities and access to healthy food in the United States: A review of food deserts literature. Health Place. 2010;16:876-84. PMID: 20462784.	Study design
116	Wang L, Dalton WT, Schetzina KE, Fulton-Robinson H, Holt N, Ho AL, et al. Home food environment, dietary	Independent Variable

Excluded Articles: Food Access

The table below lists the excluded articles with at least one reason for exclusion, but may not reflect all possible reasons.

	Excluded Citations	Reason for Exclusion
	intake, and weight among overweight and obese children in Southern Appalachia. South Med J. 2013;106:550-7. PMID: 24096948.	
117	Wang MC, Cubbin C, Ahn D, Winkleby MA. Changes in neighbourhood food store environment, food behaviour and body mass index, 1981--1990. Public Health Nutr. 2007;11:963-70. PMID: 17894915.	Study design, Independent Variable, Outcome
118	Wang MC, Gonzalez AA, Ritchie LD, Winkleby MA. The neighborhood food environment: sources of historical data on retail food stores. Int J Behav Nutr Phys Act. 2006;3:15. PMID: 16846518.	Study design, Independent Variable
119	Waterlander WE, Steenhuis IH, Boer MRd, Schuit AJ, Seidell JC. Effects of different discount levels on healthy products coupled with a healthy choice label, special offer label or both: results from a web-based supermarket experiment. Int J Behav Nutr Phys Act. 2013;10:59. PMID: 23680347.	Study design, Location
120	Waterlander WE, Steenhuis IH, Boer MRd, Schuit AJ, Seidell JC. Introducing taxes, subsidies or both: the effects of various food pricing strategies in a web-based supermarket randomized trial. Prev Med. 2012;54:323-30. PMID: 22387008.	Location
121	Waterlander WE, Steenhuis IH, Boer MRd, Schuit AJ, Seidell JC. The effects of a 25% discount on fruits and vegetables: results of a randomized trial in a three-dimensional web-based supermarket. Int J Behav Nutr Phys Act. 2012;9:11. PMID: 22316357.	Location
122	Weerts SE, Amoran A. Pass the fruits and vegetables! A community-university-industry partnership promotes weight loss in African American women. Health Promot Pract. 2009;12:252-60. PMID: 19346411.	Independent Variable
123	Whitehouse A, Simon A, French SA, Wolfson J. Availability of snacks, candy and beverages in hospital, community clinic and commercial pharmacies. Public Health Nutr. 2012;15:1117-23. PMID: 22277097.	Independent Variable, Outcome
124	Williams LK, Thornton L, Crawford D, Ball K. Perceived quality and availability of fruit and vegetables are associated with perceptions of fruit and vegetable affordability among socio-economically disadvantaged women. Public Health Nutr. 2012;15:1262-7. PMID: 22230425.	Location
125	Young CR, Aquilante JL, Solomon S, Colby L, Kawinzi MA, Uy N, et al. Improving fruit and vegetable consumption among low-income customers at farmers markets: Philly Food Bucks, Philadelphia, Pennsylvania, 2011. Prev Chronic Dis. 2013;10:E166. PMID: 24135390.	Independent Variable

APPENDIX B. FOOD ACCESS – WEIGHT STATUS

Archived from www.NEL.gov on March 21, 2017

Excluded Articles: Food Access

The table below lists the excluded articles with at least one reason for exclusion, but may not reflect all possible reasons.

	Excluded Citations	Reason for Exclusion
1	Alves L, Silva S, Severo M, Costa D, Pina MF, Barros H, et al. Association between neighborhood deprivation and fruits and vegetables consumption and leisure-time physical activity: a cross-sectional multilevel analysis. BMC Public Health. 2013;13:1103. PMID: 24289151.	Location
2	An R. Effectiveness of subsidies in promoting healthy food purchases and consumption: a review of field experiments. Public Health Nutr. 2012;16:1215-28. PMID: 23122423.	Study design, Location
3	Angelo HD, Suratkar S, Song HJ, Stauffer E, Gittelsohn J. Access to food source and food source use are associated with healthy and unhealthy food-purchasing behaviours among low-income African-American adults in Baltimore City. Public Health Nutr. 2011;14:1632-9. PMID: 21450140.	Outcome
4	Auchincloss AH, Mujahid MS, Shen M, Michos ED, Whitt-Glover MC, Roux AVD. Neighborhood health-promoting resources and obesity risk (the multi-ethnic study of atherosclerosis). Obesity (Silver Spring). 2013;21:621-8. PMID: 23592671.	Independent Variable
5	Bader MD, Schwartz-Soicher O, Jack D, Weiss CC, Richards CA, Quinn JW, et al. More neighborhood retail associated with lower obesity among New York City public high school students. Health Place. 2013;23:104-10. PMID: 23827943.	Independent Variable
6	Ball K, McNaughton SA, Mhurchu CN, Andrianopoulos N, Inglis V, McNeilly B, et al. Supermarket Healthy Eating for Life (SHELf): protocol of a randomised controlled trial promoting healthy food and beverage consumption through price reduction and skill-building strategies. BMC Public Health. 2011;11:715. PMID: 21936957.	Location, Independent Variable
7	Ball K, Thornton L. Food environments: measuring, mapping, monitoring and modifying. Public Health Nutr. 2013;16:1147-50. PMID: 23714417.	Study design
8	Bezerra IN, Curioni C, Sichieri R. Association between eating out of home and body weight. Nutr Rev. 2012;70:65-79. PMID: 22300594.	Study design
9	Bhargava A, Jolliffe D, Howard LL. Socio-economic, behavioural and environmental factors predicted body weights and household food insecurity scores in the Early Childhood Longitudinal Study-Kindergarten. Br J Nutr. 2008;100:438-44. PMID: 18275621.	Independent Variable
10	Black C, Moon G, Baird J. Dietary inequalities: What is the evidence for the effect of the neighbourhood food environment? Health Place. 2013. PMID: 24200470.	Study design
11	Boehmer TK, Lovegreen SL, Haire-Joshu D, Brownson RC. What constitutes an obesogenic environment in rural communities? Am J Health Promot. 2006;20:411-21. PMID: 16871821.	Independent Variable
12	Bower KM, Thorpe RJ, Rohde C, Gaskin DJ. The intersection of neighborhood racial segregation, poverty, and urbanicity and its impact on food store availability in the United States. Prev Med. 2013;58:33-9. PMID: 24161713.	Outcome

Excluded Articles: Food Access

The table below lists the excluded articles with at least one reason for exclusion, but may not reflect all possible reasons.

	Excluded Citations	Reason for Exclusion
13	Breyer B, Voss-Andreae A. Food mirages: Geographic and economic barriers to healthful food access in Portland, Oregon. Health Place. 2013;24:131-9. PMID: 24100236.	Independent Variable, Outcome
14	Budzynska K, West P, Savoy-Moore RT, Lindsey D, Winter M, Newby PK. A food desert in Detroit: associations with food shopping and eating behaviours, dietary intakes and obesity. Public Health Nutr. 2013;16:2114-23. PMID: 23651835.	Independent Variable
15	Burgoine T, Alvanides S, Lake AA. Creating 'obesogenic realities'; do our methodological choices make a difference when measuring the food environment? Int J Health Geogr. 2013;12:33. PMID: 23816238.	Location
16	Burgoine T, Lake AA, Stamp E, Alvanides S, Mathers JC, Adamson AJ. Changing foodscapes 1980-2000, using the ASH30 Study. Appetite. 2009;53:157-65. PMID: 19467279.	Location
17	Bustillos B, Sharkey JR, Anding J, McIntosh A. Availability of more healthful food alternatives in traditional, convenience, and nontraditional types of food stores in two rural Texas counties. J Am Diet Assoc. 2009;109:883-9. PMID: 19394475.	Independent Variable, Outcome
18	Campbell MK, McLerran D, Turner-McGrievy G, Feng Z, Havas S, Sorensen G, et al. Mediation of adult fruit and vegetable consumption in the National 5 A Day for Better Health community studies. Ann Behav Med. 2008;35:49-60. PMID: 18347904.	Independent Variable
19	Chaix B, Bean K, Daniel M, Zenk SN, Kestens Y, Charreire H, et al. Associations of supermarket characteristics with weight status and body fat: a multilevel analysis of individuals within supermarkets (RECORD study). PLoS One. 2012;7:e32908. PMID: 22496738.	Location
20	Christiansen KM, Qureshi F, Schaible A, Park S, Gittelsohn J. Environmental Factors That Impact the Eating Behaviors of Low-income African American Adolescents in Baltimore City. J Nutr Educ Behav. 2013;45:652-60. PMID: 23916684.	Outcome
21	Cole K, McNees M, Kinney K, Fisher K, Krieger JW. Increasing access to farmers markets for beneficiaries of nutrition assistance: evaluation of the farmers market access project. Prev Chronic Dis. 2013;10:E168. PMID: 24135392.	Independent Variable, Outcome
22	Crawford DA, Ball K, Cleland VJ, Campbell KJ, Timperio AF, Abbott G, et al. Home and neighbourhood correlates of BMI among children living in socioeconomically disadvantaged neighbourhoods. Br J Nutr. 2011;107:1028-36. PMID: 21824445.	Location
23	Cullen KW, Smalling AL, Thompson D, Watson KB, Reed D, Konzelmann K. Creating healthful home food environments: results of a study with participants in the expanded food and nutrition education program. J Nutr Educ Behav. 2009;41:380-8. PMID: 19879493.	Independent Variable
24	Cutler GJ, Flood A, Hannan P, Neumark-Sztainer D. Multiple sociodemographic and socioenvironmental	Independent Variable

Excluded Articles: Food Access

The table below lists the excluded articles with at least one reason for exclusion, but may not reflect all possible reasons.

	Excluded Citations	Reason for Exclusion
	characteristics are correlated with major patterns of dietary intake in adolescents. J Am Diet Assoc. 2011;111:230-40. PMID: 21272697.	
25	Dammann KW, Smith C. Food-related environmental, behavioral, and personal factors associated with body mass index among urban, low-income African-American, American Indian, and Caucasian women. Am J Health Promot. 2011;25:e1-e10. PMID: 21721954.	Independent Variable
26	Deierlein AL, Morland KB, Scanlin K, Wong S, Spark A. Diet Quality of Urban Older Adults Age 60 to 99 Years: The Cardiovascular Health of Seniors and Built Environment Study. J Acad Nutr Diet. 2013. PMID: 24262516.	Independent Variable
27	DeLong AJ, Larson NI, Story M, Neumark-Sztainer D, Weber-Main AM, Ireland M. Factors associated with overweight among urban American Indian adolescents: findings from Project EAT. Ethn Dis. 2008;18:317-23. PMID: 18785446.	Independent Variable
28	Dressler H, Smith C. Environmental, personal, and behavioral factors are related to body mass index in a group of multi-ethnic, low-income women. J Acad Nutr Diet. 2013;113:1662-8. PMID: 24119531.	Independent Variable
29	Dressler H, Smith C. Health and eating behavior differs between lean/normal and overweight/obese low-income women living in food-insecure environments. Am J Health Promot. 2013;27:358-65. PMID: 23398131.	Independent Variable
30	Drewnowski A, Moudon AV, Jiao J, Aggarwal A, Charreire H, Chaix B. Food environment and socioeconomic status influence obesity rates in Seattle and in Paris. Int J Obes (Lond). 2013. PMID: 23736365.	Study design, Location
31	Dubowitz T, Ghosh-Dastidar MB, Steiner E, Escarce JJ, Collins RL. Are our actions aligned with our evidence? The skinny on changing the landscape of obesity. Obesity (Silver Spring). 2013;21:419-20. PMID: 23592652.	Study design
32	Dubowitz T, Subramanian SV, Acevedo-Garcia D, Osypuk TL, Peterson KE. Individual and neighborhood differences in diet among low-income foreign and U.S.-born women. Womens Health Issues. 2008;18:181-90. PMID: 18222706.	Independent Variable
33	Eagle TF, Sheetz A, Gurm R, Woodward AC, Kline-Rogers E, Leibowitz R, et al. Understanding childhood obesity in America: linkages between household income, community resources, and children's behaviors. Am Heart J. 2012;163:836-43. PMID: 22607862.	Independent Variable
34	Erinosho TO, Oh AY, Moser RP, Davis KL, Nebeling LC, Yaroch AL. Association between perceived food environment and self-efficacy for fruit and vegetable consumption among US adults, 2007. Prev Chronic Dis. 2011;9:E10. PMID: 22172177.	Independent Variable
35	Frank L, Kerr J, Rosenberg D, King A. Healthy aging and where you live: community design relationships with physical activity and body weight in older Americans. J Phys Act Health. 2010;7 Suppl 1:S82-90. PMID: 20440017.	Independent Variable, Outcome
36	Franklin B, Jones A, Love D, Puckett S, Macklin J, White-Means S. Exploring mediators of food insecurity and	Study design

Excluded Articles: Food Access

The table below lists the excluded articles with at least one reason for exclusion, but may not reflect all possible reasons.

	Excluded Citations	Reason for Exclusion
	obesity: a review of recent literature. J Community Health. 2011;37:253-64. PMID: 21644024.	
37	Gary-Webb TL, Baptiste-Roberts K, Pham L, Wesche-Thobaben J, Patricio J, Pi-Sunyer FX, et al. Neighborhood and weight-related health behaviors in the Look AHEAD (Action for Health in Diabetes) study. BMC Public Health. 2010;10:312. PMID: 20525373.	Independent Variable, Unhealthy Subjects
38	Gittelsohn J, Kim EM, He S, Pardilla M. A food store-based environmental intervention is associated with reduced BMI and improved psychosocial factors and food-related behaviors on the Navajo nation. J Nutr. 2013;143:1494-500. PMID: 23864511.	Independent Variable
39	Gooding HC, Walls CE, Richmond TK. Food insecurity and increased BMI in young adult women. Obesity (Silver Spring). 2011;20:1896-901. PMID: 21779092.	Independent Variable
40	Gorin AA, Raynor HA, Niemeier HM, Wing RR. Home grocery delivery improves the household food environments of behavioral weight loss participants: results of an 8-week pilot study. Int J Behav Nutr Phys Act. 2007;4:58. PMID: 18001469.	Independent Variable
41	Gose M, Plachta-Danielzik S, Willie B, Johannsen M, Landsberg B, Muller MJ. Longitudinal influences of neighbourhood built and social environment on children's weight status. Int J Environ Res Public Health. 2013;10:5083-96. PMID: 24132135.	Location
42	Grigsby-Toussaint DS, Zenk SN, Odoms-Young A, Ruggiero L, Moise I. Availability of commonly consumed and culturally specific fruits and vegetables in African-american and Latino neighborhoods. J Am Diet Assoc. 2010;110:746-52. PMID: 20430136.	Independent Variable, Outcome
43	Grossman M, Tekin E, Wada R. Food prices and body fatness among youths. Econ Hum Biol. 2013. PMID: 24246131.	Independent Variable
44	Gustafson A, Hankins S, Jilcott S. Measures of the consumer food store environment: a systematic review of the evidence 2000-2011. J Community Health. 2011;37:897-911. PMID: 22160660.	Study design
45	Gustafson AA, Lewis S, Wilson C, Jilcott-Pitts S. Validation of food store environment secondary data source and the role of neighborhood deprivation in Appalachia, Kentucky. BMC Public Health. 2012;12:688. PMID: 22914100.	Outcome
46	Hardin-Fanning F. Adherence to a Mediterranean diet in a rural Appalachian food desert. Rural Remote Health. 2013;13:2293. PMID: 23331293.	Independent Variable
47	He M, Tucker P, Irwin JD, Gilliland J, Larsen K, Hess P. Obesogenic neighbourhoods: the impact of neighbourhood restaurants and convenience stores on adolescents' food consumption behaviours. Public Health Nutr. 2012;15:2331-9. PMID: 22390896.	Location
48	Heller MC, Keoleian GA, Willett WC. Toward a Life Cycle-Based, Diet-level Framework for Food Environmental	Study design

Excluded Articles: Food Access

The table below lists the excluded articles with at least one reason for exclusion, but may not reflect all possible reasons.

	Excluded Citations	Reason for Exclusion
	Impact and Nutritional Quality Assessment: A Critical Review. Environ Sci Technol. 2013;47:12632-47. PMID: 24152032.	
49	Hendershot W, Turmel P. Is food grown in urban gardens safe? Integr Environ Assess Manag. 2007;3:463-4. PMID: 17695120.	Location, Independent Variable, Outcome
50	Hollywood LE, Cuskelly GJ, Brien MO, McConnon A, Barnett J, Raats MM, et al. Healthful grocery shopping. Perceptions and barriers. Appetite. 2013;70:119-26. PMID: 23831013.	Independent Variable
51	Holsten JE, Compher CW. Children's food store, restaurant, and home food environments and their relationship with body mass index: a pilot study. Ecol Food Nutr. 2012;51:58-78. PMID: 22292712.	Independent Variable
52	Holsten JE. Obesity and the community food environment: a systematic review. Public Health Nutr. 2008;12:397-405. PMID: 18477414.	Study design
53	Iacovou M, Pattieson DC, Truby H, Palermo C. Social health and nutrition impacts of community kitchens: a systematic review. Public Health Nutr. 2012;16:535-43. PMID: 22647382.	Study design
54	Inagami S, Cohen DA, Brown AF, Asch SM. Body mass index, neighborhood fast food and restaurant concentration, and car ownership. J Urban Health. 2009;86:683-95. PMID: 19533365.	Independent Variable
55	Izumi BT, Zenk SN, Schulz AJ, Mentz GB, Wilson C. Associations between neighborhood availability and individual consumption of dark-green and orange vegetables among ethnically diverse adults in Detroit. J Am Diet Assoc. 2011;111:274-9. PMID: 21272702.	Independent Variable, Outcome
56	Jago R, Baranowski T, Baranowski JC. Fruit and vegetable availability: a micro environmental mediating variable? Public Health Nutr. 2007;10:681-9. PMID: 17381953.	Study design
57	Jennings A, Welch A, Jones AP, Harrison F, Bentham G, Sluijs EMv, et al. Local food outlets, weight status, and dietary intake: associations in children aged 9-10 years. Am J Prev Med. 2011;40:405-10. PMID: 21406273.	Location
58	Jones-Smith JC, Karter AJ, Warton EM, Kelly M, Kersten E, Moffet HH, et al. Obesity and the food environment: income and ethnicity differences among people with diabetes: the Diabetes Study of Northern California (DISTANCE). Diabetes Care. 2013;36:2697-705. PMID: 23637355.	Unhealthy Subjects
59	Laraia BA, Siega-Riz AM, Kaufman JS, Jones SJ. Proximity of supermarkets is positively associated with diet quality index for pregnancy. Prev Med. 2004;39:869-75. PMID: 15475018.	Unhealthy Subjects
60	Larson C, Haushalter A, Buck T, Campbell D, Henderson T, Schlundt D. Development of a community-sensitive strategy to increase availability of fresh fruits and vegetables in Nashville's urban food deserts, 2010-2012. Prev Chronic Dis. 2013;10:E125. PMID: 23886044.	Independent Variable
61	Larson N, Laska MN, Story M, Neumark-Sztainer D. Predictors of fruit and vegetable intake in young adulthood. J Acad Nutr Diet. 2012;112:1216-22. PMID: 22698924.	Independent Variable

Excluded Articles: Food Access

The table below lists the excluded articles with at least one reason for exclusion, but may not reflect all possible reasons.

	Excluded Citations	Reason for Exclusion
62	Lear SA, Gasevic D, Schuurman N. Association of supermarket characteristics with the body mass index of their shoppers. Nutr J. 2013;12:117. PMID: 23941309.	Location
63	Lee RE, Heinrich KM, Medina AV, Regan GR, Reese-Smith JY, Jokura Y, et al. A picture of the healthful food environment in two diverse urban cities. Environ Health Insights. 2010;4:49-60. PMID: 20706621.	Independent Variable
64	Li F, Harmer PA, Cardinal BJ, Bosworth M, Acock A, Johnson-Shelton D, et al. Built environment, adiposity, and physical activity in adults aged 50-75. Am J Prev Med. 2008;35:38-46. PMID: 18541175.	Independent Variable
65	Liese AD, Bell BA, Barnes TL, Colabianchi N, Hibbert JD, Blake CE, et al. Environmental influences on fruit and vegetable intake: results from a path analytic model. Public Health Nutr. 2013:1-10. PMID: 24192274.	Study design, Independent Variable
66	Lopez-Class M, Hosler AS. Assessment of community food resources: A Latino neighborhood study in upstate New York. J Poverty. 2010;14:369-81. PMID: 22065468.	Outcome
67	Lovasi GS, Hutson MA, Guerra M, Neckerman KM. Built environments and obesity in disadvantaged populations. Epidemiol Rev. 2009;31:7-20. PMID: 19589839.	Study design
68	Maas J, Ridder DTd, Vet Ed, Wit JBd. Do distant foods decrease intake? The effect of food accessibility on consumption. Psychol Health. 2011;27 Suppl 2:59-73. PMID: 21678172.	Independent Variable
69	Martin KS, Havens E, Boyle KE, Matthews G, Schilling EA, Harel O, et al. If you stock it, will they buy it? Healthy food availability and customer purchasing behaviour within corner stores in Hartford, CT, USA. Public Health Nutr. 2012;15:1973-8. PMID: 22230347.	Independent Variable, Outcome
70	Martin KS, Wu R, Wolff M, Colantonio AG, Grady J. A novel food pantry program: food security, self-sufficiency, and diet-quality outcomes. Am J Prev Med. 2013;45:569-75. PMID: 24139769.	Independent Variable
71	McDermott AJ, Stephens MB. Cost of eating: whole foods versus convenience foods in a low-income model. Fam Med. 2010;42:280-4. PMID: 20373171.	Independent Variable
72	Mercille G, Richard L, Gauvin L, Kestens Y, Shatenstein B, Daniel M, et al. Associations between residential food environment and dietary patterns in urban-dwelling older adults: results from the VoisiNuAge study. Public Health Nutr. 2012;15:2026-39. PMID: 22789436.	Location
73	Mhurchu CN, Blakely T, Jiang Y, Eyles HC, Rodgers A. Effects of price discounts and tailored nutrition education on supermarket purchases: a randomized controlled trial. Am J Clin Nutr. 2010;91:736-47. PMID: 20042528.	Location
74	Miller LJ, Joyce S, Carter S, Yun G. Associations Between Childhood Obesity and the Availability of Food Outlets in the Local Environment: A Retrospective Cross-Sectional Study. Am J Health Promot. 2013. PMID: 24200247.	Location
75	Millstein RA, Yeh HC, Brancati FL, Batts-Turner M, Gary TL. Food availability, neighborhood socioeconomic status, and dietary patterns among blacks with type 2 diabetes mellitus. Medscape J Med. 2009;11:15. PMID: 19295936.	Unhealthy Subjects

Excluded Articles: Food Access

The table below lists the excluded articles with at least one reason for exclusion, but may not reflect all possible reasons.

	Excluded Citations	Reason for Exclusion
76	Minaker LM, Raine KD, Wild TC, Nykiforuk CI, Thompson ME, Frank LD. Objective food environments and health outcomes. Am J Prev Med. 2013;45:289-96. PMID: 23953355.	Location
77	Mojtahedi MC, Boblick P, Rimmer JH, Rowland JL, Jones RA, Braunschweig CL. Environmental barriers to and availability of healthy foods for people with mobility disabilities living in urban and suburban neighborhoods. Arch Phys Med Rehabil. 2008;89:2174-9. PMID: 18996247.	Independent Variable, Outcome
78	Moore K, Roux AVD, Auchincloss A, Evenson KR, Kaufman J, Mujahid M, et al. Home and work neighbourhood environments in relation to body mass index: the Multi-Ethnic Study of Atherosclerosis (MESA). J Epidemiol Community Health. 2013;67:846-53. PMID: 23868527.	Independent Variable, Outcome
79	Nackers LM, Appelhans BM. Food insecurity is linked to a food environment promoting obesity in households with children. J Nutr Educ Behav. 2013;45:780-4. PMID: 24021456.	Independent Variable
80	Nalty CC, Sharkey JR, Dean WR. School-based nutrition programs are associated with reduced child food insecurity over time among Mexican-origin mother-child dyads in Texas Border Colonias. J Nutr. 2013;143:708-13. PMID: 23486977.	Independent Variable
81	Oka M, Link CL, Kawachi I. Area-based variations in obesity are more than a function of the food and physical activity environment : area-based variations in obesity. J Urban Health. 2012;90:442-63. PMID: 22700325.	Study design, Independent Variable
82	Oreskovic NM, Kuhlthau KA, Romm D, Perrin JM. Built environment and weight disparities among children in high- and low-income towns. Acad Pediatr. 2009;9:315-21. PMID: 19477705.	Independent Variable
83	Oreskovic NM, Winickoff JP, Kuhlthau KA, Romm D, Perrin JM. Obesity and the built environment among Massachusetts children. Clin Pediatr (Phila). 2009;48:904-12. PMID: 19487763.	Independent Variable
84	Osei-Assibey G, Dick S, Macdiarmid J, Semple S, Reilly JJ, Ellaway A, et al. The influence of the food environment on overweight and obesity in young children: a systematic review. BMJ Open. 2012;2. PMID: 23253872.	Study design
85	Pearson AL, Wilson N. Optimising locational access of deprived populations to farmers' markets at a national scale: one route to improved fruit and vegetable consumption? PeerJ. 2013;1:e94. PMID: 23862107.	Location
86	Pearson T, Russell J, Campbell MJ, Barker ME. Do 'food deserts' influence fruit and vegetable consumption?--A cross-sectional study. Appetite. 2005;45:195-7. PMID: 15927303.	Location
87	Pelletier JE, Laska MN. Campus food and beverage purchases are associated with indicators of diet quality in college students living off campus. Am J Health Promot. 2013;28:80-7. PMID: 23631451.	Independent Variable
88	Phipps EJ, Stites SD, Wallace SL, Braitman LE. Fresh fruit and vegetable purchases in an urban supermarket by low-income households. J Nutr Educ Behav. 2012;45:165-70. PMID: 23084071.	Independent Variable
89	Pitts SB, Bringolf KR, Lawton KK, McGuirt JT, Wall-Bassett E, Morgan J, et al. Formative evaluation for a healthy	Study design,

Excluded Articles: Food Access

The table below lists the excluded articles with at least one reason for exclusion, but may not reflect all possible reasons.

	Excluded Citations	Reason for Exclusion
	corner store initiative in Pitt County, North Carolina: assessing the rural food environment, part 1. Prev Chronic Dis. 2013;10:E121. PMID: 23866165.	Independent Variable, Outcome
90	Pitts SB, Bringolf KR, Lloyd CL, McGuirt JT, Lawton KK, Morgan J. Formative evaluation for a healthy corner store initiative in Pitt County, North Carolina: engaging stakeholders for a healthy corner store initiative, part 2. Prev Chronic Dis. 2013;10:E120. PMID: 23866164.	Study design, Independent Variable
91	Poti JM, Slining MM, Popkin BM. Solid fat and added sugar intake among U.S. children: The role of stores, schools, and fast food, 1994-2010. Am J Prev Med. 2013;45:551-9. PMID: 24139767.	Independent Variable
92	Poti JM, Slining MM, Popkin BM. Where Are Kids Getting Their Empty Calories? Stores, Schools, and Fast-Food Restaurants Each Played an Important Role in Empty Calorie Intake among US Children During 2009-2010. J Acad Nutr Diet. 2013. PMID: 24200654.	Independent Variable
93	Potter SC, Schneider D, Coyle KK, May G, Robin L, Seymour J. What works? Process evaluation of a school-based fruit and vegetable distribution program in Mississippi. J Sch Health. 2011;81:202-11. PMID: 21392012.	Study design, Independent Variable
94	Powell LM. Fast food costs and adolescent body mass index: evidence from panel data. J Health Econ. 2009;28:963-70. PMID: 19732982.	Independent Variable
95	Robaina KA, Martin KS. Food insecurity, poor diet quality, and obesity among food pantry participants in Hartford, CT. J Nutr Educ Behav. 2012;45:159-64. PMID: 23219294.	Independent Variable
96	Rose D, Bodor JN, Hutchinson PL, Swalm CM. The importance of a multi-dimensional approach for studying the links between food access and consumption. J Nutr. 2010;140:1170-4. PMID: 20410084.	Study design, Independent Variable
97	Rose D, Hutchinson PL, Bodor JN, Swalm CM, Farley TA, Cohen DA, et al. Neighborhood food environments and Body Mass Index: the importance of in-store contents. Am J Prev Med. 2009;37:214-9. PMID: 19666158.	Independent Variable
98	Sadler RC, Gilliland JA, Arku G. A food retail-based intervention on food security and consumption. Int J Environ Res Public Health. 2013;10:3325-46. PMID: 23921626.	Independent Variable
99	Sallis JF, Glanz K. Physical activity and food environments: solutions to the obesity epidemic. Milbank Q. 2009;87:123-54. PMID: 19298418.	Study design
100	Scully M, Wakefield M, Niven P, Chapman K, Crawford D, Pratt IS, et al. Association between food marketing exposure and adolescents' food choices and eating behaviors. Appetite. 2011;58:1-5. PMID: 22001023.	Location, Independent Variable
101	Sharkey JR, Dean WR, Nalty CC, Xu J. Convenience stores are the key food environment influence on nutrients available from household food supplies in Texas Border Colonias. BMC Public Health. 2013;13:45. PMID: 23327426.	Outcome
102	Sikic NI, Erbstein N, Welch K, Grundberg E, Miller E. Initial evaluation of a student-run fruit and vegetable business in urban high schools. J Health Care Poor Underserved. 2012;23:1590-9. PMID: 23698673.	Study design

Excluded Articles: Food Access

The table below lists the excluded articles with at least one reason for exclusion, but may not reflect all possible reasons.

	Excluded Citations	Reason for Exclusion
103	Silveira BM, Kliemann N, Silva DP, Colussi CF, Proenca RP. Availability and price of food products with and without trans fatty acids in food stores around elementary schools in low- and medium-income neighborhoods. Ecol Food Nutr. 2013;52:63-75. PMID: 23282191.	Location
104	Singh GK, Siahpush M, Kogan MD. Neighborhood socioeconomic conditions, built environments, and childhood obesity. Health Aff (Millwood). 2010;29:503-12. PMID: 20194993.	Independent Variable
105	Slack T, Myers CA, Martin CK, Heymsfield SB. The geographic concentration of U.S adult obesity prevalence and associated social, economic, and environmental factors. Obesity (Silver Spring). 2013. PMID: 23630100.	Independent Variable
106	Smith C, Parnell WR, Brown RC, Gray AR. Providing additional money to food-insecure households and its effect on food expenditure: a randomized controlled trial. Public Health Nutr. 2012;16:1507-15. PMID: 22877571.	Location
107	Svastisalee CM, Holstein BE, Due P. Fruit and vegetable intake in adolescents: association with socioeconomic status and exposure to supermarkets and fast food outlets. J Nutr Metab. 2012;2012:185484. PMID: 22988491.	Location
108	Taber DR, Chriqui JF, Powell L, Chaloupka FJ. Association between state laws governing school meal nutrition content and student weight status: implications for new USDA school meal standards. JAMA Pediatr. 2013;167:513-9. PMID: 23567869.	Independent Variable
109	Tak NI, Velde SJt, Kamphuis CB, Ball K, Crawford D, Brug J, et al. Associations between neighbourhood and household environmental variables and fruit consumption: exploration of mediation by individual cognitions and habit strength in the GLOBE study. Public Health Nutr. 2012;16:505-14. PMID: 22691612.	Location
110	Tester JM, Yen IH, Pallis LC, Laraia BA. Healthy food availability and participation in WIC (Special Supplemental Nutrition Program for Women, Infants, and Children) in food stores around lower- and higher-income elementary schools. Public Health Nutr. 2011;14:960-4. PMID: 21205402.	Independent Variable, Outcome
111	Thompson OM, Ballew C, Resnicow K, Must A, Bandini LG, Cyr H, et al. Food purchased away from home as a predictor of change in BMI z-score among girls. Int J Obes Relat Metab Disord. 2003;28:282-9. PMID: 14647177.	Independent Variable
112	Timperio AF, Ball K, Roberts R, Andrianopoulos N, Crawford DA. Children's takeaway and fast-food intakes: associations with the neighbourhood food environment. Public Health Nutr. 2009;12:1960-4. PMID: 19243674.	Independent Variable
113	Valdez Z, Dean WR, Sharkey JR. Mobile and home-based vendors' contributions to the retail food environment in rural South Texas Mexican-origin settlements. Appetite. 2012;59:212-7. PMID: 22531289.	Independent Variable, Outcome
114	Walker RE, Block J, Kawachi I. Do residents of food deserts express different food buying preferences compared to residents of food oases? A mixed-methods analysis. Int J Behav Nutr Phys Act. 2012;9:41. PMID: 22490237.	Study design, Outcome
115	Walker RE, Keane CR, Burke JG. Disparities and access to healthy food in the United States: A review of food deserts literature. Health Place. 2010;16:876-84. PMID: 20462784.	Study design
116	Wang L, Dalton WT, Schetzina KE, Fulton-Robinson H, Holt N, Ho AL, et al. Home food environment, dietary	Independent Variable

Excluded Articles: Food Access

The table below lists the excluded articles with at least one reason for exclusion, but may not reflect all possible reasons.

	Excluded Citations	Reason for Exclusion
	intake, and weight among overweight and obese children in Southern Appalachia. South Med J. 2013;106:550-7. PMID: 24096948.	
117	Wang MC, Cubbin C, Ahn D, Winkleby MA. Changes in neighbourhood food store environment, food behaviour and body mass index, 1981--1990. Public Health Nutr. 2007;11:963-70. PMID: 17894915.	Study design, Independent Variable, Outcome
118	Wang MC, Gonzalez AA, Ritchie LD, Winkleby MA. The neighborhood food environment: sources of historical data on retail food stores. Int J Behav Nutr Phys Act. 2006;3:15. PMID: 16846518.	Study design, Independent Variable
119	Waterlander WE, Steenhuis IH, Boer MRd, Schuit AJ, Seidell JC. Effects of different discount levels on healthy products coupled with a healthy choice label, special offer label or both: results from a web-based supermarket experiment. Int J Behav Nutr Phys Act. 2013;10:59. PMID: 23680347.	Study design, Location
120	Waterlander WE, Steenhuis IH, Boer MRd, Schuit AJ, Seidell JC. Introducing taxes, subsidies or both: the effects of various food pricing strategies in a web-based supermarket randomized trial. Prev Med. 2012;54:323-30. PMID: 22387008.	Location
121	Waterlander WE, Steenhuis IH, Boer MRd, Schuit AJ, Seidell JC. The effects of a 25% discount on fruits and vegetables: results of a randomized trial in a three-dimensional web-based supermarket. Int J Behav Nutr Phys Act. 2012;9:11. PMID: 22316357.	Location
122	Weerts SE, Amoran A. Pass the fruits and vegetables! A community-university-industry partnership promotes weight loss in African American women. Health Promot Pract. 2009;12:252-60. PMID: 19346411.	Independent Variable
123	Whitehouse A, Simon A, French SA, Wolfson J. Availability of snacks, candy and beverages in hospital, community clinic and commercial pharmacies. Public Health Nutr. 2012;15:1117-23. PMID: 22277097.	Independent Variable, Outcome
124	Williams LK, Thornton L, Crawford D, Ball K. Perceived quality and availability of fruit and vegetables are associated with perceptions of fruit and vegetable affordability among socio-economically disadvantaged women. Public Health Nutr. 2012;15:1262-7. PMID: 22230425.	Location
125	Young CR, Aquilante JL, Solomon S, Colby L, Kawinzi MA, Uy N, et al. Improving fruit and vegetable consumption among low-income customers at farmers markets: Philly Food Bucks, Philadelphia, Pennsylvania, 2011. Prev Chronic Dis. 2013;10:E166. PMID: 24135390.	Independent Variable

APPENDIX C. EARLY CARE AND EDUCATION

Archived from www.NEL.gov on March 21, 2017

Excluded Articles: Early Childhood Education

The table below lists the excluded articles with at least one reason for exclusion, but may not reflect all possible reasons.

	Excluded Citations	Reason for Exclusion
1	Adair LS. Long-term consequences of nutrition and growth in early childhood and possible preventive interventions. Nestle Nutr Inst Workshop Ser. 2014;78 :111-20. PMID:24504211.	Study Design, Independent Variable
2	Adams AK,LaRowe TL,Cronin KA,Prince RJ,Wubben DP,Parker T,Jobe JB. The Healthy Children, Strong Families intervention: design and community participation. J Prim Prev. 2012;33(4):175-85. PMID:22956296.	Independent Variable
3	Adedze P,Orr RA,Chapman-Novakofski K,Donovan SM. Set the Pace: Nutrition Education DVD for Head Start Parents. J Nutr Educ Behav. 2013;45(3):279-81. PMID:23266304.	Outcome
4	Agras WS,Hammer LD,Huffman LC,Mascola A,Bryson SW,Danaher C. Improving healthy eating in families with a toddler at risk for overweight: a cluster randomized controlled trial. J Dev Behav Pediatr. 2012;33(7):529-34. PMID:22947882.	Independent Variable
5	Agrawal T,Hoffman JA,Ahl M,Bhaumik U,Healey C,Carter S,Dickerson D,Nethersole S,Griffin D,Castaneda-Sceppa C. Collaborating for impact: a multilevel early childhood obesity prevention initiative. Fam Community Health. 2012;35(3):192-202. PMID:22617410.	Outcome
6	Andreyeva T,Luedicke J,Middleton AE,Long MW,Schwartz MB. Positive influence of the revised Special Supplemental Nutrition Program for Women, Infants, and Children food packages on access to healthy foods. J Acad Nutr Diet. 2012;112(6):850-8. PMID:22709812.	Independent Variable
7	Andreyeva T,Luedicke J,Tripp AS,Henderson KE. Effects of reduced juice allowances in food packages for the women, infants, and children program. Pediatrics. 2013;131(5):919-27. PMID:23629613.	Independent Variable
8	Annesi JJ,Smith AE,Tennant GA. Effects of the Start For Life treatment on physical activity in primarily African American preschool children of ages 3-5 years. Psychol Health Med. 2013;18(3):300-9. PMID:22882084.	Outcome
9	Annesi JJ,Smith AE,Tennant GA. Reducing high BMI in African American preschoolers: effects of a behavior-based physical activity intervention on caloric expenditure. South Med J. 2013;106(8):456-9. PMID:23912139.	Independent Variable, Outcome
10	Antoine B,Jerome B,Susi K,Pedro MV,Tanja K,Jardena P. Effects of a physical activity intervention in children attending child care (youp'la bouge program): A cluster-randomized controlled trial. Obesity Facts. 2012;5 :71.	Independent Variable
11	Arabi M. Foreword to Every Child's Potential: Integrating Nutrition and Early Childhood Development Interventions. Ann N Y Acad Sci. 2014;1308(1):v-vi. PMID:24571221.	Study Design
12	Arcan C,Hannan PJ,Fulkerson JA,Himes JH,Rock BH,Smyth M,Story M. Associations of home food availability, dietary intake, screen time and physical activity with BMI in young American-Indian children. Public Health Nutr. 2013;16(1):146-55. PMID:22376987.	Independent Variable, Age
13	Arcan C,Hannan PJ,Himes JH,Fulkerson JA,Rock BH,Smyth M,Story M. Intervention effects on	Independent Variable, Age

Excluded Articles: Early Childhood Education

The table below lists the excluded articles with at least one reason for exclusion, but may not reflect all possible reasons.

	Excluded Citations	Reason for Exclusion
	kindergarten and first-grade teachers' classroom food practices and food-related beliefs in American Indian reservation schools. J Acad Nutr Diet. 2013;113(8):1076-83. PMID:23885704.	
14	Ariza AJ,Hartman J,Grodecki J,Clavier A,Ghaey K,Elsner M,Moore C,Reina OO,Binns HJ. Linking pediatric primary care obesity management to community programs. J Health Care Poor Underserved. 2013;24(2 Suppl):158-67. PMID:23727972.	Independent Variable
15	Aryana M,Li Z,Bommer WJ. Obesity and physical fitness in California school children. Am Heart J. 2012;163(2):302-12. PMID:22305851.	Independent Variable, Age
16	Bacardi-Gascon M,Reveles-Rojas C,Woodward-Lopez G,Crawford P,Jimenez-Cruz A. Assessing the validity of a physical activity questionnaire developed for parents of preschool children in Mexico. J Health Popul Nutr. 2012;30(4):439-46. PMID:23304910.	Independent Variable
17	Bailey-Davis L,Horst M,Hillemeier MM,Lauter A. Obesity disparities among elementary-aged children: data from school-based BMI surveillance. Pediatrics. 2012;130(6):1102-9. PMID:23147975.	Age
18	Baird DL,Syrette J,Hendrie GA,Riley MD,Bowen J,Noakes M. Dairy food intake of Australian children and adolescents 2-16 years of age: 2007 Australian National Children's Nutrition and Physical Activity Survey. Public Health Nutr. 2012;15(11):2060-73. PMID:22583653.	Age
19	Baker J,Sanghvi T,Hajeebhoy N,Abrha TH. Learning from the design and implementation of large-scale programs to improve infant and young child feeding. Food Nutr Bull. 2013;34(3 Suppl):S226-30. PMID:24261079.	Location
20	Baranowski T,Frankel L. Let's get technical! Gaming and technology for weight control and health promotion in children. Child Obes. 2012;8(1):34-7. PMID:22799477.	Study Design
21	Barkin SL,Gesell SB,Po'e EK,Escarfuller J,Tempesti T. Culturally tailored, family-centered, behavioral obesity intervention for Latino-American preschool-aged children. Pediatrics. 2012;130(3):445-56. PMID:22869834.	Independent Variable
22	Battista RA,Oakley H,Weddell MS,Mudd LM,Greene JB,West ST. Improving the physical activity and nutrition environment through self-assessment (NAP SACC) in rural area child care centers in North Carolina. Prev Med. 2014; . PMID:24495522.	Independent Variable, Outcome, Unhealthy subjects
23	Bayer O,Nehring I,Bolte G,Von Kries R. Fruit and vegetable consumption and BMI change in primary school-age children: A cohort study. European Journal of Clinical Nutrition. 2014;68(2):265-270.	Age
24	Bell AC,Davies L,Finch M,Wolfenden L,Francis JL,Sutherland R,Wiggers J. An implementation intervention to encourage healthy eating in centre-based child-care services: impact of the Good for Kids Good for Life programme. Public Health Nutr. 2014; :1-10. PMID:24477181.	Outcome
25	Bellows L,Anderson J. The Food Friends Get Movin' with Mighty Moves: a physical activity program for preschoolers. J Nutr Educ Behav. 2013;45(5):473-5. PMID:23523275.	Outcome
26	Bellows L,Spaeth A,Lee V,Anderson J. Exploring the use of storybooks to reach mothers of	Independent Variable

Excluded Articles: Early Childhood Education

The table below lists the excluded articles with at least one reason for exclusion, but may not reflect all possible reasons.

	Excluded Citations	Reason for Exclusion
	preschoolers with nutrition and physical activity messages. J Nutr Educ Behav. 2013;45(4):362-7. PMID:23415760.	
27	Bellows LL,Davies PL,Anderson J,Kennedy C. Effectiveness of a physical activity intervention for Head Start preschoolers: a randomized intervention study. Am J Occup Ther. 2013;67(1):28-36. PMID:23245780.	Independent Variable, Outcome
28	Bellows LL,Johnson SL,Davies PL,Anderson J,Gavin WJ,Boles RE. The Colorado LEAP study: rationale and design of a study to assess the short term longitudinal effectiveness of a preschool nutrition and physical activity program. BMC Public Health. 2013;13 :1146. PMID:24321701.	Study Design
29	Bel-Serrat S,Mouratidou T,Santaliestra-Pasias AM,Iacoviello L,Kourides YA,Marild S,Molnar D,Reisch L,Siani A,Stomfai S,Vanaelst B,Veidebaum T,Pigeot I,Ahrens W,Krogh V,Moreno LA. Clustering of multiple lifestyle behaviours and its association to cardiovascular risk factors in children: the IDEFICS study. Eur J Clin Nutr. 2013;67(8):848-54. PMID:23632753.	Location, Independent Variable
30	Benjamin Neelon SE,Reyes-Morales H,Haines J,Gillman MW,Taveras EM. Nutritional quality of foods and beverages on child-care centre menus in Mexico. Public Health Nutr. 2013;16(11):2014-22. PMID:23036360.	Location, Independent Variable
31	Benjamin Neelon SE,Taveras EM,Ostbye T,Gillman MW. Preventing Obesity in Infants and Toddlers in Child Care: Results from a Pilot Randomized Controlled Trial. Matern Child Health J. 2013; . PMID:24065371.	Outcome
32	Benjamin Neelon SE,Vaughn A,Ball SC,McWilliams C,Ward DS. Nutrition practices and mealtime environments of North Carolina child care centers. Child Obes. 2012;8(3):216-23. PMID:22799547.	Outcome
33	Bisset S,Potvin L,Daniel M. The adaptive nature of implementation practice: case study of a school-based nutrition education intervention. Eval Program Plann. 2013;39 :10-8. PMID:23501242.	Location, Age
34	Bjelland M,Brantsaeter AL,Haugen M,Meltzer HM,Nystad W,Andersen LF. Changes and tracking of fruit, vegetables and sugar-sweetened beverages intake from 18 months to 7 years in the Norwegian Mother and Child Cohort Study. BMC Public Health. 2013;13 :793. PMID:24103398.	Location, Age
35	Black MM,Creed-Kanashiro HM. [How to feed children? Healthy eating behaviors starting at childhood]. Rev Peru Med Exp Salud Publica. 2012;29(3):373-8. PMID:23085800.	Study Design
36	Bocca G,Corpeleijn E,Stolk RP,Sauer PJ. Results of a multidisciplinary treatment program in 3-year-old to 5-year-old overweight or obese children: a randomized controlled clinical trial. Arch Pediatr Adolesc Med. 2012;166(12):1109-15. PMID:23108941.	Unhealthy subjects
37	Bocca G,Corpeleijn E,Stolk RP,Wolffenbuttel BH,Sauer PJ. Effect of obesity intervention programs on adipokines, insulin resistance, lipid profile, and low-grade inflammation in 3-to 5-y-old children. Pediatric Research. 2014;75(2):352-357.	Independent Variable
38	Bocca G,Corpeleijn E,van den Heuvel ER,Stolk RP,Sauer PJ. Three-year follow-up of 3-year-old to	Independent Variable, Unhealthy

Excluded Articles: Early Childhood Education

The table below lists the excluded articles with at least one reason for exclusion, but may not reflect all possible reasons.

	Excluded Citations	Reason for Exclusion
	5-year-old children after participation in a multidisciplinary or a usual-care obesity treatment program. Clin Nutr. 2013; . PMID:24377413.	subjects
39	Bonuck K,Avraham SB,Lo Y,Kahn R,Hyden C. Bottle-weaning intervention and toddler overweight. J Pediatr. 2014;164(2):306-12.e1-2. PMID:24183206.	Independent Variable
40	Boonpleng W,Park CG,Gallo AM. Timing of adiposity rebound: a step toward preventing obesity. Pediatr Nurs. 2012;38(1):37-42. PMID:22474857.	Independent Variable, Age
41	Boutain DM,McNees M. Initiating policy, systems, and environmental changes for childhood obesity prevention by engaging six faith-based organizations. Fam Community Health. 2013;36(3):248-59. PMID:23718960.	Independent Variable
42	Boyer LE,Laurentz S,McCabe GP,Kranz S. Shape of snack foods does not predict snack intake in a sample of preschoolers: a cross-over study. Int J Behav Nutr Phys Act. 2012;9 :94. PMID:22866912.	Outcome
43	Briley ME,Ranjit N,Hoelscher DM,Sweitzer SJ,Almansour F,Roberts-Gray C. Unbundling outcomes of a multilevel intervention to increase fruit, vegetables, and whole grains parents pack for their preschool children in sack lunches. Am J Health Educ. 2012;43(3):135-142. PMID:23243631.	Independent Variable
44	Brink-Melis WJ,Derksen ER,Westerman MJ,Renders CM,Seidell JC,Visscher TL. The local implementation of a chronic disease management model for childhood overweight and obesity. Obes Facts. 2012;5(5):766-75. PMID:23107830.	Independent Variable, Age
45	Brotman LM,Dawson-McClure S,Huang KY,Theise R,Kamboukos D,Wang J,Petkova E,Ogedegbe G. Early childhood family intervention and long-term obesity prevention among high-risk minority youth. Pediatrics. 2012;129(3):e621-8. PMID:22311988.	Independent Variable, Age
46	Brouwer R,Ostbye T,Benjamin-Neelon S. Child care arrangement and BMI/activity levels in preschoolers. Obesity Facts. 2012;5 :257.	Independent Variable
47	Burgess JN,Broome ME. Perceptions of weight and body image among preschool children: A pilot study. Pediatr Nurs. 2012;38(3):147-52, 176. PMID:22908457.	Independent Variable, Outcome
48	Burgi F,Niederer I,Schindler C,Bodenmann P,Marques-Vidal P,Kriemler S,Puder JJ. Effect of a lifestyle intervention on adiposity and fitness in socially disadvantaged subgroups of preschoolers: a cluster-randomized trial (Ballabeina). Prev Med. 2012;54(5):335-40. PMID:22373886.	Non-human Subjects
49	Byun W,Blair SN,Pate RR. Objectively measured sedentary behavior in preschool children: comparison between Montessori and traditional preschools. Int J Behav Nutr Phys Act. 2013;10 :2. PMID:23286454.	Independent Variable, Outcome
50	Byun W,Liu J,Pate RR. Association between objectively measured sedentary behavior and body mass index in preschool children. Int J Obes (Lond). 2013;37(7):961-5. PMID:23318716.	Independent Variable
51	Cameron AJ,Ball K,Pearson N,Lioret S,Crawford DA,Campbell K,Hesketh K,McNaughton SA. Socioeconomic variation in diet and activity-related behaviours of Australian children and	Age

Excluded Articles: Early Childhood Education

The table below lists the excluded articles with at least one reason for exclusion, but may not reflect all possible reasons.

	Excluded Citations	Reason for Exclusion
	adolescents aged 2-16 years. Pediatr Obes. 2012;7(4):329-42. PMID:22715088.	
52	Campbell AC,Barnum D,Ryden V,Ishkanian S,Stock S,Chanoine JP. The effectiveness of the implementation of healthy buddies(trademark), a school-based, peer- Led health promotion program in elementary schools. Canadian Journal of Diabetes. 2012;36(4):181-186.	Age
53	Carletti C,Macaluso A,Pani P,Caroli M,Giacchi M,Montico M,Cattaneo A. Diet and physical activity in pre-school children: a pilot project for surveillance in three regions of Italy. Public Health Nutr. 2013;16(4):616-24. PMID:23174193.	Location, Independent Variable
54	Carter MA,Dubois L,Tremblay MS,Taljaard M. Local social environmental factors are associated with household food insecurity in a longitudinal study of children. BMC Public Health. 2012;12 :1038. PMID:23190743.	Independent Variable, Age
55	Castro DC,Samuels M,Harman AE. Growing healthy kids: a community garden-based obesity prevention program. Am J Prev Med. 2013;44(3 Suppl 3):S193-9. PMID:23415183.	Independent Variable, Age
56	Caton SJ,Ahern SM,Remy E,Nicklaus S,Blundell P,Hetherington MM. Repetition counts: repeated exposure increases intake of a novel vegetable in UK pre-school children compared to flavour-flavour and flavour-nutrient learning. Br J Nutr. 2013;109(11):2089-97. PMID:23110783.	Location, Age
57	Cawley J,Frisvold D,Meyerhoefer C. The impact of physical education on obesity among elementary school children. J Health Econ. 2013;32(4):743-55. PMID:23721885.	Independent Variable, Age
58	Cespedes J,Briceno G,Farkouh M,Vedanthan R,Leal M,Dennis R,Hunn M,Fuster V. A randomized preschool trial to promote cardiovascular health in Colombia: 12 month follow up. Circulation. 2012;125(19):e703.	Non-human Subjects
59	Cespedes J,Briceno G,Farkouh M,Vedanthan R,Leal M,Dennis R,Hunn M,Fuster V. A randomized preschool trial to promote cardiovascular health in colombia: 18 month follow up. Circulation. 2012;125(10) .	Non-human Subjects
60	Chafin C,Edwards MJ,Morgan D,Isom P,Morgan D. A-B-C-1-2-3 Healthy Kids in Tennessee - Let's Eat Well, Play, and Be Aware Every Day: a preliminary report. Stud Health Technol Inform. 2012;172 :144-9. PMID:22910514.	Study Design, Independent Variable
61	Chen HJ,Wang Y. Influence of school beverage environment on the association of beverage consumption with physical education participation among US adolescents. Am J Public Health. 2013;103(11):e63-70. PMID:24028221.	Independent Variable, Age
62	Chiasson MA,Findley SE,Sekhobo JP,Scheinmann R,Edmunds LS,Faly AS,McLeod NJ. Changing WIC changes what children eat. Obesity (Silver Spring). 2013;21(7):1423-9. PMID:23703806.	Independent Variable
63	Chriqui JF,Turner L,Taber DR,Chaloupka FJ. Association between district and state policies and US public elementary school competitive food and beverage environments. JAMA Pediatr. 2013;167(8):714-22. PMID:23753810.	Independent Variable, Age

Excluded Articles: Early Childhood Education

The table below lists the excluded articles with at least one reason for exclusion, but may not reflect all possible reasons.

	Excluded Citations	Reason for Exclusion
64	Christian MS,El Evans C,Conner M,Ransley JK,Cade JE. Study protocol: can a school gardening intervention improve children's diets?. BMC Public Health. 2012;12 :304. PMID:22537179.	Study Design, Age
65	Christian MS,Evans CE,Hancock N,Nykjaer C,Cade JE. Family meals can help children reach their 5 a day: a cross-sectional survey of children's dietary intake from London primary schools. J Epidemiol Community Health. 2013;67(4):332-8. PMID:23254183.	Location, Independent Variable
66	Cohen JF,Kraak VI,Choumenkovitch SF,Hyatt RR,Economos CD. The CHANGE study: a healthy-lifestyles intervention to improve rural children's diet quality. J Acad Nutr Diet. 2014;114(1):48-53. PMID:24126295.	Age
67	Copeland KA,Benjamin Neelon SE,Howald AE,Wosje KS. Nutritional quality of meals compared to snacks in child care. Child Obes. 2013;9(3):223-32. PMID:23635311.	Outcome
68	Correia DC,O'Connell M,Irwin ML,Henderson KE. Pairing vegetables with a liked food and visually appealing presentation: promising strategies for increasing vegetable consumption among preschoolers. Child Obes. 2014;10(1):72-6. PMID:24433126.	Outcome
69	Cosco NG,Moore RC,Smith WR. Childcare outdoor renovation as a built environment health promotion strategy: evaluating the preventing obesity by design intervention. Am J Health Promot. 2014;28(3 Suppl):S27-32. PMID:24380462.	Independent Variable, Outcome
70	Cox R,Skouteris H,Rutherford L,Fuller-Tyszkiewicz M,Dell' Aquila D,Hardy LL. Television viewing, television content, food intake, physical activity and body mass index: a cross-sectional study of preschool children aged 2-6 years. Health Promot J Austr. 2012;23(1):58-62. PMID:22730942.	Independent Variable
71	Crespi CM,Alfonso VH,Whaley SE,Wang MC. Validity of child anthropometric measurements in the Special Supplemental Nutrition Program for Women, Infants, and Children. Pediatr Res. 2012;71(3):286-92. PMID:22337260.	Independent Variable
72	Crespo NC,Elder JP,Ayala GX,Slymen DJ,Campbell NR,Sallis JF,McKenzie TL,Baquero B,Arredondo EM. Results of a multi-level intervention to prevent and control childhood obesity among Latino children: the Aventuras Para Ninos Study. Ann Behav Med. 2012;43(1):84-100. PMID:22215470.	Independent Variable, Age
73	Cruz TH,Davis SM,Fitzgerald CA,Canaca GF,Keane PC. Engagement, Recruitment, and Retention in a Trans-Community, Randomized Controlled Trial for the Prevention of Obesity in Rural American Indian and Hispanic Children. J Prim Prev. 2014; . PMID:24549525.	Study Design, Outcome
74	Davis CR,Dearing E,Usher N,Trifiletti S,Zaichenko L,Ollen E,Brinkoetter MT,Crowell-Doom C,Joung K,Park KH,Mantzoros CS,Crowell JA. Detailed assessments of childhood adversity enhance prediction of central obesity independent of gender, race, adult psychosocial risk and health behaviors. Metabolism. 2014;63(2):199-206. PMID:24211017.	Independent Variable, Age
75	Dawson A,Richards R,Collins C,Reeder AI,Gray A. Edible gardens in early childhood education	Location, Independent Variable

Excluded Articles: Early Childhood Education

The table below lists the excluded articles with at least one reason for exclusion, but may not reflect all possible reasons.

	Excluded Citations	Reason for Exclusion
	settings in Aotearoa, New Zealand. Health Promot J Austr. 2013;24(3):214-8. PMID:24355341.	
76	De Boer MD,Scharf RJ. Consumption of sugar-sweetened beverages is associated with prospective weight gain in preschoolers. Hormone Research in Paediatrics. 2013;80 :102.	Independent Variable
77	De Coen V,De Bourdeaudhuij I,Verbestel V,Maes L,Vereecken C. Risk factors for childhood overweight: a 30-month longitudinal study of 3- to 6-year-old children. Public Health Nutr. 2013; :1-8. PMID:24172063.	Independent Variable
78	De Craemer M,De Decker E,De Bourdeaudhuij I,Deforche B,Vereecken C,Duvinage K,Grammatikaki E,Iotova V,Fernandez-Alvira JM,Zych K,Manios Y,Cardon G. Physical activity and beverage consumption in preschoolers: focus groups with parents and teachers. BMC Public Health. 2013;13 :278. PMID:23537117.	Location, Outcome
79	De Decker E,De Craemer M,De Bourdeaudhuij I,Wijndaele K,Duvinage K,Androutsos O,Iotova V,Lateva M,Alvira JM,Zych K,Manios Y,Cardon G. Influencing factors of sedentary behavior in European preschool settings: an exploration through focus groups with teachers. J Sch Health. 2013;83(9):654-61. PMID:23879785.	Location, Outcome
80	de Ruyter JC,Olthof MR,Kuijper LD,Katan MB. Effect of sugar-sweetened beverages on body weight in children: design and baseline characteristics of the Double-blind, Randomized INtervention study in Kids. Contemp Clin Trials. 2012;33(1):247-57. PMID:22056980.	Age
81	de Silva-Sanigorski AM,Bell AC,Kremer P,Park J,Demajo L,Smith M,Sharp S,Nichols M,Carpenter L,Boak R,Swinburn B. Process and impact evaluation of the Romp & Chomp obesity prevention intervention in early childhood settings: lessons learned from implementation in preschools and long day care settings. Child Obes. 2012;8(3):205-15. PMID:22799546.	Independent Variable, Age
82	Della Santa AP,Britz M,Deffeminis M,Dornell T,Martinez J,Cavalleri F. Study of the effectiveness of an educational model to prevent and control childhood obesity. Annals of Nutrition and Metabolism. 2013;63 :928.	Location
83	Dessing D,Pierik FH,Sterkenburg RP,van Dommelen P,Maas J,de Vries SI. Schoolyard physical activity of 6-11 year old children assessed by GPS and accelerometry. Int J Behav Nutr Phys Act. 2013;10 :97. PMID:23945145.	Independent Variable, Age
84	Dev DA,McBride BA,Speirs KE,Donovan SM,Cho HK. Predictors of Head Start and Child-Care Providers' Healthful and Controlling Feeding Practices with Children Aged 2 to 5 Years. J Acad Nutr Diet. 2014; . PMID:24618036.	Independent Variable
85	Dev DA,McBride BA. Academy of Nutrition and Dietetics benchmarks for nutrition in child care 2011: are child-care providers across contexts meeting recommendations?. J Acad Nutr Diet. 2013;113(10):1346-53. PMID:23916973.	Independent Variable, Outcome
86	Dickin KL,Lent M,Lu AH,Sequeira J,Dollahite JS. Developing a measure of behavior change in a	Age

Excluded Articles: Early Childhood Education

The table below lists the excluded articles with at least one reason for exclusion, but may not reflect all possible reasons.

	Excluded Citations	Reason for Exclusion
	program to help low-income parents prevent unhealthful weight gain in children. J Nutr Educ Behav. 2012;44(1):12-21. PMID:21996430.	
87	Dolinsky DH,Armstrong SC,Walter EB,Kemper AR. The effectiveness of a primary care-based pediatric obesity program. Clin Pediatr (Phila). 2012;51(4):345-53. PMID:22013148.	Independent Variable, Unhealthy subjects
88	Dollahite JS,Pijai EI,Scott-Pierce M,Parker C,Trochim W. A randomized controlled trial of a community-based nutrition education program for low-income parents. J Nutr Educ Behav. 2014;46(2):102-9. PMID:24268300.	Independent Variable
89	Dreisinger ML,Boland EM,Filler CD,Baker EA,Hessel AS,Brownson RC. Contextual factors influencing readiness for dissemination of obesity prevention programs and policies. Health Educ Res. 2012;27(2):292-306. PMID:21893684.	Independent Variable, Outcome
90	Dubuisson C,Lioret S,Dufour A,Volatier JL,Lafay L,Turck D. Associations between usual school lunch attendance and eating habits and sedentary behaviour in French children and adolescents. Eur J Clin Nutr. 2012;66(12):1335-41. PMID:23047714.	Age
91	Duncanson K,Burrows T,Collins C. Study protocol of a parent-focused child feeding and dietary intake intervention: the feeding healthy food to kids randomised controlled trial. BMC Public Health. 2012;12 :564. PMID:22839300.	Study Design, Independent Variable
92	Dunn LL,Venturanza JA,Walsh RJ,Nonas CA. An observational evaluation of move-to-improve, a classroom-based physical activity program, New York City schools, 2010. Prev Chronic Dis. 2012;9 :E146. PMID:22974754.	Independent Variable, Outcome, Age
93	Ekberg J,Angbratt M,Valter L,Nordvall M,Timpka T. History matters: childhood weight trajectories as a basis for planning community-based obesity prevention to adolescents. Int J Obes (Lond). 2012;36(4):524-8. PMID:22249226.	Age
94	Elizondo-Montemayor L,Moreno-Sanchez D,Gutierrez NG,Monsivais-Rodriguez F,Martinez U,Lamadrid-Zertuche AC,Hernandez-Torre MM. Individualized tailor-made dietetic intervention program at schools enhances eating behaviors and dietary habits in obese hispanic children of low socioeconomic status. The Scientific World Journal. 2014;2014 .	Location, Unhealthy subjects
95	Elliott C. Marketing foods to children: are we asking the right questions?. Child Obes. 2012;8(3):191-4. PMID:22799544.	Study Design
96	Erinosho TO,Ball SC,Hanson PP,Vaughn AE,Ward DS. Assessing foods offered to children at child-care centers using the Healthy Eating Index-2005. J Acad Nutr Diet. 2013;113(8):1084-9. PMID:23773561.	Independent Variable, Outcome
97	Erinosho TO,Hales DP,McWilliams CP,Emunah J,Ward DS. Nutrition policies at child-care centers and impact on role modeling of healthy eating behaviors of caregivers. J Acad Nutr Diet. 2012;112(1):119-24. PMID:22709641.	Independent Variable

Excluded Articles: Early Childhood Education

The table below lists the excluded articles with at least one reason for exclusion, but may not reflect all possible reasons.

	Excluded Citations	Reason for Exclusion
98	Falconer CL,Park MH,Croker H,Kessel AS,Saxena S,Viner RM,Kinra S. Can the relationship between ethnicity and obesity-related behaviours among school-aged children be explained by deprivation? A cross-sectional study. BMJ Open. 2014;4(1) .	Location, Independent Variable
99	Ferguson CJ,Munoz ME,Medrano MR. Advertising influences on young children's food choices and parental influence. J Pediatr. 2012;160(3):452-5. PMID:21983204.	Independent Variable, Age
100	Fernandes MM. A national evaluation of the impact of state policies on competitive foods in schools. J Sch Health. 2013;83(4):249-55. PMID:23488885.	Independent Variable, Age
101	Fernandes MM. Effect of the Supplemental Nutrition Assistance Program (SNAP) on frequency of beverage consumption among youth in the United States. J Acad Nutr Diet. 2012;112(8):1241-6. PMID:22682882.	Age
102	Fialkowski MK,Debaryshe B,Bersamin A,Nigg C,Leon Guerrero R,Rojas G,Areta AA,Vargo A,Belyeu-Camacho T,Castro R,Luick B,Novotny R. A Community Engagement Process Identifies Environmental Priorities to Prevent Early Childhood Obesity: The Children's Healthy Living (CHL) Program for Remote Underserved Populations in the US Affiliated Pacific Islands, Hawaii and Alaska. Matern Child Health J. 2013; . PMID:24043557.	Study Design, Independent Variable
103	Finch M,Wolfenden L,Falkiner M,Edenden D,Pond N,Hardy LL,Milat AJ,Wiggers J. Impact of a population based intervention to increase the adoption of multiple physical activity practices in centre based childcare services: a quasi experimental, effectiveness study. Int J Behav Nutr Phys Act. 2012;9 :101. PMID:22929434.	Independent Variable
104	Fisher JO,Mennella JA,Hughes SO,Liu Y,Mendoza PM,Patrick H. Offering "dip" promotes intake of a moderately-liked raw vegetable among preschoolers with genetic sensitivity to bitterness. J Acad Nutr Diet. 2012;112(2):235-45. PMID:22741167.	Outcome
105	Fleischhacker S,Byrd RR,Ramachandran G,Vu M,Ries A,Bell RA,Evenson KR. Tools for healthy tribes: improving access to healthy foods in Indian country. Am J Prev Med. 2012;43(3 Suppl 2):S123-9. PMID:22898161.	Study Design
106	Frampton AM,Sisson SB,Horm D,Campbell JE,Lora K,Ladner JL. What's for Lunch? An Analysis of Lunch Menus in 83 Urban and Rural Oklahoma Child-Care Centers Providing All-Day Care to Preschool Children. J Acad Nutr Diet. 2013; . PMID:24332085.	Independent Variable
107	Frenn M,Pruszynski JE,Felzer H,Zhang J. Authoritative feeding behaviors to reduce child BMI through online interventions. J Spec Pediatr Nurs. 2013;18(1):65-77. PMID:23289456.	Independent Variable, Age
108	Frongillo EA,Tofail F,Hamadani JD,Warren AM,Mehrin SF. Measures and indicators for assessing impact of interventions integrating nutrition, health, and early childhood development. Ann N Y Acad Sci. 2014;1308(1):68-88. PMID:24372533.	Study Design
109	Galvan M,Uauy R,Lopez-Rodriguez G,Kain J. Association between childhood obesity, cognitive	Location, Independent Variable,

Excluded Articles: Early Childhood Education

The table below lists the excluded articles with at least one reason for exclusion, but may not reflect all possible reasons.

	Excluded Citations	Reason for Exclusion
	development, physical fitness and social-emotional wellbeing in a transitional economy. Ann Hum Biol. 2014;41(2):99-104. PMID:24116969.	Outcome
110	Gerards SM,Dagnelie PC,Jansen MW,van der Goot LO,de Vries NK,Sanders MR,Kremers SP. Lifestyle Triple P: a parenting intervention for childhood obesity. BMC Public Health. 2012;12 :267. PMID:22471971.	Independent Variable, Age
111	Gesell SB,Sommer EC,Lambert EW,Vides de Andrade AR,Whitaker L,Davis L,Beech BM,Mitchell SJ,Arinze N,Neloms S,Ryan CK,Barkin SL. Comparative effectiveness of after-school programs to increase physical activity. J Obes. 2013;2013 :576821. PMID:23984052.	Independent Variable, Age
112	Ghisolfi J,Fantino M,Turck D,de Courcy GP,Vidailhet M. Nutrient intakes of children aged 1-2 years as a function of milk consumption, cows' milk or growing-up milk. Public Health Nutr. 2013;16(3):524-34. PMID:23098567.	Location, Independent Variable, Age
113	Glasson C,Chapman K,Wilson T,Gander K,Hughes C,Hudson N,James E. Increased exposure to community-based education and 'below the line' social marketing results in increased fruit and vegetable consumption. Public Health Nutr. 2013;16(11):1961-70. PMID:23806675.	Location, Independent Variable, Age
114	Goldfield GS,Harvey A,Grattan K,Colley R,Alberga AS,Ferraro ZM,Temple VA,Naylor PJ,Barrowman N,Adamo KB. The preschoolers activity trial (PAT): A randomized controlled trial of physical activity intervention in the early years. Archives of Disease in Childhood. 2012;97 :A114.	Independent Variable
115	Golley RK,Hendrie GA. The impact of replacing regular- with reduced-fat dairy foods on children's wider food intake: secondary analysis of a cluster RCT. Eur J Clin Nutr. 2012;66(10):1130-4. PMID:22909579.	Independent Variable, Age
116	Gooze RA,Hughes CC,Finkelstein DM,Whitaker RC. Obesity and food insecurity at the same table: how head start programs respond. Prev Chronic Dis. 2012;9 :E132. PMID:22840884.	Independent Variable, Outcome
117	Gorin AA,Wiley J,Ohannessian CM,Hernandez D,Grant A,Cloutier MM. Steps to Growing Up Healthy: a pediatric primary care based obesity prevention program for young children. BMC Public Health. 2014;14(1):72. PMID:24456698.	Independent Variable
118	Gortmaker SL,Lee RM,Mozaffarian RS,Sobol AM,Nelson TF,Roth BA,Wiecha JL. Effect of an after-school intervention on increases in children's physical activity. Med Sci Sports Exerc. 2012;44(3):450-7. PMID:21814151.	Independent Variable, Age
119	Graversen L,Sorensen TI,Petersen L,Sovio U,Kaakinen M,Sandbaek A,Laitinen J,Taanila A,Pouta A,Jarvelin MR,Obel C. Preschool weight and body mass index in relation to central obesity and metabolic syndrome in adulthood. PLoS One. 2014;9(3):e89986. PMID:24595022.	Location, Independent Variable
120	Grin BM,Gayle TL,Saravia DC,Sanders LM. Use of farmers markets by mothers of WIC recipients, Miami-Dade County, Florida, 2011. Prev Chronic Dis. 2013;10 :E95. PMID:23764344.	Independent Variable
121	Gripshover SJ,Markman EM. Teaching young children a theory of nutrition: conceptual change and	Outcome

Excluded Articles: Early Childhood Education

The table below lists the excluded articles with at least one reason for exclusion, but may not reflect all possible reasons.

	Excluded Citations	Reason for Exclusion
	the potential for increased vegetable consumption. Psychol Sci. 2013;24(8):1541-53. PMID:23804961.	
122	Gubbels JS,Kremers SP,Goldbohm RA,Stafleu A,Thijs C. Energy balance-related behavioural patterns in 5-year-old children and the longitudinal association with weight status development in early childhood. Public Health Nutr. 2012;15(8):1402-10. PMID:22124196.	Independent Variable, Outcome
123	Gubbels JS,Kremers SP,Stafleu A,Goldbohm RA,de Vries NK,Thijs C. Clustering of energy balance-related behaviors in 5-year-old children: lifestyle patterns and their longitudinal association with weight status development in early childhood. Int J Behav Nutr Phys Act. 2012;9 :77. PMID:22721567.	Independent Variable
124	Gunter KB,Rice KR,Ward DS,Trost SG. Factors associated with physical activity in children attending family child care homes. Prev Med. 2012;54(2):131-3. PMID:22178820.	Independent Variable
125	Gupta A,Holla R,Dadhich JP,Suri S,Trejos M,Chanetsa J. The status of policy and programmes on infant and young child feeding in 40 countries. Health Policy Plan. 2013;28(3):279-98. PMID:22763127.	Location, Independent Variable
126	Haines J,McDonald J,O'Brien A,Sherry B,Bottino CJ,Schmidt ME,Taveras EM. Healthy Habits, Happy Homes: randomized trial to improve household routines for obesity prevention among preschool-aged children. JAMA Pediatr. 2013;167(11):1072-9. PMID:24019074.	Independent Variable
127	Hardy L,King L. Children's first year at school: An indicator of effectiveness for obesity prevention programs in preschool aged children?. Obesity Research and Clinical Practice. 2012;6 :64.	Independent Variable
128	Hardy LL,King L,Hector D,Lloyd B. Weight status and weight-related behaviors of children commencing school. Prev Med. 2012;55(5):433-7. PMID:22995371.	Study Design, Location, Independent Variable
129	Hare ME,Coday M,Williams NA,Richey PA,Tylavsky FA,Bush AJ. Methods and baseline characteristics of a randomized trial treating early childhood obesity: the Positive Lifestyles for Active Youngsters (Team PLAY) trial. Contemp Clin Trials. 2012;33(3):534-49. PMID:22342450.	Study Design, Outcome
130	Harrison GG,Hirschman JD,Owens TA,McNutt SW,Sallack LE. WIC Infant and Toddler Feeding Practices Study: protocol design and implementation. Am J Clin Nutr. 2014;99(3):742s-6s. PMID:24477040.	Study Design, Age
131	Hasnain SR,Singer MR,Bradlee ML,Moore LL. Beverage intake in early childhood and change in body fat from preschool to adolescence. Child Obes. 2014;10(1):42-9. PMID:24450382.	Independent Variable
132	Hayes A,Lung T,Wen LM,Baur L,Rissel C,Howard K. Economic evaluation of "healthy beginnings" an early childhood intervention to prevent obesity. Obesity (Silver Spring). 2014; . PMID:24639421.	Location, Outcome
133	Hearst MO,Biskeborn K,Christensen M,Cushing C. Trends of overweight and obesity among white and American Indian school children in South Dakota, 1998-2010. Obesity (Silver Spring).	Age

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The table below lists the excluded articles with at least one reason for exclusion, but may not reflect all possible reasons.

	Excluded Citations	Reason for Exclusion
	2013;21(1):E26-32. PMID:23404863.	
134	Heitmann B,Pedersen J,Seeger C,Stougaard M,Handel MN,Olsen NJ. The healthy start project: A randomized, controlled intervention to prevent overweight among normal weight, preschool children predisposed to future obesity. Annals of Nutrition and Metabolism. 2013;62 :39.	Location, Independent Variable
135	Herman AN,Malhotra K,Wright G,Fisher JO,Whitaker RC. A qualitative study of the aspirations and challenges of low-income mothers in feeding their preschool-aged children. Int J Behav Nutr Phys Act. 2012;9 :132. PMID:23157723.	Independent Variable
136	Herrera J,Lockner D,Kibbe D,Marley SC,Trowbridge F,Bailey A. Innovative tools help counselors discuss childhood obesity with parents. Child Obes. 2013;9(2):144-9. PMID:23496294.	Independent Variable
137	Hingle M,Beltran A,O'Connor T,Thompson D,Baranowski J,Baranowski T. A model of goal directed vegetable parenting practices. Appetite. 2012;58(2):444-9. PMID:22210348.	Independent Variable
138	Hoffmann SW,Ulrich R,Simon P. Refined analysis of the critical age ranges of childhood overweight: implications for primary prevention. Obesity (Silver Spring). 2012;20(10):2151-4. PMID:22714087.	Location, Independent Variable, Age
139	Horodynski MA,Coleman G,Baker S,Auld G,Lindau J. The healthy toddlers curriculum. J Nutr Educ Behav. 2012;44(6):661-2. PMID:23010014.	Study Design
140	Hunsberger M,McGinnis P,Smith J,Beamer BA,O'Malley J. Elementary school children's recess schedule and dietary intake at lunch: a community-based participatory research partnership pilot study. BMC Public Health. 2014;14(1):156. PMID:24520852.	Outcome
141	Inayati DA,Scherbaum V,Purwestri RC,Wirawan NN,Suryantan J,Hartono S,Bloem MA,Pangaribuan RV,Biesalski HK,Hoffmann V,Bellows AC. Improved nutrition knowledge and practice through intensive nutrition education: a study among caregivers of mildly wasted children on Nias Island, Indonesia. Food Nutr Bull. 2012;33(2):117-27. PMID:22908693.	Location, Independent Variable, Unhealthy subjects
142	Jackson AA,Wiseman M,Wootton SA. Tackling the obesity crisis: how do we 'measure up'?. Arch Dis Child. 2014;99(2):95-8. PMID:24243929.	Study Design
143	Jahn I,Bottcher S. [Prevention of Obesity and Promotion of Healthy Nutrition in Children by a Kindergarten-Based Intervention: An Evaluation Study.]. Gesundheitswesen. 2013; . PMID:23970391.	Language
144	Janicke DM,Lim CS,Mathews AE,Shelnutt KP,Boggs SR,Silverstein JH,Brumback BA. The community-based healthy-lifestyle intervention for rural preschools (CHIRP) study: design and methods. Contemp Clin Trials. 2013;34(2):187-95. PMID:23183252.	Independent Variable
145	Janjua NZ,Mahmood B,Islam MA,Goldenberg RL. Maternal and Early Childhood Risk Factors for Overweight and Obesity among Low-Income Predominantly Black Children at Age Five Years: A Prospective Cohort Study. J Obes. 2012;2012 :457173. PMID:23056928.	Independent Variable
146	Jansen PW,Giallo R,Westrupp EM,Wake M,Nicholson JM. Bidirectional associations between	Location, Independent Variable

Excluded Articles: Early Childhood Education

The table below lists the excluded articles with at least one reason for exclusion, but may not reflect all possible reasons.

	Excluded Citations	Reason for Exclusion
	mothers' and fathers' parenting consistency and child BMI. Pediatrics. 2013;132(6):e1513-20. PMID:24276845.	
147	Jansen PW,Roza SJ,Jaddoe VW,Mackenbach JD,Raat H,Hofman A,Verhulst FC,Tiemeier H. Children's eating behavior, feeding practices of parents and weight problems in early childhood: results from the population-based Generation R Study. Int J Behav Nutr Phys Act. 2012;9 :130. PMID:23110748.	Independent Variable
148	Jauregui A,Villalpando S,Rangel-Baltazar E,Lara-Zamudio YA,Castillo-Garcia MM. Physical activity and fat mass gain in Mexican school-age children: a cohort study. BMC Pediatr. 2012;12 :109. PMID:22839498.	Independent Variable, Age
149	Johnson BA,Kremer PJ,Swinburn BA,de Silva-Sanigorski AM. Multilevel analysis of the Be Active Eat Well intervention: environmental and behavioural influences on reductions in child obesity risk. Int J Obes (Lond). 2012;36(7):901-7. PMID:22531087.	Age
150	Johnson SL,Hughes SO,Cui X,Li X,Allison DB,Liu Y,Goodell LS,Nicklas T,Power TG,Vollrath K. Portion sizes for children are predicted by parental characteristics and the amounts parents serve themselves. Am J Clin Nutr. 2014;99(4):763-70. PMID:24477036.	Independent Variable, Outcome
151	Johnson SL,Ramsay S,Shultz JA,Branen LJ,Fletcher JW. Creating potential for common ground and communication between early childhood program staff and parents about young children's eating. J Nutr Educ Behav. 2013;45(6):558-70. PMID:23769298.	Independent Variable, Outcome
152	Johnston Molloy C,Kearney J,Hayes N,Glennon Slattery C,Corish C. Pre-school manager training: a cost-effective tool to promote nutrition- and health-related practice improvements in the Irish full-day-care pre-school setting. Public Health Nutr. 2013; :1-11. PMID:24135258.	Outcome
153	Johnston Molloy C,Kearney J,Hayes N,Slattery CG,Corish C. Healthy incentive scheme in the Irish full-day-care pre-school setting. Proc Nutr Soc. 2014;73(1):147-58. PMID:24330783.	Study Design
154	Junnila R,Aromaa M,Heinonen OJ,Lagstrom H,Liuksila PR,Vahlberg T,Salantera S. The Weighty Matter intervention: a family-centered way to tackle an overweight childhood. J Community Health Nurs. 2012;29(1):39-52. PMID:22313184.	Independent Variable, Unhealthy subjects
155	Jurkowski JM,Green Mills LL,Lawson HA,Bovenzi MC,Quartimon R,Davison KK. Engaging low-income parents in childhood obesity prevention from start to finish: a case study. J Community Health. 2013;38(1):1-11. PMID:22714670.	Independent Variable, Outcome
156	Kain J,Uauy R,Concha F,Leyton B,Bustos N,Salazar G,Lobos L,Vio F. School-based obesity prevention interventions for Chilean children during the past decades: lessons learned. Adv Nutr. 2012;3(4):616s-621s. PMID:22798002.	Age
157	Karp SM,Barry KM,Gesell SB,Po'e EK,Dietrich MS,Barkin SL. Parental feeding patterns and child weight status for Latino preschoolers. Obes Res Clin Pract. 2014;8(1):e88-97. PMID:24548581.	Independent Variable

Excluded Articles: Early Childhood Education

The table below lists the excluded articles with at least one reason for exclusion, but may not reflect all possible reasons.

	Excluded Citations	Reason for Exclusion
158	Kaufman-Shriqui V,Fraser D,Friger M,Bilenko N,Vardi H,Abu-Saad K,Elhadad N,Mor K,Feine Z,Shahar DR. Factors associated with childhood overweight and obesity among acculturated and new immigrants. Ethn Dis. 2013;23(3):329-35. PMID:23914419.	Location, Independent Variable
159	Kelishadi R,Malekahmadi M,Hashemipour M,Soghrati M,Soghrati M,Mirmoghtadaee P,Ghatrehsamani S,Poursafa P,Khavarian N. Can a trial of motivational lifestyle counseling be effective for controlling childhood obesity and the associated cardiometabolic risk factors?. Pediatr Neonatol. 2012;53(2):90-7. PMID:22503255.	Independent Variable, Age
160	Kelley SJ,Whitley DM,Campos PE. African American caregiving grandmothers: results of an intervention to improve health indicators and health promotion behaviors. J Fam Nurs. 2013;19(1):53-73. PMID:23007422.	Independent Variable
161	Kiefner-Burmeister AE,Hoffmann DA,Meers MR,Koball AM,Musher-Eizenman DR. Food consumption by young children: a function of parental feeding goals and practices. Appetite. 2014;74 :6-11. PMID:24275668.	Independent Variable, Age
162	Kim J,Shim JE,Wiley AR,Kim K,McBride BA. Is there a difference between center and home care providers' training, perceptions, and practices related to obesity prevention?. Matern Child Health J. 2012;16(8):1559-66. PMID:21877239.	Independent Variable
163	Kimbro RT,Denney JT. Neighborhood context and racial/ethnic differences in young children's obesity: structural barriers to interventions. Soc Sci Med. 2013;95 :97-105. PMID:23089614.	Independent Variable
164	Knowlden A,Sharma M. A Feasibility and Efficacy Randomized Controlled Trial of an Online Preventative Program for Childhood Obesity: Protocol for the EMPOWER Intervention. JMIR Res Protoc. 2012;1(1):e5. PMID:23611831.	Independent Variable, Outcome
165	Kokkvoll A,Grimsgaard S,Odegaard R,Flaegstad T,Njolstad I. Single versus multiple-family intervention in childhood overweight - Finnmark Activity School: A randomised trial. Archives of Disease in Childhood. 2014;99(3):225-231.	Age
166	Koleilat M,Harrison GG,Whaley S,McGregor S,Jenks E,Afifi A. Preschool enrollment is associated with lower odds of childhood obesity among WIC participants in LA County. Matern Child Health J. 2012;16(3):706-12. PMID:21431308.	Independent Variable
167	Koleilat M,Whaley SE,Afifi AA,Estrada L,Harrison GG. Understanding the Relationship Between the Retail Food Environment Index and Early Childhood Obesity Among WIC Participants in Los Angeles County Using GeoDa. Online J Public Health Inform. 2012;4(1) . PMID:23569623.	Independent Variable
168	Kong A,Odoms-Young AM,Schiffer LA,Berbaum ML,Porter SJ,Blumstein L,Fitzgibbon ML. Racial/ethnic differences in dietary intake among WIC families prior to food package revisions. J Nutr Educ Behav. 2013;45(1):39-46. PMID:23073175.	Independent Variable
169	Korenman S,Abner KS,Kaestner R,Gordon RA. The Child and Adult Care Food Program and the	Outcome

Excluded Articles: Early Childhood Education

The table below lists the excluded articles with at least one reason for exclusion, but may not reflect all possible reasons.

	Excluded Citations	Reason for Exclusion
	Nutrition of Preschoolers. Early Child Res Q. 2013;28(2):325-336. PMID:23687405.	
170	Krombholz H. The impact of a 20-month physical activity intervention in child care centers on motor performance and weight in overweight and healthy-weight preschool children. Percept Mot Skills. 2012;115(3):919-32. PMID:23409603.	Independent Variable
171	Kuhl ES,Clifford LM,Bandstra NF,Filigno SS,Yeomans-Maldonado G,Rausch JR,Stark LJ. Examination of the association between lifestyle behavior changes and weight outcomes in preschoolers receiving treatment for obesity. Health Psychol. 2014;33(1):95-8. PMID:23815763.	Unhealthy subjects
172	Kyttala P,Erkkola M,Lehtinen-Jacks S,Ovaskainen ML,Uusitalo L,Veijola R,Simell O,Knip M,Virtanen SM. Finnish Children Healthy Eating Index (FCHEI) and its associations with family and child characteristics in pre-school children. Public Health Nutr. 2013; :1-9. PMID:24152429.	Location, Independent Variable
173	Lanigan JD. The relationship between practices and child care providers' beliefs related to child feeding and obesity prevention. J Nutr Educ Behav. 2012;44(6):521-9. PMID:22559927.	Outcome
174	Laster LE,Lovelady CA,West DG,Wiltheiss GA,Brouwer RJ,Stroo M,Ostbye T. Diet quality of overweight and obese mothers and their preschool children. J Acad Nutr Diet. 2013;113(11):1476-83. PMID:23871105.	Independent Variable
175	Lee A,Keung VM,Cheung GC. Compensation consumption of high-energy-density food among pre-school children leading to suboptimal intake of recommended food groups: case study in Hong Kong. Public Health. 2013;127(2):182-5. PMID:23206382.	Study Design, Independent Variable
176	Lee R,Zhai F,Han WJ,Brooks-Gunn J,Waldfogel J. "Head Start and Children's Nutrition, Weight, and Health Care Receipt". Early Child Res Q. 2013;28(4) . PMID:24187433.	Independent Variable
177	Lerner-Geva L,Bar-Zvi E,Levitan G,Boyko V,Reichman B,Pinhas-Hamiel O. An intervention for improving the lifestyle habits of kindergarten children in Israel: a cluster-randomised controlled trial investigation. Public Health Nutr. 2014; :1-8. PMID:24621661.	Location, Age
178	Lessard L,Williams Leng S,Brennan R. Consistency of compliance with nutrition-related regulations among Delaware child care centers. Child Obes. 2013;9(3):233-9. PMID:23675900.	Independent Variable
179	Leung CW,Blumenthal SJ,Hoffnagle EE,Jensen HH,Foerster SB,Nestle M,Cheung LW,Mozaffarian D,Willett WC. Associations of food stamp participation with dietary quality and obesity in children. Pediatrics. 2013;131(3):463-72. PMID:23439902.	Independent Variable
180	Leventer-Roberts M,Patel A,Trasande L. Is severity of obesity associated with diagnosis or health education practices?. Int J Obes (Lond). 2012;36(12):1571-7. PMID:22270382.	Age
181	Levy DT,Friend KB. Simulation modeling of policies directed at youth sugar-sweetened beverage consumption. Am J Community Psychol. 2013;51(1-2):299-313. PMID:22810953.	Age
182	Lindberg SM,Adams AK,Prince RJ. Early predictors of obesity and cardiovascular risk among American Indian children. Matern Child Health J. 2012;16(9):1879-86. PMID:22527771.	Independent Variable, Age

Excluded Articles: Early Childhood Education

The table below lists the excluded articles with at least one reason for exclusion, but may not reflect all possible reasons.

	Excluded Citations	Reason for Exclusion
183	Liu JH,Jones SJ,Sun H,Probst JC,Merchant AT,Cavicchia P. Diet, physical activity, and sedentary behaviors as risk factors for childhood obesity: an urban and rural comparison. Child Obes. 2012;8(5):440-8. PMID:23061499.	Independent Variable, Age
184	Lohse B,Rifkin R,Arnold K,Least C. A digital program informs low-income caregivers of preschool-age children about family meals. J Nutr Educ Behav. 2012;44(3):256-61. PMID:22386387.	Independent Variable, Outcome
185	Looney SM,Raynor HA. Are changes in consumption of "healthy" foods related to changes in consumption of "unhealthy" foods during pediatric obesity treatment?. Int J Environ Res Public Health. 2012;9(4):1368-78. PMID:22690199.	Independent Variable
186	Lopez-Dicastillo O,Grande G,Callery P. School children's own views, roles and contribution to choices regarding diet and activity in Spain. Child Care Health Dev. 2013;39(1):109-17. PMID:22329506.	Location, Age
187	Lyn R,Evers S,Davis J,Maalouf J,Griffin M. Barriers and Supports to Implementing a Nutrition and Physical Activity Intervention in Child Care: Directors' Perspectives. J Nutr Educ Behav. 2014; . PMID:24406269.	Study Design, Outcome
188	Lyn R,Maalouf J,Evers S,Davis J,Griffin M. Nutrition and physical activity in child care centers: the impact of a wellness policy initiative on environment and policy assessment and observation outcomes, 2011. Prev Chronic Dis. 2013;10 :E83. PMID:23701720.	Outcome
189	Maggio ABR,Saunders Gasser C,Gal-Duding C,Beghetti M,Martin XE,Farpour-Lambert NJ,Chamay-Weber C. BMI changes in children and adolescents attending a specialized childhood obesity center: A cohort study. BMC Pediatrics. 2013;13(1) .	Location, Independent Variable
190	Maguire JL,Birken CS,Loeb MB,Mamdani M,Thorpe K,Hoch JS,Mazzulli T,Borkhoff CM,Macarthur C,Parkin PC,Abdullah K,Anderson L,Carsley S,Chen Y,D'Ascanio M,Katz-Lavigne M,Kavikondala K,Lee GJ,Omand J,Persaud N,van den Heuvel M,Zabih W,Baker J,Barozzino T,Bonifacio J,Campbell D,Cheema S,Chisamore B,Danayan K,Das P,Derocher MB,Do A,Dorey M,Freeman S,Fung K,Guiang C,Handford C,Hatch H,Jacobson S,Kiran T,Knowles H,Kwok B,Lakhoo S,Lam-Antoniades M,Lau E,Leung FH,Loo J,Mahmoud S,Moodie R,Morinis J,Naymark S,Neelands P,Owen J,Peer M,Perlmutar M,Pinto A,Porepa M,Ramji N,Ramji N,Rosenthal A,Saunderson J,Saxena R,Sgro M,Shepherd S,Smiltnieks B,Taylor C,Weisdors T,Wijayasinghe S,Wong P,Ying E,Young E. DO IT Trial: Vitamin D Outcomes and Interventions in Toddlers - a TARGet Kids! randomized controlled trial. BMC Pediatrics. 2014;14(1) .	Independent Variable, Outcome
191	Manios Y. The 'ToyBox-study' obesity prevention programme in early childhood: an introduction. Obes Rev. 2012;13 Suppl 1 :1-2. PMID:22309060.	Study Design
192	Marks J,Barnett L,Foulkes C,Allender S. A case study identifying system level intervention points for obesity prevention in a long day care setting. Obesity Research and Clinical Practice. 2012;6 :24.	Study Design, Outcome

Excluded Articles: Early Childhood Education

The table below lists the excluded articles with at least one reason for exclusion, but may not reflect all possible reasons.

	Excluded Citations	Reason for Exclusion
193	Marks J,Barnett LM,Foulkes C,Hawe P,Allender S. Using social network analysis to identify key child care center staff for obesity prevention interventions: a pilot study. J Obes. 2013;2013 :919287. PMID:23986867.	Independent Variable, Outcome
194	Martin KS,Wolff M,Lonczak M,Chambers M,Cooke C,Whitney G. Formative research to examine collaboration between special supplemental nutrition program for woman, infants, and children and head start programs. Matern Child Health J. 2014;18(1):326-32. PMID:23417212.	Independent Variable, Outcome
195	McGowan L,Cooke LJ,Gardner B,Beeken RJ,Croker H,Wardle J. Healthy feeding habits: efficacy results from a cluster-randomized, controlled exploratory trial of a novel, habit-based intervention with parents. Am J Clin Nutr. 2013;98(3):769-77. PMID:23864536.	Location, Independent Variable
196	McGowan L,Croker H,Wardle J,Cooke LJ. Environmental and individual determinants of core and non-core food and drink intake in preschool-aged children in the United Kingdom. Eur J Clin Nutr. 2012;66(3):322-8. PMID:22252108.	Independent Variable
197	Menon P,Rawat R,Ruel M. Bringing rigor to evaluations of large-scale programs to improve infant and young child feeding and nutrition: the evaluation designs for the Alive & Thrive initiative. Food Nutr Bull. 2013;34(3 Suppl):S195-211. PMID:24261077.	Study Design, Location
198	Metallinos-Katsaras E,Must A,Gorman K. A longitudinal study of food insecurity on obesity in preschool children. J Acad Nutr Diet. 2012;112(12):1949-58. PMID:23174682.	Independent Variable
199	Middleton AE,Henderson KE,Schwartz MB. From policy to practice: implementation of water policies in child care centers in Connecticut. J Nutr Educ Behav. 2013;45(2):119-25. PMID:23472930.	Outcome
200	Miller AL,Horodynski MA,Herb HE,Peterson KE,Contreras D,Kaciroti N,Staples-Watson J,Lumeng JC. Enhancing self-regulation as a strategy for obesity prevention in Head Start preschoolers: the growing healthy study. BMC Public Health. 2012;12 :1040. PMID:23194185.	Study Design
201	Mitchell B,McLennan S,Latimer K,Graham D,Gilmore J,Rush E. Improvement of fundamental movement skills through support and mentorship of class room teachers. Obes Res Clin Pract. 2013;7(3):e230-4. PMID:23697592.	Location, Independent Variable, Age
202	More JA,Emmett PM. Evidenced-based, practical food portion sizes for preschool children and how they fit into a well balanced, nutritionally adequate diet. J Hum Nutr Diet. 2014; . PMID:24654561.	Location, Independent Variable
203	Moreno L,Mouratidou T,DeMiguel-Etayo P,De Bourdeaudhuij I,Koletzko B,Lateva M,Socha P,Lobstein T,Androutsos O,Manios Y. Pre-school children's food intake and snacking habits and their determinants. Annals of Nutrition and Metabolism. 2013;63 :65-66.	Location, Independent Variable
204	Morrissey TW,Jacknowitz A,Vinopal K. Local Food Prices and Their Associations With Children's Weight and Food Security. Pediatrics. 2014;133(3):422-30. PMID:24515513.	Independent Variable
205	Moss A,Smith S,Null D,Long Roth S,Tragoudas U. Farm to School and Nutrition Education: Positively Affecting Elementary School-Aged Children's Nutrition Knowledge and Consumption	Age

Excluded Articles: Early Childhood Education

The table below lists the excluded articles with at least one reason for exclusion, but may not reflect all possible reasons.

	Excluded Citations	Reason for Exclusion
	Behavior. Child Obes. 2013;9(1):51-6. PMID:23308373.	
206	Mozaffarian RS,Andry A,Lee RM,Wiecha JL,Gortmaker SL. Price and healthfulness of snacks in 32 YMCA after-school programs in 4 US metropolitan areas, 2006-2008. Prev Chronic Dis. 2012;9 :E38. PMID:22239753.	Independent Variable
207	Murashima M,Hoerr SL,Hughes SO,Kaplowitz SA. Feeding behaviors of low-income mothers: directive control relates to a lower BMI in children, and a nondirective control relates to a healthier diet in preschoolers. Am J Clin Nutr. 2012;95(5):1031-7. PMID:22456658.	Independent Variable
208	Murphy E,Ice C,McCartney K,Leary J,Cottrell L. Is parent and child weight status associated with decision making regarding nutrition and physical activity opportunities?. Appetite. 2012;59(2):563-9. PMID:22732569.	Independent Variable
209	Murray-Kolb LE,Khatry SK,Katz J,Schaefer BA,Cole PM,LeClerq SC,Morgan ME,Tielsch JM,Christian P. Preschool micronutrient supplementation effects on intellectual and motor function in school-aged Nepalese children. Arch Pediatr Adolesc Med. 2012;166(5):404-10. PMID:22566538.	Independent Variable, Age
210	Namenek Brouwer RJ,Benjamin Neelon SE. Watch me grow: a garden-based pilot intervention to increase vegetable and fruit intake in preschoolers. BMC Public Health. 2013;13 :363. PMID:23597235.	Sample Size
211	Natale R,Scott SH,Messiah SE,Schrack MM,Uhlhorn SB,Delamater A. Design and methods for evaluating an early childhood obesity prevention program in the childcare center setting. BMC Public Health. 2013;13 :78. PMID:23356862.	Study Design, Outcome
212	Navarro JI,Sigulem DM,Ferraro AA,Polanco JJ,Barros AJ. The double task of preventing malnutrition and overweight: a quasi-experimental community-based trial. BMC Public Health. 2013;13 :212. PMID:23496939.	Location, Age
213	Nemet D,Geva D,Meckel Y,Eliakim A. Health-related knowledge and preferences in low socio-economic kindergarteners. Int J Behav Nutr Phys Act. 2012;9 :1. PMID:22233712.	Age
214	Nichols MS,Reynolds RC,Waters E,Gill T,King L,Swinburn BA,Allender S. Community-based efforts to prevent obesity: Australia-wide survey of projects. Health Promot J Austr. 2013;24(2):111-7. PMID:24168737.	Location, Independent Variable
215	Nickelson J,Lawrence JC,Parton JM,Knowlden AP,McDermott RJ. What proportion of preschool-aged children consume sweetened beverages?. J Sch Health. 2014;84(3):185-94. PMID:24443780.	Independent Variable
216	Nicklas TA,Liu Y,Stuff JE,Fisher JO,Mendoza JA,O'Neil CE. Characterizing lunch meals served and consumed by pre-school children in Head Start. Public Health Nutr. 2013;16(12):2169-77. PMID:23701867.	Outcome
217	Nicklas TA,O'Neil CE,Stuff JE,Hughes SO,Liu Y. Characterizing dinner meals served and consumed by low-income preschool children. Child Obes. 2012;8(6):561-71. PMID:23181922.	Independent Variable

Excluded Articles: Early Childhood Education

The table below lists the excluded articles with at least one reason for exclusion, but may not reflect all possible reasons.

	Excluded Citations	Reason for Exclusion
218	Niederer I,Burgi F,Ebenegger V,Marques-Vidal P,Schindler C,Nydegger A,Kriemler S,Puder JJ. Effects of a lifestyle intervention on adiposity and fitness in overweight or low fit preschoolers (Ballabeina). Obesity (Silver Spring). 2013;21(3):E287-93. PMID:23592683.	Non-human Subjects
219	Nobari TZ,Wang MC,Chaparro MP,Crespi CM,Koleilat M,Whaley SE. Immigrant enclaves and obesity in preschool-aged children in Los Angeles County. Soc Sci Med. 2013;92 :1-8. PMID:23849273.	Independent Variable
220	Noradilah MJ,Zahara AM. Acceptance of a test vegetable after repeated exposures among preschoolers. Malays J Nutr. 2012;18(1):67-75. PMID:23713231.	Location, Age
221	Novotny R,Nigg C,McGlone K,Renda G,Jung N,Matsunaga M,Karanja N. Pacific Tracker 2 - expert system (PacTrac2-ES) behavioural assessment and intervention tool for the Pacific Kids DASH for Health (PacDASH) study. Food Chem. 2013;140(3):471-7. PMID:23601394.	Study Design, Independent Variable, Age
222	O'Connell ML,Henderson KE,Luedicke J,Schwartz MB. Repeated exposure in a natural setting: a preschool intervention to increase vegetable consumption. J Acad Nutr Diet. 2012;112(2):230-4. PMID:22732458.	Outcome
223	O'Connor TM,Cerin E,Hughes SO,Robles J,Thompson D,Baranowski T,Lee RE,Nicklas T,Shewchuk RM. What Hispanic parents do to encourage and discourage 3-5 year old children to be active: a qualitative study using nominal group technique. Int J Behav Nutr Phys Act. 2013;10 :93. PMID:23919301.	Independent Variable, Outcome
224	O'Connor TM,Hilmers A,Watson K,Baranowski T,Giardino AP. Feasibility of an obesity intervention for paediatric primary care targeting parenting and children: Helping HAND. Child Care Health Dev. 2013;39(1):141-9. PMID:22066521.	Independent Variable, Age
225	Ohly H,Pealing J,Hayter AK,Pettinger C,Pikhart H,Watt RG,Rees G. Parental food involvement predicts parent and child intakes of fruits and vegetables. Appetite. 2013;69 :8-14. PMID:23684902.	Location, Independent Variable
226	Ohly HR,Hayter A,Pettinger C,Pikhart H,Watt RG,Rees GA. Developing a nutrition intervention in children's centres: exploring views of parents in rural/urban settings in the UK. Public Health Nutr. 2013;16(8):1516-21. PMID:22935540.	Location, Independent Variable
227	Okihiro M,Pillen M,Ancog C,Inda C,Sehgal V. Implementing the obesity care model at a community health center in Hawaii to address childhood obesity. J Health Care Poor Underserved. 2013;24(2 Suppl):1-11. PMID:23727960.	Study Design, Independent Variable
228	Olafsdottir S,Berg C,Eiben G,Lanfer A,Reisch L,Ahrens W,Kourides Y,Molnar D,Moreno LA,Siani A,Veidebaum T,Lissner L. Young children's screen activities, sweet drink consumption and anthropometry: Results from a prospective European study. European Journal of Clinical Nutrition. 2014;68(2):223-228.	Independent Variable
229	Olsen NJ,Buch-Andersen T,Handel MN,Ostergaard LM,Pedersen J,Seeger C,Stougaard M,Traerup	Study Design, Non-human

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The table below lists the excluded articles with at least one reason for exclusion, but may not reflect all possible reasons.

	Excluded Citations	Reason for Exclusion
	M,Livemore K,Mortensen EL,Holst C,Heitmann BL. The Healthy Start project: a randomized, controlled intervention to prevent overweight among normal weight, preschool children at high risk of future overweight. BMC Public Health. 2012;12 :590. PMID:22852799.	Subjects
230	Onnerfalt J,Erlandsson LK,Orban K,Broberg M,Helgason C,Thorngren-Jerneck K. A family-based intervention targeting parents of preschool children with overweight and obesity: conceptual framework and study design of LOOPS- Lund overweight and obesity preschool study. BMC Public Health. 2012;12 :879. PMID:23072247.	Study Design, Independent Variable
231	Osborne CL,Forestell CA. Increasing children's consumption of fruit and vegetables: does the type of exposure matter?. Physiol Behav. 2012;106(3):362-8. PMID:22266134.	Independent Variable
232	Ostbye T,Krause KM,Stroo M,Lovelady CA,Evenson KR,Peterson BL,Bastian LA,Swamy GK,West DG,Brouwer RJ,Zucker NL. Parent-focused change to prevent obesity in preschoolers: results from the KAN-DO study. Prev Med. 2012;55(3):188-95. PMID:22705016.	Independent Variable
233	Ostbye T,Malhotra R,Stroo M,Lovelady C,Brouwer R,Zucker N,Fuemmeler B. The effect of the home environment on physical activity and dietary intake in preschool children. International Journal of Obesity. 2013;37(10):1314-1321.	Independent Variable
234	Pallan MJ,Adab P,Sitch AJ,Aveyard P. Are school physical activity characteristics associated with weight status in primary school children? A multilevel cross-sectional analysis of routine surveillance data. Arch Dis Child. 2014;99(2):135-41. PMID:24152572.	Age
235	Pan L,May AL,Wethington H,Dalenius K,Grummer-Strawn LM. Incidence of obesity among young U.S. children living in low-income families, 2008-2011. Pediatrics. 2013;132(6):1006-13. PMID:24276843.	Independent Variable, Age
236	Papaioannou MA,Cross MB,Power TG,Liu Y,Qu H,Shewchuk RM,Hughes SO. Feeding style differences in food parenting practices associated with fruit and vegetable intake in children from low-income families. J Nutr Educ Behav. 2013;45(6):643-51. PMID:23860101.	Independent Variable
237	Patel BP,Luhovyy B,Mollard R,Painter JE,Anderson GH. A premeal snack of raisins decreases mealtime food intake more than grapes in young children. Appl Physiol Nutr Metab. 2013;38(4):382-9. PMID:23713530.	Age, Sample Size
238	Pathare N,Haskvitz EM,Selleck M. Comparison of measures of physical performance among young children who are healthy weight, overweight, or obese. Pediatr Phys Ther. 2013;25(3):291-6. PMID:23797399.	Independent Variable
239	Patton SR,Dolan LM,Chen M,Powers SW. Dietary adherence and mealtime behaviors in young children with type 1 diabetes on intensive insulin therapy. J Acad Nutr Diet. 2013;113(2):258-62. PMID:23351629.	Unhealthy subjects
240	Patton SR,Odar C,Midyett LK,Clements MA. Pilot Study Results for a Novel Behavior Plus Nutrition	Independent Variable, Unhealthy

Excluded Articles: Early Childhood Education

The table below lists the excluded articles with at least one reason for exclusion, but may not reflect all possible reasons.

	Excluded Citations	Reason for Exclusion
	Intervention for Caregivers of Young Children With Type 1 Diabetes. J Nutr Educ Behav. 2014; . PMID:24438850.	subjects
241	Pei Z,Flexeder C,Fuertes E,Thiering E,Koletzko B,Cramer C,Berdel D,Lehmann I,Bauer CP,Heinrich J. Early life risk factors of being overweight at 10 years of age: results of the German birth cohorts GINIplus and LISAplus. Eur J Clin Nutr. 2013;67(8):855-62. PMID:23612517.	Location, Independent Variable, Age
242	Pelto GH,Armar-Klemesu M,Siekmann J,Schofield D. The focused ethnographic study 'assessing the behavioral and local market environment for improving the diets of infants and young children 6 to 23 months old' and its use in three countries. Matern Child Nutr. 2013;9 Suppl 1 :35-46. PMID:23167583.	Study Design, Location
243	Pena MM,Dixon B,Taveras EM. Are you talking to ME? The importance of ethnicity and culture in childhood obesity prevention and management. Child Obes. 2012;8(1):23-7. PMID:22799474.	Study Design
244	Persaud N,Maguire JL,Lebovic G,Carsley S,Khovratovich M,Randall Simpson JA,McCrindle BW,Parkin PC,Birken C. Association between serum cholesterol and eating behaviours during early childhood: a cross-sectional study. Cmaj. 2013;185(11):E531-6. PMID:23775611.	Location, Independent Variable
245	Persson Osowski C,Goranzon H,Fjellstrom C. Teachers' interaction with children in the school meal situation: the example of pedagogic meals in Sweden. J Nutr Educ Behav. 2013;45(5):420-7. PMID:23768894.	Location, Outcome
246	Peters J,Parletta N,Lynch J,Campbell K. A comparison of parental views of their pre-school children's 'healthy' versus 'unhealthy' diets. A qualitative study. Appetite. 2014;76c :129-136. PMID:24524974.	Location, Independent Variable
247	Piqueras MJ,Campoy C,Miranda MT,Decsi T,Koletzko B,Emmett PM. Growth in pre-school children from 3 european countries and its relationship with dietary differences. Annals of Nutrition and Metabolism. 2013;63 :1874.	Location, Independent Variable
248	Piziak V. A pilot study of a pictorial bilingual nutrition education game to improve the consumption of healthful foods in a head start population. Int J Environ Res Public Health. 2012;9(4):1319-25. PMID:22690195.	Outcome
249	Plachta-Danielzik S,Kehden B,Landsberg B,Schaffrath Rosario A,Kurth BM,Arnold C,Graf C,Hense S,Ahrens W,Muller MJ. Attributable risks for childhood overweight: evidence for limited effectiveness of prevention. Pediatrics. 2012;130(4):e865-71. PMID:22945402.	Location, Age
250	Pobutsky A,Bradbury E,Reyes-Salvail F,Kishaba G. Overweight and obesity among Hawai'i children aged 4 to 5 years enrolled in public schools in 2007-2008 and comparison with a similar 2002-2003 cohort. Hawaii J Med Public Health. 2013;72(7):225-36. PMID:23900736.	Study Design, Independent Variable
251	Po'e EK,Heerman WJ,Mistry RS,Barkin SL. Growing Right Onto Wellness (GROW): a family-centered, community-based obesity prevention randomized controlled trial for preschool child-parent pairs. Contemp Clin Trials. 2013;36(2):436-49. PMID:24012890.	Study Design, Independent Variable

Excluded Articles: Early Childhood Education

The table below lists the excluded articles with at least one reason for exclusion, but may not reflect all possible reasons.

	Excluded Citations	Reason for Exclusion
252	Porter CM. Community action to prevent childhood obesity: lessons from three US case studies. Child Obes. 2013;9(2):164-74. PMID:23517281.	Study Design, Independent Variable
253	Pratt CA,Boyington J,Esposito L,Pemberton VL,Bonds D,Kelley M,Yang S,Murray D,Stevens J. Childhood Obesity Prevention and Treatment Research (COPTR): interventions addressing multiple influences in childhood and adolescent obesity. Contemp Clin Trials. 2013;36(2):406-13. PMID:23999502.	Study Design
254	Raat H,Struijk MK,Remmers T,Vlasblom E,van Grieken A,Broeren SM,te Velde SJ,Beltman M,Boere-Boonekamp MM,L'Hoir MP. Primary prevention of overweight in preschool children, the BeeBOFT study (breastfeeding, breakfast daily, outside playing, few sweet drinks, less TV viewing): design of a cluster randomized controlled trial. BMC Public Health. 2013;13 :974. PMID:24138805.	Independent Variable, Age
255	Ramsay SA,Armstrong Shultz J,Johnson SL,Branen LJ,Fletcher JW,Anderson E. Child Care Mealtime and Active Play Partnerships (Child Care MAPP): evaluation of a training resource Web site for enhancing nutrition education communication. J Nutr Educ Behav. 2013;45(6):803-5. PMID:23800780.	Study Design, Independent Variable, Age
256	Rappaport EB,Daskalakis C,Sendecki JA. Using routinely collected growth data to assess a school-based obesity prevention strategy. Int J Obes (Lond). 2013;37(1):79-85. PMID:22945605.	Age
257	Rauber F,Hoffman DJ,Vitolo MR. Diet quality from pre-school to school age in Brazilian children: a 4-year follow-up in a randomised control study. Br J Nutr. 2014;111(3):499-505. PMID:23967839.	Independent Variable
258	Rawlins E,Baker G,Maynard M,Harding S. Perceptions of healthy eating and physical activity in an ethnically diverse sample of young children and their parents: the DEAL prevention of obesity study. J Hum Nutr Diet. 2013;26(2):132-44. PMID:22827466.	Location, Age
259	Reifsnider E,McCormick DP,Cullen KW,Szalacha L,Moramarco MW,Diaz A,Reyna L. A randomized controlled trial to prevent childhood obesity through early childhood feeding and parenting guidance: rationale and design of study. BMC Public Health. 2013;13 :880. PMID:24063435.	Independent Variable
260	Reznar MM,Carlson JS,Hughes SO,Pavangadkar AS,Scott MK,Hoerr SL. An Interactive Parents' Guide for Feeding Preschool-Aged Children: Pilot Studies for Improvement. J Acad Nutr Diet. 2014; . PMID:24512951.	Study Design, Independent Variable
261	Ridgers ND,Timperio A,Crawford D,Salmon J. Five-year changes in school recess and lunchtime and the contribution to children's daily physical activity. Br J Sports Med. 2012;46(10):741-6. PMID:21596716.	Age
262	Ritchie LD,Boyle M,Chandran K,Spector P,Whaley SE,James P,Samuels S,Hecht K,Crawford P. Participation in the child and adult care food program is associated with more nutritious foods and beverages in child care. Child Obes. 2012;8(3):224-9. PMID:22799548.	Outcome
263	Robbins JM,Nguyen JV,Houck KL,Inman KA,Nobis EA,Robbins SW. Overweight Among Children	Age

Excluded Articles: Early Childhood Education

The table below lists the excluded articles with at least one reason for exclusion, but may not reflect all possible reasons.

	Excluded Citations	Reason for Exclusion
	Younger Than 3 Years in a Low-Income Patient Population: Prevalence in 2010. Clin Pediatr (Phila). 2014; . PMID:24634432.	
264	Rodgers RF,Paxton SJ,Massey R,Campbell KJ,Wertheim EH,Skouteris H,Gibbons K. Maternal feeding practices predict weight gain and obesogenic eating behaviors in young children: a prospective study. Int J Behav Nutr Phys Act. 2013;10 :24. PMID:23414332.	Independent Variable
265	Rodriguez J,Applebaum J,Stephenson-Hunter C,Tinio A,Shapiro A. Cooking, healthy eating, fitness and fun (CHEFFs): qualitative evaluation of a nutrition education program for children living at urban family homeless shelters. Am J Public Health. 2013;103 Suppl 2 :S361-7. PMID:24148062.	Independent Variable
266	Roe LS,Meengs JS,Birch LL,Rolls BJ. Serving a variety of vegetables and fruit as a snack increased intake in preschool children. Am J Clin Nutr. 2013;98(3):693-9. PMID:23902783.	Outcome
267	Rosado JI,Johnson SB,McGinnity KA,Cuevas JP. Obesity among Latino children within a migrant farmworker community. Am J Prev Med. 2013;44(3 Suppl 3):S274-81. PMID:23415193.	Study Design, Independent Variable
268	Rosario R,Araujo A,Oliveira B,Padrao P,Lopes O,Teixeira V,Moreira A,Barros R,Pereira B,Moreira P. The impact of an intervention taught by trained teachers on childhood fruit and vegetable intake: A randomized trial. Journal of Obesity. 2012;2012 .	Age
269	Rothausen BW,Matthiessen J,Hoppe C,Brockhoff PB,Andersen LF,Tetens I. Differences in Danish children's diet quality on weekdays v. weekend days. Public Health Nutr. 2012;15(9):1653-60. PMID:22625874.	Location, Independent Variable, Age
270	Ruel MT,Alderman H. Nutrition-sensitive interventions and programmes: how can they help to accelerate progress in improving maternal and child nutrition?. Lancet. 2013;382(9891):536-51. PMID:23746780.	Study Design
271	Rush E,Reed P,McLennan S,Coppinger T,Simmons D,Graham D. A school-based obesity control programme: Project Energize. Two-year outcomes. Br J Nutr. 2012;107(4):581-7. PMID:21733268.	Location, Age
272	Rush E,Reed PW,Simmons D,Coppinger T,McLennan S,Graham D. Baseline measures for a school-based obesity control programme: Project Energize: differences by ethnicity, rurality, age and school socio-economic status. J Paediatr Child Health. 2013;49(4):E324-31. PMID:23199372.	Location, Age
273	Rust P,Hold E,Bayaty P,Wagner-Sahl K. Impact of socio-economic status on body weight of austrian kindergarten children. Annals of Nutrition and Metabolism. 2013;63 :364-365.	Location, Independent Variable
274	Saavedra JM,Deming D,Dattilo A,Reidy K. Lessons from the feeding infants and toddlers study in North America: what children eat, and implications for obesity prevention. Ann Nutr Metab. 2013;62 Suppl 3 :27-36. PMID:23970213.	Study Design, Age
275	Salvo D,Frediani JK,Ziegler TR,Cole CR. Food group intake patterns and nutrient intake vary across low-income Hispanic and African American preschool children in Atlanta: a cross sectional study. Nutr J. 2012;11 :62. PMID:22931188.	Independent Variable

Excluded Articles: Early Childhood Education

The table below lists the excluded articles with at least one reason for exclusion, but may not reflect all possible reasons.

	Excluded Citations	Reason for Exclusion
276	Sandy R,Tchernis R,Wilson J,Liu G,Zhou X. Effects of the built environment on childhood obesity: the case of urban recreational trails and crime. Econ Hum Biol. 2013;11(1):18-29. PMID:22459489.	Independent Variable
277	Santos C,Figueiredo M,Vieira M. Nutritional status, breakfast habits and fruit and vegetables consumption among children in a preschool at fundao city. Atencion Primaria. 2013;45 :150.	Location, Independent Variable
278	Santos-Beneit G,Sotos-Prieto M,Penalvo JL,Pocock S,Redondo J,Fuster V. Anthropometry and blood pressure in 3-5 year old children of madrid: Program si! study. Annals of Nutrition and Metabolism. 2013;63 :921.	Non-human Subjects
279	Savage JS,Peterson J,Marini M, Jr. Bordi PL,Birch LL. The addition of a plain or herb-flavored reduced-fat dip is associated with improved preschoolers' intake of vegetables. J Acad Nutr Diet. 2013;113(8):1090-5. PMID:23701754.	Outcome
280	Scarborough P,Payne C,Agu CG,Kaur A,Mizdrak A,Rayner M,Halford JC,Boyland E. How important is the choice of the nutrient profile model used to regulate broadcast advertising of foods to children? A comparison using a targeted data set. Eur J Clin Nutr. 2013;67(8):815-20. PMID:23801095.	Location, Independent Variable
281	Schindler JM,Corbett D,Forestell CA. Assessing the effect of food exposure on children's identification and acceptance of fruit and vegetables. Eat Behav. 2013;14(1):53-6. PMID:23265402.	Age
282	Schmeiser MD. The impact of long-term participation in the supplemental nutrition assistance program on child obesity. Health Econ. 2012;21(4):386-404. PMID:21305645.	Age
283	Sekhobo JP,Egglefield K,Edmunds LS,Shackman G. Evidence of the adoption and implementation of a statewide childhood obesity prevention initiative in the New York State WIC Program: the NY Fit WIC process evaluation. Health Educ Res. 2012;27(2):281-91. PMID:22052217.	Independent Variable
284	Sharma S,Dortch KS,Byrd-Williams C,Truxillio JB,Rahman GA,Bonsu P,Hoelscher D. Nutrition-related knowledge, attitudes, and dietary behaviors among head start teachers in Texas: a cross-sectional study. J Acad Nutr Diet. 2013;113(4):558-62. PMID:23415503.	Independent Variable, Outcome
285	Sherwood NE,French SA,Veblen-Mortenson S,Crain AL,Berge J,Kunin-Batson A,Mitchell N,Senso M. NET-Works: Linking families, communities and primary care to prevent obesity in preschool-age children. Contemp Clin Trials. 2013;36(2):544-54. PMID:24120933.	Study Design, Independent Variable
286	Shi X,Tubb L,Fingers ST,Chen S,Caffrey JL. Associations of physical activity and dietary behaviors with children's health and academic problems. J Sch Health. 2013;83(1):1-7. PMID:23253284.	Independent Variable, Age
287	Sigman-Grant M,Byington TA,Lindsay AR,Lu M,Mobley AR,Fitzgerald N,Hildebrand D. Preschoolers can distinguish between healthy and unhealthy foods: the all 4 kids study. J Nutr Educ Behav. 2014;46(2):121-7. PMID:24246710.	Outcome
288	Simmons S,Alexander JL,Ewing H,Whetzel S. SNAP participation in preschool-aged children and prevalence of overweight and obesity. J Sch Health. 2012;82(12):548-52. PMID:23151116.	Independent Variable, Non-human Subjects
289	Simon PA,Lightstone AS,Baldwin S,Kuo T,Shih M,Fielding JE. Declines in sugar-sweetened	Independent Variable

Excluded Articles: Early Childhood Education

The table below lists the excluded articles with at least one reason for exclusion, but may not reflect all possible reasons.

	Excluded Citations	Reason for Exclusion
	beverage consumption among children in Los Angeles County, 2007 and 2011. Prev Chronic Dis. 2013;10 :E131. PMID:23928456.	
290	Sisson SB,Campbell JE,May KB,Brittain DR,Monroe LA,Guss SH,Ladner JL. Assessment of food, nutrition, and physical activity practices in Oklahoma child-care centers. J Acad Nutr Diet. 2012;112(8):1230-40. PMID:22818731.	Outcome
291	Skala K,Chuang RJ,Evans A,Hedberg AM,Dave J,Sharma S. Ethnic differences in the home food environment and parental food practices among families of low-income Hispanic and African-American preschoolers. J Immigr Minor Health. 2012;14(6):1014-22. PMID:22262411.	Independent Variable
292	Slining MM,Mathias KC,Popkin BM. Trends in food and beverage sources among US children and adolescents: 1989-2010. J Acad Nutr Diet. 2013;113(12):1683-94. PMID:23916972.	Study Design, Independent Variable
293	Slusser W,Frankel F,Robison K,Fischer H,Cumberland WG,Neumann C. Pediatric overweight prevention through a parent training program for 2-4 year old Latino children. Child Obes. 2012;8(1):52-9. PMID:22799481.	Independent Variable
294	Small L,Bonds-McClain D,Melnyk B,Vaughan L,Gannon AM. The Preliminary Effects of a Primary Care-Based Randomized Treatment Trial With Overweight and Obese Young Children and Their Parents. J Pediatr Health Care. 2013; . PMID:23511090.	Independent Variable, Age
295	Small L,Bonds-McClain D,Vaughan L,Melnyk B,Gannon A,Thompson S. A parent-directed portion education intervention for young children: Be Beary Healthy. J Spec Pediatr Nurs. 2012;17(4):312-20. PMID:23009043.	Independent Variable
296	Soares NS,Hobson WL,Ruch-Ross H,Finneran M,Varrasso DA,Keller D. The influence of Community Access to Child Health (CATCH) program on community pediatrics. Pediatrics. 2014;133(1):e205-12. PMID:24323996.	Study Design, Independent Variable
297	Sokolovic N,Kuriyan R,Kurpad AV,Thomas T. Sleep and birthweight predict visceral adiposity in overweight/obese children. Pediatr Obes. 2013;8(3):e41-4. PMID:23512928.	Independent Variable, Unhealthy subjects
298	Sotos-Prieto M,Santos-Beneit G,Penalvo JL,Pocock S,Redondo J,Fuster V. Mediterranean dietary patterns in 3-5 year old children and their parents: The program si!/// study. Annals of Nutrition and Metabolism. 2013;63 :921-922.	Location, Independent Variable, Outcome
299	Spence AC,McNaughton SA,Lioret S,Hesketh KD,Crawford DA,Campbell KJ. A health promotion intervention can affect diet quality in early childhood. J Nutr. 2013;143(10):1672-8. PMID:23966329.	Location, Age
300	Story M,Hannan PJ,Fulkerson JA,Rock BH,Smyth M,Arcan C,Himes JH. Bright Start: Description and main outcomes from a group-randomized obesity prevention trial in American Indian children. Obesity (Silver Spring). 2012;20(11):2241-9. PMID:22513491.	Age
301	Tabak RG,Jones E,Jacobs JA,Dobbs T,Sutton V,Dove C,Brownson RC. Policy perceptions related to physical activity and healthy eating in Mississippi. J Public Health Manag Pract. 2013;19(3 Suppl	Unhealthy subjects, Age

Excluded Articles: Early Childhood Education

The table below lists the excluded articles with at least one reason for exclusion, but may not reflect all possible reasons.

	Excluded Citations	Reason for Exclusion
	1):S97-s104. PMID:23399933.	
302	Tabak RG,Tate DF,Stevens J,Siega-Riz AM,Ward DS. Family ties to health program: a randomized intervention to improve vegetable intake in children. J Nutr Educ Behav. 2012;44(2):166-71. PMID:22154131.	Independent Variable
303	Taber DR,Chriqui JF,Perna FM,Powell LM,Chaloupka FJ. Weight status among adolescents in States that govern competitive food nutrition content. Pediatrics. 2012;130(3):437-44. PMID:22891223.	Independent Variable, Age
304	Tandon PS,Zhou C,Christakis DA. The frequency of outdoor play for preschool age children cared for at home-based child care settings. Acad Pediatr. 2012;12(6):475-80. PMID:22980727.	Independent Variable
305	Taylor C,Darby H,Upton P,Upton D. Can a school-based intervention increase children's fruit and vegetable consumption in the home setting?. Perspectives in Public Health. 2013;133(6):330-336.	Age
306	Taylor RW,Williams SM,Dawson AM,Taylor BJ,Meredith-Jones K,Brown D. What factors influence uptake into family-based obesity treatment after weight screening?. J Pediatr. 2013;163(6):1657-1662.e1. PMID:24075623.	Location, Independent Variable, Unhealthy subjects
307	Tester JM,Yen IH,Laraia B. Using mobile fruit vendors to increase access to fresh fruit and vegetables for schoolchildren. Prev Chronic Dis. 2012;9 :E102. PMID:22632739.	Independent Variable, Age
308	Thibault H,Carriere C,Langevin C,Kossi Deti E,Barberger-Gateau P,Maurice S. Prevalence and factors associated with overweight and obesity in French primary-school children. Public Health Nutr. 2013;16(2):193-201. PMID:22953729.	Location, Age
309	Thompson DA,Joshi A,Hernandez RG,Bair-Merritt MH,Arora M,Luna R,Ellen JM. Nutrition education via a touchscreen: a randomized controlled trial in Latino immigrant parents of infants and toddlers. Acad Pediatr. 2012;12(5):412-9. PMID:22682718.	Independent Variable, Age
310	Thomson JL,Tussing-Humphreys LM,Goodman MH. Delta Healthy Sprouts: A randomized comparative effectiveness trial to promote maternal weight control and reduce childhood obesity in the Mississippi Delta. Contemp Clin Trials. 2014; . PMID:24685997.	Independent Variable
311	Thomson JL,Tussing-Humphreys LM,Martin CK,LeBlanc MM,Onufrak SJ. Associations among school characteristics and foodservice practices in a nationally representative sample of United States schools. J Nutr Educ Behav. 2012;44(5):423-31. PMID:22963956.	Independent Variable, Outcome
312	Turer CB,Stroo M,Brouwer RJ,Krause KM,Lovelady CA,Bastian LA,Peterson B,Ostbye T. Do high-risk preschoolers or overweight mothers meet AAP-recommended behavioral goals for reducing obesity?. Acad Pediatr. 2013;13(3):243-50. PMID:23491583.	Independent Variable
313	Turner-McGrievy GM,Hales SB,Baum AC. Transitioning to new child-care nutrition policies: nutrient content of preschool menus differs by presence of vegetarian main entree. J Acad Nutr Diet. 2014;114(1):117-23. PMID:24144990.	Outcome

Excluded Articles: Early Childhood Education

The table below lists the excluded articles with at least one reason for exclusion, but may not reflect all possible reasons.

	Excluded Citations	Reason for Exclusion
314	Tylka TL,Eneli IU,Kroon Van Diest AM,Lumeng JC. Which adaptive maternal eating behaviors predict child feeding practices? An examination with mothers of 2- to 5-year-old children. Eat Behav. 2013;14(1):57-63. PMID:23265403.	Independent Variable, Age
315	Underwood SM,Averhart L,Dean A,Ivalis R,Muluken M,Robinson R,Russ J,Williams M. Clinical evaluation and follow-up of body mass and blood pressure in pre-elementary school children: program review. J Natl Black Nurses Assoc. 2012;23(1):8-15. PMID:23061164.	Study Design, Independent Variable
316	Upton D,Upton P,Taylor C. Fruit and vegetable intake of primary school children: a study of school meals. J Hum Nutr Diet. 2012;25(6):557-62. PMID:22958172.	Age
317	Upton D,Upton P,Taylor C. Increasing children's lunchtime consumption of fruit and vegetables: an evaluation of the Food Dudes programme. Public Health Nutr. 2013;16(6):1066-72. PMID:23067425.	Age
318	Vale S,Trost S,Ruiz JJ,Rego C,Moreira P,Mota J. Physical activity guidelines and preschooler's obesity status. International Journal of Obesity. 2013;37(10):1352-1355.	Location, Independent Variable
319	Valmorbida JL,Vitolo MR. Factors associated with low consumption of fruits and vegetables by preschoolers of low socio-economic level. J Pediatr (Rio J). 2014; . PMID:24656872.	Location, Independent Variable
320	van Grieken A,Veldhuis L,Renders CM,Borsboom GJ,van der Wouden JC,Hirasing RA,Raat H. Population-based childhood overweight prevention: outcomes of the 'Be active, eat right' study. PLoS One. 2013;8(5):e65376. PMID:23741491.	Location, Unhealthy subjects
321	Van Hook J,Altman CE. Competitive Food Sales in Schools and Childhood Obesity: A Longitudinal Study. Sociol Educ. 2012;85(1):23-39. PMID:22611291.	Age
322	Van Stan S,Lessard L,Dupont Phillips K. The impact of a statewide training to increase child care providers' knowledge of nutrition and physical activity rules in Delaware. Child Obes. 2013;9(1):43-50. PMID:23327747.	Independent Variable
323	Vargas L,Jimenez-Cruz A,Bacardi-Gascon M. Unhealthy and healthy food consumption inside and outside of the school by pre-school and elementary school Mexican children in Tijuana, Mexico. J Community Health. 2013;38(6):1166-74. PMID:23864428.	Location, Independent Variable
324	Vartanian TP,Houser L. The effects of childhood SNAP use and neighborhood conditions on adult body mass index. Demography. 2012;49(3):1127-54. PMID:22644777.	Independent Variable
325	Veldhuis L,Vogel I,Renders CM,van Rossem L,Oenema A,HiraSing RA,Raat H. Behavioral risk factors for overweight in early childhood; the 'Be active, eat right' study. Int J Behav Nutr Phys Act. 2012;9 :74. PMID:22704042.	Independent Variable
326	Veldhuis L,Vogel I,van Rossem L,Renders CM,Hirasing RA,Mackenbach JP,Raat H. Influence of maternal and child lifestyle-related characteristics on the socioeconomic inequality in overweight and obesity among 5-year-old children; the "Be Active, Eat Right" Study. Int J Environ Res Public Health. 2013;10(6):2336-47. PMID:23743794.	Location, Independent Variable

Excluded Articles: Early Childhood Education

The table below lists the excluded articles with at least one reason for exclusion, but may not reflect all possible reasons.

	Excluded Citations	Reason for Exclusion
327	Verbestel V,De Coen V,Van Winckel M,Huybrechts I,Maes L,De Bourdeaudhuij I. Prevention of overweight in children younger than 2 years old: a pilot cluster-randomized controlled trial. Public Health Nutr. 2013; :1-9. PMID:23701835.	Age
328	Vereecken C,Covents M,Maes L,Moyson T. Formative evaluation of the feedback component of Children's and Adolescents' Nutrition Assessment and Advice on the Web (CANAA-W) among parents of schoolchildren. Public Health Nutr. 2013;16(1):15-26. PMID:23174271.	Independent Variable, Age
329	Vericker TC. Children's school-related food and physical activity behaviors are associated with body mass index. J Acad Nutr Diet. 2014;114(2):250-6. PMID:24209890.	Unhealthy subjects, Age
330	Visram S,Hall TD,Geddes L. Getting the balance right: qualitative evaluation of a holistic weight management intervention to address childhood obesity. J Public Health (Oxf). 2013;35(2):246-54. PMID:22967909.	Study Design, Location, Age
331	Vollmer RL,Mobley AR. A pilot study to explore how low-income mothers of different ethnic/racial backgrounds perceive and implement recommended childhood obesity prevention messages. Child Obes. 2013;9(3):261-8. PMID:23679199.	Independent Variable, Age
332	Wake M,Lycett K,Clifford SA,Sabin MA,Gunn J,Gibbons K,Hutton C,McCallum Z,Arnup SJ,Wittert G. Shared care obesity management in 3-10 year old children: 12 month outcomes of HopSCOTCH randomised trial. Bmj. 2013;346 :f3092. PMID:23751902.	Location, Independent Variable, Unhealthy subjects
333	Wake M,Lycett K,Sabin MA,Gunn J,Gibbons K,Hutton C,McCallum Z,York E,Stringer M,Wittert G. A shared-care model of obesity treatment for 3-10 year old children: protocol for the HopSCOTCH randomised controlled trial. BMC Pediatr. 2012;12 :39. PMID:22455381.	Location, Independent Variable, Age
334	Wang L, 3rd Dalton WT,Schetzina KE,Fulton-Robinson H,Holt N,Ho AL,Tudiver F,Wu T. Home food environment, dietary intake, and weight among overweight and obese children in Southern Appalachia. South Med J. 2013;106(10):550-7. PMID:24096948.	Study Design, Age
335	Wang YC,Orleans CT,Gortmaker SL. Reaching the healthy people goals for reducing childhood obesity: closing the energy gap. Am J Prev Med. 2012;42(5):437-44. PMID:22516482.	Independent Variable, Age
336	Watt TT,Appel L,Roberts K,Flores B,Morris S. Sugar, stress, and the Supplemental Nutrition Assistance Program: early childhood obesity risks among a clinic-based sample of low-income Hispanics. J Community Health. 2013;38(3):513-20. PMID:23197136.	Age
337	Watts SO,Pinero DJ,Alter MM,Lancaster KJ. An Assessment of nutrition education in selected counties in New York State elementary schools (kindergarten through fifth grade). J Nutr Educ Behav. 2012;44(6):474-80. PMID:23010012.	Independent Variable, Outcome, Age
338	Weatherspoon LJ,Venkatesh S,Horodynski MA,Stommel M,Brophy-Herb HE. Food patterns and mealtime behaviors in low-income mothers and toddlers. J Community Health Nurs. 2013;30(1):1-15. PMID:23384063.	Independent Variable

Excluded Articles: Early Childhood Education

The table below lists the excluded articles with at least one reason for exclusion, but may not reflect all possible reasons.

	Excluded Citations	Reason for Exclusion
339	Wehrly SE,Bonilla C,Perez M,Liew J. Controlling parental feeding practices and child body composition in ethnically and economically diverse preschool children. Appetite. 2014;73 :163-71. PMID:24269508.	Independent Variable
340	Wen LM,Baur LA,Rissel C,Flood V,Simpson JM,Hayes A,Hardy LL,Wardle K. Healthy Beginnings Trial Phase 2 study: follow-up and cost-effectiveness analysis. Contemp Clin Trials. 2012;33(2):396-401. PMID:22101220.	Study Design, Age
341	Whaley SE,Koleilat M,Whaley M,Gomez J,Meehan K,Saluja K. Impact of policy changes on infant feeding decisions among low-income women participating in the Special Supplemental Nutrition Program for Women, Infants, and Children. Am J Public Health. 2012;102(12):2269-73. PMID:23078467.	Independent Variable, Age
342	Whetstone LM,Kolasa KM,Collier DN. Participation in community-originated interventions is associated with positive changes in weight status and health behaviors in youth. Am J Health Promot. 2012;27(1):10-6. PMID:22950920.	Independent Variable, Age
343	Wiecha JL,Hall G,Gannett E,Roth B. Development of healthy eating and physical activity quality standards for out-of-school time programs. Child Obes. 2012;8(6):572-6. PMID:23181923.	Independent Variable
344	Wijesinha-Bettoni R,Orito A,Lowik M,McLean C,Muehlhoff E. Increasing fruit and vegetable consumption among schoolchildren: efforts in middle-income countries. Food Nutr Bull. 2013;34(1):75-94. PMID:23767283.	Location, Outcome
345	Willers SM,Brunekreef B,Smit HA,van der Beek EM,Gehring U,de Jongste C,Kerkhof M,Koppelman GH,Wijga AH. BMI development of normal weight and overweight children in the PIAMA study. PLoS One. 2012;7(6):e39517. PMID:22761811.	Independent Variable, Age
346	Williams PA,Cates SC,Blitstein JL,Hersey J,Gabor V,Ball M,Kosa K,Wilson H,Olson S,Singh A. Nutrition-Education Program Improves Preschoolers' At-Home Diet: A Group Randomized Trial. J Acad Nutr Diet. 2014; . PMID:24667090.	Outcome
347	Williamson DA,Han H,Johnson WD,Martin CK, Jr. Newton RL. Modification of the school cafeteria environment can impact childhood nutrition. Results from the Wise Mind and LA Health studies. Appetite. 2013;61(1):77-84. PMID:23154216.	Study Design, Independent Variable
348	Willis TA,George J,Hunt C,Roberts KP,Evans CE,Brown RE,Rudolf MC. Combating child obesity: impact of HENRY on parenting and family lifestyle. Pediatr Obes. 2013; . PMID:23818487.	Location, Independent Variable
349	Willis TA,Potrata B,Hunt C,Rudolf MC. Training community practitioners to work more effectively with parents to prevent childhood obesity: the impact of HENRY upon Children's Centres and their staff. J Hum Nutr Diet. 2012;25(5):460-8. PMID:22489933.	Outcome
350	Witt KE,Dunn C. Increasing fruit and vegetable consumption among preschoolers: evaluation of color me healthy. J Nutr Educ Behav. 2012;44(2):107-13. PMID:21924957.	Outcome

Excluded Articles: Early Childhood Education

The table below lists the excluded articles with at least one reason for exclusion, but may not reflect all possible reasons.

	Excluded Citations	Reason for Exclusion
351	Wojcicki JM,Heyman MB. Reducing childhood obesity by eliminating 100% fruit juice. Am J Public Health. 2012;102(9):1630-3. PMID:22813423.	Study Design
352	Wolfenden L,Wyse R,Campbell E,Brennan L,Campbell KJ,Fletcher A,Wiggers J,Bowman J,Heard TR. Randomized controlled trial of a telephone-based intervention for child fruit and vegetable intake: long-term follow-up. Am J Clin Nutr. 2014;99(3):543-50. PMID:24429539.	Location, Independent Variable
353	Wyse R,Wolfenden L,Campbell E,Campbell KJ,Wiggers J,Brennan L,Fletcher A,Bowman J,Heard TR. A cluster randomized controlled trial of a telephone-based parent intervention to increase preschoolers' fruit and vegetable consumption. Am J Clin Nutr. 2012;96(1):102-10. PMID:22623749.	Independent Variable
354	Xu H,Wen LM,Rissel C,Flood VM,Baur LA. Parenting style and dietary behaviour of young children. Findings from the Healthy Beginnings Trial. Appetite. 2013;71 :171-7. PMID:23994508.	Location, Independent Variable
355	Zask A,Adams JK,Brooks LO,Hughes DF. Tooty Fruity Vegie: an obesity prevention intervention evaluation in Australian preschools. Health Promot J Austr. 2012;23(1):10-5. PMID:22730932.	Non-human Subjects
356	Zenk SN,Powell LM,Odoms-Young AM,Krauss R,Fitzgibbon ML,Block D,Campbell RT. Impact of the revised Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) food package policy on fruit and vegetable prices. J Acad Nutr Diet. 2014;114(2):288-96. PMID:24183996.	Independent Variable