



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: <i>HEI and healthy food consumption scores:</i> NS Children: <i>HEI grain score:</i> $\beta=1.83$ (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 (\leq\$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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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: <i>Men:</i> OR=2.14 (95% CI: 1.19, 3.83), P<0.05 <i>Women:</i> NS <i>All other variables or subgroups:</i> 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: <ul style="list-style-type: none"> • <i>Soda intake (servings/d):</i> Incidence Rate Ratios (IRR)=1.078 (SE=0.035; P<0.05) • <i>All other foods:</i> NS All other food outlet types and food intake: NS Adolescents' food intake Convenience stores within 0.5 miles: <ul style="list-style-type: none"> • <i>Fast food intake (servings/d):</i> IRR=0.935 (SE=0.031;



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	<p>Hispanic (31%)</p> <p>Mean household income: <i>Children:</i> \$51,534.2; <i>Adolescents:</i> \$46,166.1</p> <p>Parent's education: <i>Children:</i> Less than high school (12.0%), college graduate (32.0%); <i>Adolescents:</i> Less than high school (21.0%), college graduate (28.0%)</p>		<p>P<0.05)</p> <ul style="list-style-type: none"> • <i>Soda intake (servings/d):</i> IRR=0.936 (SE=0.031; P<0.05) <p>Small food stores within 0.5 miles: <i>Fast food intake (servings/d):</i> IRR=1.017 (SE=0.005; P<0.01)</p> <p>Grocery stores within 0.5 miles:</p> <ul style="list-style-type: none"> • <i>Fast food intake (servings/d):</i> IRR=1.083 (SE=0.034; P<0.05) • <i>Soda intake (servings/d):</i> IRR=1.088 (SE=0.031; P<0.01) <p>Large supermarkets within 0.5 miles: <i>Fast food intake (servings/d):</i> IRR=0.930 (SE=0.036; P<0.05)</p> <p>All other food outlet types and food intake: NS</p>
<p>Carroll-Scott, 2013</p> <p>Cross-sectional study</p> <p>US</p> <p>Risk of bias: 0/26</p>	<p>N=1,048</p> <p>10.9y (SD=0.8)</p> <p>52.4% female</p> <p>White, other 10.5%, Black 40.7%, Latino 48.9%</p> <p>Free/reduced lunch eligibility: Eligible (76.9%), not eligible (12.0%)</p> <p>Food secure (self-report): Yes (76.7%), No (10.5%)</p>	<p>1) Walking distance to nearest food outlet</p> <p>2) Food outlet density</p>	<p>Diet quality</p> <p>Nearest grocery store >0.5 miles:</p> <ul style="list-style-type: none"> • <i>Healthy eating score:</i> NS • <i>Unhealthy eating score:</i> NS <p>Nearest fast-food restaurant <0.25 miles:</p> <ul style="list-style-type: none"> • <i>Healthy eating score:</i> NS • <i>Unhealthy eating score:</i> NS
<p>Caspi, 2012</p> <p>Cross-sectional study</p>	<p>N=743</p> <p>18-60y or older</p>	<p>Distance to the supermarket</p>	<p>Fruit and vegetable intake</p> <p>Distance to supermarket: NS</p>



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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: <ul style="list-style-type: none"> • <i>F/V variety:</i> NS • <i>F/V freshness:</i> NS • <i>F/V price:</i> $\beta = -0.310$ (95% CI: -0.446, -0.174); $P < 0.01$ Miles to supermarket: <ul style="list-style-type: none"> • <i>Full sample:</i> $\beta = -0.011$ (95% CI: -0.021, 0); $P < 0.05$ • <i>Urban area:</i> NS • <i>Rural area:</i> $\beta = -0.013$ (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-healthy" food outlets (supermarkets, fruit/vegetable markets, non-fast-food restaurants) 2) Proximity to "less-healthy" food outlets (convenience stores, fast-food restaurants).	Fruit and vegetable intake <i>Proximity to more-healthy food outlets or less-healthy food outlets:</i> NS



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	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: <ul style="list-style-type: none"> • <i>Vegetable intake (ref: <1 serving/day):</i> OR=3.07 (95% CI: 1.78, 5.31) • <i>High meat intake (ref: <5 servings/day):</i> OR=1.58 (95% CI: 1.06, 2.35) • <i>All other diet variables: fruits, grains, milk, total HEI score:</i> 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): <ul style="list-style-type: none"> • <i>Convenience stores:</i> NS; OR=1.95 (95% CI: 1.11, 3.45) • <i>Farmers market:</i> NS; NS • <i>Grocery stores/supermarkets:</i> NS; NS Vegetable intake (ref: <1 serving/day): <ul style="list-style-type: none"> • <i>Convenience stores:</i> NS; OR=5.00 (95% CI: 2.15, 11.61) • <i>Farmers market:</i> OR=6.92 (95% CI: 4.09, 11.69); OR=4.36 (95% CI: 1.85, 10.28) • <i>Grocery stores/supermarkets:</i> OR=3.04 (95% CI: 1.13, 8.17); OR=6.91 (95% CI: 4.09, 11.69)



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			<p>Milk intake (ref: <1 serving/day):</p> <ul style="list-style-type: none"> • <i>Convenience stores</i>: NS; OR=3.01 (95% CI: 1.42, 6.38) • <i>Farmers market</i>: OR=3.79 (95% CI: 2.14, 6.71); OR=3.23 (95% CI: 1.64, 6.37) • <i>Grocery stores/supermarkets</i>: OR=2.65 (95% CI: 1.64, 4.28); NS <p>Grain intake (ref: <5 servings/day):</p> <ul style="list-style-type: none"> • <i>Convenience stores</i>: NS; NS • <i>Farmers market</i>: OR=1.76 (95% CI: 1.01, 3.05); NS • <i>Grocery stores/supermarkets</i>: OR=2.13 (95% CI: 1.55, 2.93); OR=1.76 (95% CI: 1.01, 3.05) <p>Meat intake (ref: <5 servings/day):</p> <ul style="list-style-type: none"> • <i>Convenience stores</i>: OR=0.46 (95% CI: 0.24, 0.88); OR=3.25 (95% CI: 1.70, 6.22) • <i>Farmers market</i>: OR=3.34 (95% CI: 2.06, 5.43); OR=2.82 (95% CI=1.68, 4.73) • <i>Grocery stores/supermarkets</i>: OR=2.75 (95% CI: 1.51, 5.01); OR=3.34 (95% CI: 2.06, 5.43) <p>Diet quality (total HEI scores):</p> <ul style="list-style-type: none"> • <i>Convenience stores</i>: NS; β=3.69 (95% CI: 0.32, 7.07) • <i>Farmers market</i>: NS; NS • <i>Grocery stores/supermarkets</i>: NS; NS
Jack, 2013	N=15,634	Healthy food outlet density.	Fruit and vegetable intake \geq5 servings/day



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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): <ul style="list-style-type: none"> • <i>Full sample (quartile 4):</i> NS • <i>Females (quartile 4):</i> NS • <i>Males (quartile 4):</i> NS • <i>High income zip codes (quartile 4):</i> NS • <i>Low income zip codes (quartile 4):</i> 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: <i>Distance to small food store:</i> z=2.63; P=0.008 Vegetable intake (excludes fried potato, potato salad, coleslaw): <i>Distance to small food store:</i> NS; P=0.06 Fried potato, potato salad, and coleslaw intake: <i>Distance to small food store:</i> 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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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 <ul style="list-style-type: none"> • Convenience store within 1,600m: <i>Sugar-sweetened beverage (SSB) intake:</i> $\beta=0.24$ (95% CI: 0.06, 0.41; $P<0.01$) • Distance to nearest grocery store: <i>SSB intake:</i> $\beta=-0.005$ (95% CI: -0.01, -0.001; $P<0.01$) • Grocery store within 1600m: <i>SSB intake:</i> $\beta=0.31$ (95% CI: 0.11, 0.51; $P<0.01$) • Any food outlet within 1600m: <i>SSB intake:</i> $\beta=0.24$ (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) <i>Healthy diet [top quintile of Alternate Healthy Eating Index (AHEI) diet score]:</i> RP=0.75 (95% CI: 0.59, 0.95) <i>Healthy diet (bottom quintile of "fats and processed meats" dietary pattern):</i> RP=0.54 (95% CI: 0.42, 0.70)



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<p>Ollberding, 2012</p> <p>Cross-sectional study</p> <p>US</p> <p>Risk of bias: 1/26</p>	<p>\$34,999 (22.7%); ≥\$35,000 (21.7%)</p> <p>N=384</p> <p>18-35y (25.3%), 36-55y (39.6%), ≥ 56y (34.9%)</p> <p>63.5% female</p> <p>Non-Hispanic White 32.3%, Asian-American 35.9%, Other/mixed race 31.0%</p> <p>Education: Less than high school (25.3%), some college (28.9%), college graduate (45.6%)</p> <p>Annual individual income: Less than \$30,000 (24.5%), \$30,000-\$59,999 (29.2%), \$60,000 or more (36.5%)</p>	<p>"Healthy" and "unhealthy" food outlet density.</p>	<p>Fruit and vegetable intake servings</p> <p>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</p> <p>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</p> <p>All outer measures of access, distance, and food outlet type: NS</p>
<p>Powell, 2009</p> <p>Cross-sectional study</p> <p>US</p> <p>Risk of bias: 1/26</p>	<p>N=3,739</p> <p>20.02y (SD=1.43); 18-23 y</p> <p>47.1% female</p> <p>White 68.3%, Black 12.4%, Asian 2.9%, Hispanic 14.0%, Other race 2.4%</p> <p>Education: Not completed high school (17.1%), completed high school (42.6%), some or completed college (40.3), enrolled in college (41.6%)</p> <p>Income: Youth income (\$7,500; SD=\$8,600),</p>	<p>1) Food price index</p> <p>2) Food outlet density</p>	<p>Fruit and vegetable intake</p> <p>Price of F/V: $\beta=0.664$ (SE=0.032); P<0.05</p> <p>Price of food at home: $\beta=0.680$ (SE=0.051); P<0.01</p> <p>Price of meat, dairy and bread: NS</p> <p>Price of fast food: NS</p> <p>Number of grocery stores: $\beta=0.975$ (SE=0.050); P<0.05</p> <p>Number of convenience stores: NS</p> <p>Number of supermarkets: NS</p>



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<p>Sharkey, 2010</p> <p>Cross-sectional study</p> <p>US</p> <p>Risk of bias: 1/26</p>	<p>parental income (\$8,190; SD=\$7,390)</p> <p>N=582</p> <p>69.92y (SD=6.91); 60-90y</p> <p>68.2% female</p> <p>Minority: 14.4%</p> <p>Education: 13.1% less than high school</p> <p>Household income: ≤100% Federal Poverty Level (FPL) (17.0%), 101-199% FPL (16.3%)</p>	<p>1) Supermarket proximity</p> <p>2) Availability and variety of fresh and processed fruits and vegetables in food stores.</p>	<p>Fruit and vegetable intake</p> <p>Distance to nearest food store with fresh fruit or vegetables:</p> <ul style="list-style-type: none"> • <i>Fruit intake:</i> NS • <i>Vegetable intake:</i> NS <p>Distance to nearest food store with any fruits or vegetables:</p> <ul style="list-style-type: none"> • <i>Fruit intake:</i> $\beta=-0.027$ (SE=0.009; P=0.003) • <i>Vegetable intake:</i> NS <p>Distance to nearest supermarket:</p> <ul style="list-style-type: none"> • <i>Fruit intake:</i> $\beta=-0.012$ (SE=0.004; P=0.003) • <i>Vegetable intake:</i> $\beta=-0.008$ (SE=0.004; P=0.033) <p>Has few grocery stores:</p> <ul style="list-style-type: none"> • <i>Fruit intake:</i> NS • <i>Vegetable intake:</i> $\beta=-0.240$ (SE=0.119; P=0.002) <p>Fruit/vegetable variety at primary food outlet:</p> <ul style="list-style-type: none"> • <i>Fruit intake:</i> $\beta=-0.276$ (SE=0.110), P=0.012 • <i>Vegetable intake:</i> NS
<p>Zenk, 2009</p> <p>Cross-sectional study</p>	<p>N=919</p> <p>46.28y (SE=0.84)</p>	<p>1) Food store density</p> <p>2) Supermarket proximity</p>	<p>Fruit and vegetable intake</p> <p>Presence of a large grocery store: $\beta=0.691$ (SE=0.210; P=0.002)</p>



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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)