

How Far is Local?

Tennessee Consumer Perceptions About Travel Distance for Milk and Dairy Products

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Background

- As with other states, local foods have grown in popularity. As an example, the number of farmers markets in the state rose from 99 in 2013 to 129 in 2018 (USDA/ERS).
- At the same time, the state's number of dairy farms have been declining at a rapid rate, from 979 operations in 2012 to 418 operations in 2017 (USDA/NASS).
- Facing market challenges, some dairy farmers have elected to go into value-added processing. Local milk and dairy products may bring price premiums; however, the question arises, how far can these dairy products travel and still retain local price premiums by consumers?
- This study examines how the definition of what is “local” distance may vary across milk and dairy products and how consumer demographics, expenditures, shopping patterns, and attitudes about local foods may influence perceptions about distances that constitute “local” for milk and dairy products.

Prior Studies

- Adams and Adams (2011) found consumers defined local < 100 miles from their homes, significantly less than the USDA definition of within 400 miles (Martinez, et al. 2010). Nurse, Onozaka, and Thilmany McFadden (2010) found most consumers considered a 50-mile radius as local. Bir et al. (2019) found that most respondents viewed local as their county of residence, from their county or neighboring counties, or within 100 miles from their home.
- Consumer perceptions about local can drive their WTP for local food products. Lopez and Khanal (2021) examined regional and distance effects on consumer preferences for local milk. They found that consumer preferences for local milk decay with distance, with this effect being stronger in the NE compared with the South.
- A variety of other studies have shown that product miles traveled can influence WTP for products (Oysters-Li, Ahsanuzzaman, & Kent, 2020; Steak-Lim and Hu, 2013, Meats-Wolf and McLennan, 2017)

Data and Methods

- This study hypothesizes that what is considered local miles may vary by type of product (for example: fluid milk, ice cream, or cheeses).
- Travel distance to be considered local for milk and for dairy products were hypothesized to be affected by demographics, expenditures, shopping patterns, and attitudes about local foods.
$$\text{Miles Local Milk}_i = f(\mathbf{X}_i)$$
$$\text{Miles Local Dairy Products}_i = f(\mathbf{X}_i)$$
$$\mathbf{X}_i = \text{Milk \& Dairy Expenditures, Farm Background, Female, Age, Household Income, Education, Household Size, Urbanization, Attitudes Toward Organic, Attitudes Toward Local}$$
- The CMP module in STATA 17.0 was used to estimate seemingly unrelated regressions with correlated errors. Note: The data had very few '0' miles hence tobit models were not estimated.

Data and Methods

Data are from a 2019 online survey through Qualtrics

- Qualtrics provided the panel of consumers
 - Tennessee residents
 - Aged 18 years and older
 - Primary food shoppers they or a household member at least occasionally consumer milk or dairy products.
- IRB Approval under UTK University of Tennessee Institutional Review Board (UTK IRB-18-04484-XM).

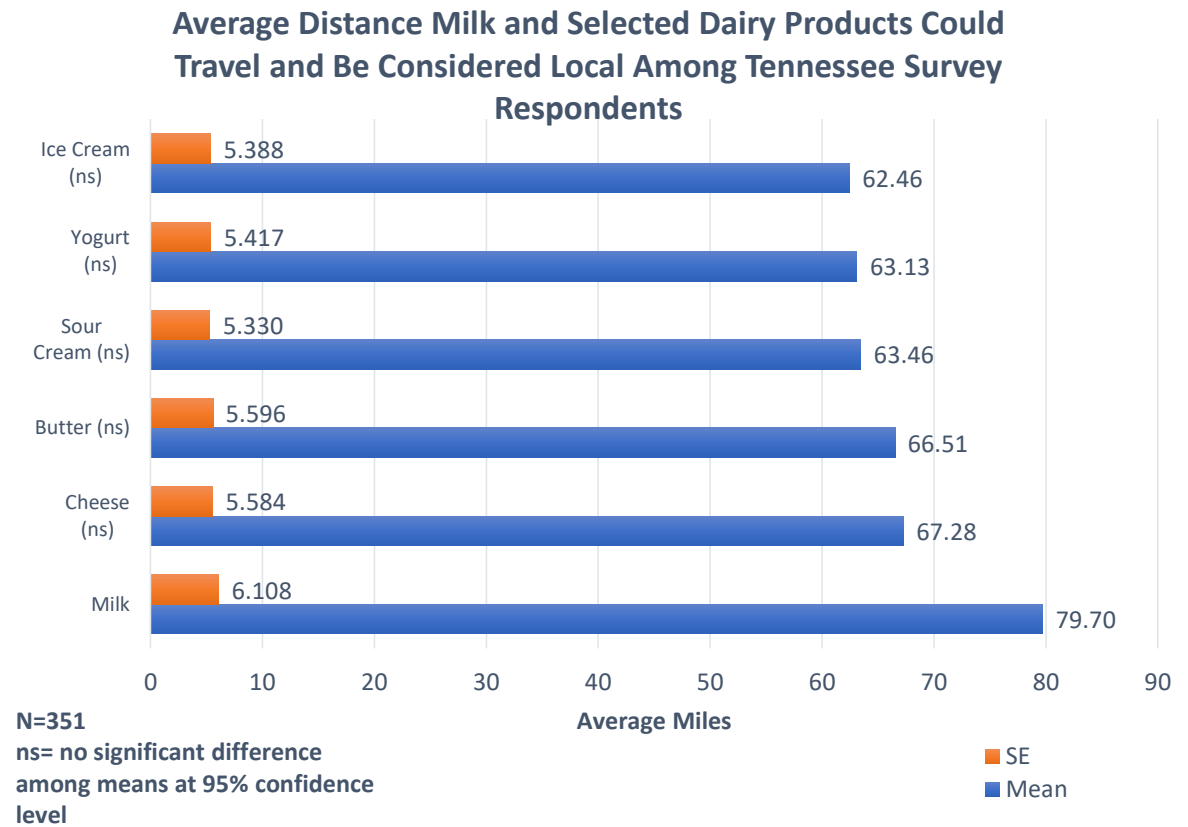
Data and Methods

- The survey contained several sections including questions about household consumption of milk and dairy products.
- Respondents were also asked about preference for an existing Tennessee Milk logo and a hypothetical processed dairy products made with Tennessee milk logo (these are addressed in other papers).
- Questions were also asked about milk purchase patterns, consumption frequency of processed dairy products.
- Respondents were asked about attitudes toward local products.
- Demographic information was also collected (gender, age, income, education, etc.).
- Local Travel Distance Information was elicited as “For processed dairy products (milk) to be considered **LOCALLY PRODUCED**, what is the **maximum number of miles they should travel?**”, with the following products being evaluated: cheese, ice cream, yogurt, sour cream, butter, and milk.

Results-Average Distance to be Called Local

- Respondents indicated milk could travel just under 80 miles and still be called local.
- Other dairy products local distance were 67.3 miles for cheese, 66.5 miles for butter, 63.5 miles for sour cream, 63.1 miles for yogurt, and 62.5 miles for ice cream.
- The average miles fluid milk could travel and be called local was significantly farther than the other dairy products at the 95% confidence level.
- No significant differences were found in the mean local miles for the non-fluid milk, processed dairy products.
- In the model of distance products could travel and be called local, the average of the dairy products is modeled and along with milk distance.

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Results-Variable Names, Definitions, and Means for the SUR Model of Local Travel Distance for Milk and Dairy Products

Variable Name	Definition	Mean	SD
Dependent Variables		N=316	
Miles Local Milk	Miles fluid milk could travel and be considered local	76.206	90.025
Miles Local Dairy Products	Miles dairy products (Average of several products) could travel and still be considered local	63.610	88.589
Explanatory Variables			
Monthly Expenditures Milk & Dairy	Dollars per month spend on milk and dairy products	58.84	25.18
Farm Background	1 if they or a household member had farm background, 0 otherwise	0.427	0.495
Female	1 if female, 0 otherwise	0.835	0.371
Age	Age in years	44.453	14.127
Age Squared	Age in years squared	2174.959	1299.046
Household Income	Household income for 2018 in Thousand Dollars	46.978	33.584
College Graduate	1 if college graduate, 0 otherwise	0.244	0.430
Household Size	Household size	2.981	1.573
Metro Residence	1 if reside in metro area, 0 otherwise	0.155	0.363
Shop Farmers Markets	1= strongly disagree, ..., 5=strongly agree	2.791	1.273
Buy Organic When Can	" "	2.554	1.336
Choose Grocer Based on Local Foods	" "	2.725	1.286
Local Foods Support Farmers	" "	4.241	0.956
Local Foods Fresher	" "	4.035	1.031
Local Foods Safer	" "	3.434	1.192
Local Foods Higher Quality	" "	3.519	1.167

- A total of 316 answered all questions used in the estimated model.
- For these 316, the average local miles for milk was 76.2 and for dairy products was 63.6 miles.
- The local miles are hypothesized to be influenced by demographics, shopping patterns, and attitudes.

Results-Comparison of Demographics with State Level Averages

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Dependent Variables		N=316	
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- The average age was 44.5 years old, while the statewide population's average age was 39 (U.S. Census Bureau, 2020).
- The percent female was 83.5 percent, compared with the statewide percentage of 51 percent. This discrepancy can potentially be explained by the fact that a person responsible for the household food shopping was asked to complete the survey (Schaeffer, 2019).
- Mean income of the sample was \$46,978, while the median household income for the state was about \$52,000.
- 24.4 percent of the sample were college graduates compared to 27.5 percent for Tennessee.
- For these indicators, except for gender, the sample compared average estimates are similar to those of the state's population.

Results-Averages of Opinion Variables Regarding Local Foods

Variable Name	Definition	Mean	SD
Dependent Variables		N=316	
Miles Local Milk	Miles fluid milk could travel and be considered local	76.206	90.025
Miles Local Dairy Products	Miles dairy products (Average of several products) could travel and still be considered local	63.610	88.589
Explanatory Variables			
Monthly Expenditures Milk & Dairy	Dollars per month spend on milk and dairy products	29.006	10.318
Farm Background	1 if they our a household member had farm background, 0 otherwise	0.427	0.495
Female	1 if female, 0 otherwise	0.835	0.371
Age	Age in years	44.453	14.127
Age Squared	Age in years squared	2174.959	1299.046
Household Income	Household income for 2018 in Thousand Dollars	46.978	33.584
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- The respondents tended to strongly agree that local foods help farmers and are fresher. They were slightly less in agreement that local foods are safer or higher quality.
- The respondents only somewhat agreed that they regularly shop at farmers markets, that they buy organic when they can, and that they choose grocers based on local foods offerings.

SUR Model of Miles Traveled to be Local for Fluid Milk & Dairy Products

	Miles Local Milk			Miles Local Dairy Products	
	Estimate	SE		Estimate	SE
Intercept	28.624	62.179		10.141	35.016
Monthly Expenditures Milk and Dairy	0.129	0.233		0.325	0.242
Farm Background	23.065	12.155*		12.319	11.236
Female	5.499	11.551		7.215	10.628
Age	1.588	1.885		6.355	2.210***
Age Squared	-0.016	0.021		-0.071	0.024***
Household Income	0.000	0.000		0.000	0.000
College Graduate	5.387	8.963		3.786	8.089
Household Size	3.200	5.140		-4.617	2.806*
Metro Residence	3.270	21.136		-20.191	9.081**
Shop Farmers Markets	11.052	6.678*		-0.773	4.720
Buy Organic When Can	1.235	6.078		-5.519	3.955
Choose Grocer Based on Local Foods	-19.395	11.497*		-9.584	4.328**
Local Foods Support Farmers	2.356	5.579		-1.181	10.530
Local Foods Fresher	6.298	8.048		3.280	6.746
Local Foods Safer	0.686	6.680		2.295	9.151
Local Foods Higher Quality	-10.486	8.370		-15.741	7.778**
ρ_{12}	0.488	0.128***			
LLR Test Against Intercept Only (32df)=57.55***					
LL = -3654.0023					
Mean VIF=6.47					

- The LLR Test Against Intercept Only was significant, indicating overall model significance.
- Mean VIF=6.47, This does not suggest strong multicollinearity issues. When Age Squared is removed, this number drops.
- The correlation coefficient was significantly different from zero, reflecting correlation between the error terms from the two equations.

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- **Monthly Expenditures Milk and Dairy** nor **Household Income** had no significant effects on local milk or local dairy products miles.
- Compared with those with no farm background, those with a **Farm Background** would consider milk local that travels 23.1 miles farther. However, no significant effect of farm background was found for local miles for other processed dairy products.
- **Female** gender nor being a **College Graduate** significantly affected local miles for milk or dairy products.
- While **Age** had no effect on local miles for milk, it had a non-linear effect for dairy products, first increasing with age, then decreasing, with a turning point at 44.8 years of age.
- Greater **Household Size** had a negative effect on local dairy products miles. Each additional household member decreased the distance for dairy products to be local by 4.6 miles.
- **Metro Residence** had a negative effect on local dairy product miles, with metro residents considering local to be 20.19 miles less than more suburban or rural residents.

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R^2_{12}	0.488	0.128***			
LLR Test Against Intercept Only (32df)=57.55***					
LL =-3654.0023		Mean VIF=6.47			

- Those who agreed they regularly shopped at farmers (**Shop Farmers Markets**) felt milk could travel farther than those who did not, with each level of agreement increasing local milk miles by 11 miles.
- While agreeing that they **Buy Organic When Can** had no effect, **Choose Grocer Based on Local Foods** did. For each level of agreement with the statement regarding choosing a grocer based on local products, the local milk miles decreased by 19.4 miles and local dairy products miles decreased by 9.6 miles.
- Although perceptions about local foods being fresher or safer had no significant effect, the perceptions about local foods being higher quality did. For each level of agreement with **Local Foods Higher Quality**, the local dairy products miles decreased by 15.7.

Conclusions

- Tennessee consumers' view ***milk as being local within just under 80 miles.***
- It was anticipated that the less processed or more perishable products might be considered local within shorter distances. ***Surprisingly, consumers viewed the distances for other dairy products as lower than milk (62 to 67 miles).***
- One possible explanation for the above result is that consumers may more readily brand-identify with more processed products and hence wish local brand to be from a somewhat closer radius.
- For each of the products, however, the results are well within the range found in prior research (Adams and Adams, 2011; Nurse, Onozaka, and Thilmany McFadden, 2010 ; Bir et al., 2019)
- A couple of the results suggest that ***where consumers shop for local foods may influence their perceptions of local distance. Consumers who more strongly agreed that they shop at farmers markets regularly and had farm backgrounds were willing to consider milk from farther distances as local.***
- Conversely, ***those who chose grocers based on them selling local foods were willing to consider both milk and dairy products as local from shorter distances than those who do not chose their grocers on this basis.*** These results suggest that marketing of milk from farther distances may hold greater appeal to farmers market shoppers, but consumers shopping grocers based on local foods, as willing to consider milk and dairy products as local from shorter distances.

Conclusions

- ***Youngest and oldest shoppers were willing to consider milk as local from shorter distances than those who are aged in their 40's.***
- ***Household size also had a negative effect on local distance for processed dairy products.*** This may reflect the effects of children in the household and wanting to know more about local products that are being considered for purchase.
- ***Metro residents were willing to consider dairy products from shorter distances than their less urbanized counterparts.*** The fact that metro considered local shorter, while farm background and farmers market shoppers were willing to consider local as farther suggests that greater connection to rural areas or farming may make consumers more accepting of products from farther distances.
- ***Finally, perceptions that local products are higher quality has a negative effect on distances that are considered local for processed dairy products.*** Hence, those who are shopping for premium ice creams or artisanal cheeses may prefer products from closer by.

References Used

- Adams, D. C., and A. E. Adams. 2011. "De-placing Local at the Farmers' Market: Consumer Conceptions of Local Foods." *Journal of Rural Social Sciences* 26(2):74–100.
- Bir, C., H. Lai, N. Widmar, N. Thompson, J. Ellett, and C. Crosslin. "There's No Place Like Home: Inquiry into Preferences for Local Foods." *Journal of Food Distribution Research* 50,1: 29-45.
- Li, T., Ahsanuzzaman, K. Messer. 2020. "Is This Food "Local"? Evidence from a Framed Field Experiment." *Journal of Agricultural and Resource Economics* 45,2:179-198.
- Limm, K. and W. Hu. 2013. "How local is local? Consumer Preference for Steaks with Different Food Mile Implications." Selected Paper prepared for presentation at the Southern Agricultural Economics Association Annual Meeting, February 3-5, Orlando, Florida
- Lopez, R. and B. Khanal. 2021. "Regional and Distance Effects on Consumer Preferences for Local Milk." 2021 Agricultural and Applied Economics Association (AAEA) Conference Annual Meeting, August 1-3, Austin, Texas.
- Martinez, S., M. Hand, M. DaPra, S. Pollack, K. Ralston, T. Smith, S. Vogel, S. Clark, L. Lohr, S. Low, and C. Newman. 2010. *Local Food Systems: Concepts, Impacts and Issues*. Economic Research Report-97. United States Department of Agriculture, Economic Research Service.
- Nurse, G., Y. Onozaka and D. Thilmany McFadden. 2012. "Consumer Motivations and Buying Behavior: The Case of the Local Food System Movement." *Journal of Food Products Marketing*. 18:5, 385-396
- Schaefer, K. 2019. *Among U.S. Couples, Women Do More Cooking and Grocery Shopping than Men.* Pew Research Center. September 14. Available online: <https://pewrsr.ch/2meYzTm>.
- StataCorp. 2021. *Stata Statistical Software, Version 17.0*. College Station, TX: StataCorp.
- U.S. Census Bureau. 2020. *Tennessee Demographics*. Available online: <https://data.census.gov/cedsci/profile?g=0400000US47&q=Tennessee>.
- Wolf, M. and S. McLennan. 2017. "Local Meat Brands Attract Consumer Demand." *Journal of Food Distribution Research* 48,1: 111-112.