

## INTRODUCTION

- There is evidence indicating that individuals of low socioeconomic status and minority racial/ethnic background may suffer greater rates of foodborne illness.<sup>1,4</sup>
- It is not known where in the farm to fork continuum these populations might experience greater risks for foodborne illness than others.
- Populations of low socioeconomic status and minority racial/ethnic background have been shown to have limited access to, and ability to transport, food.<sup>2,3</sup>
- The purpose of this research was to examine whether there is a difference in the microbial loads of ready-to-eat products at retail food stores available to populations of different demographics.

## MATERIALS AND METHODS

- Study was conducted in the city of Philadelphia, Pennsylvania.
- Data from the US Census Bureau was used to identify census tracts with high Asian, Hispanic, Caucasian and African American populations, as well as high (HSES) and low socioeconomic status (LSES) areas.
- Two databases were used to identify food store outlets available in identified tracts: Dun and Bradstreet and data available online at the Philadelphia Department of Health.
- The following ready-to-eat (RTE) foods prepared in-store were purchased when available: lunchmeat and hoagies.



Figure 1. Hoagie sample



Figure 2. Lunchmeat

- Food samples were tested for:
  - ✓ aerobic plate count
  - ✓ coliforms
  - ✓ fecal coliforms
  - ✓ *E. coli*
  - ✓ *S. aureus*
  - ✓ *L. monocytogenes*

- Milk and eggs were tested for temperature. In addition, milk samples were tested for aerobic plate count to detect abusive temperatures during transportation or storage.



Figure 3. Eggs being tested for temperature



Figure 4. Milk being tested for temperature

- Sixty four (64) census tracts were identified in the city of Philadelphia (Fig. 5).

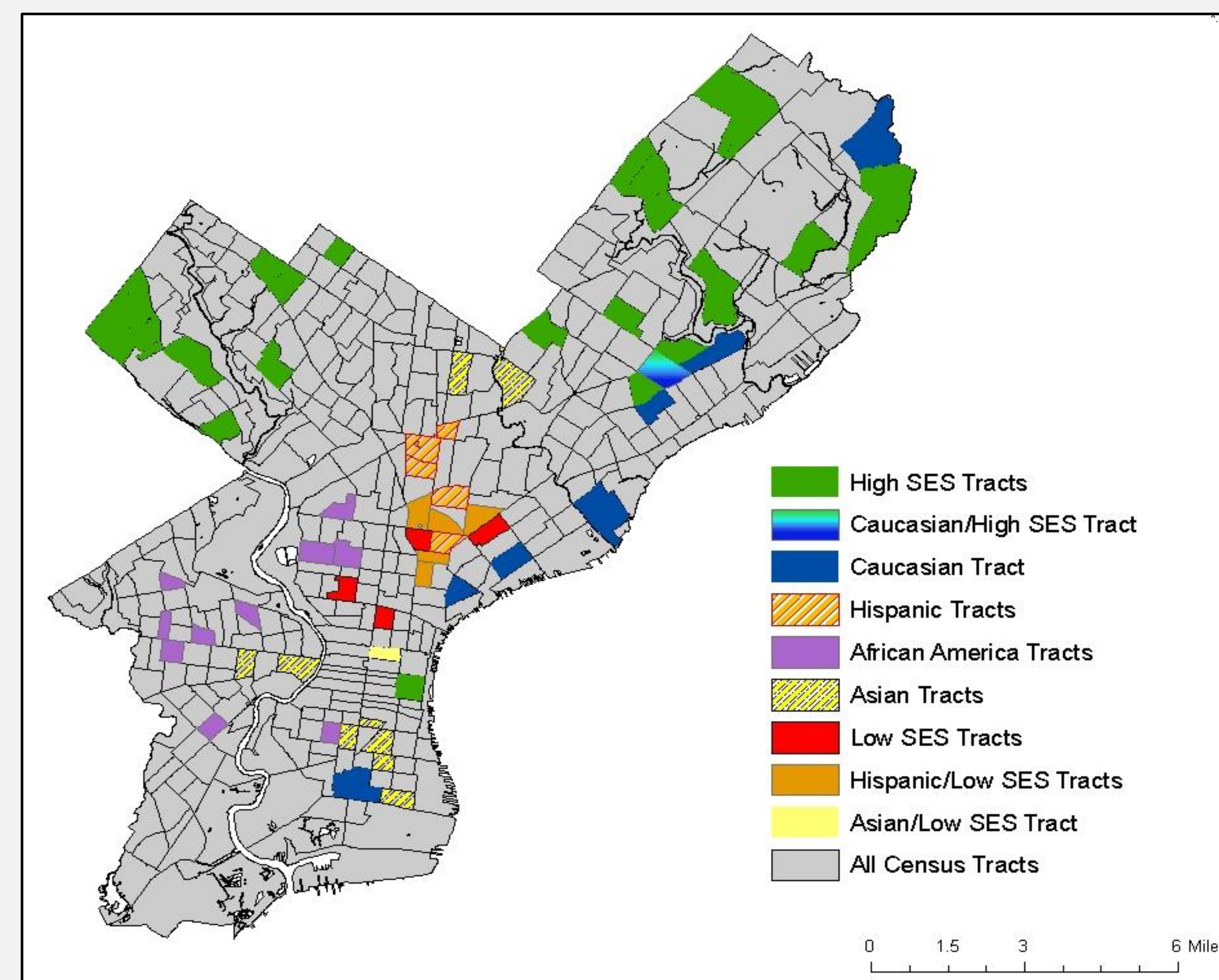
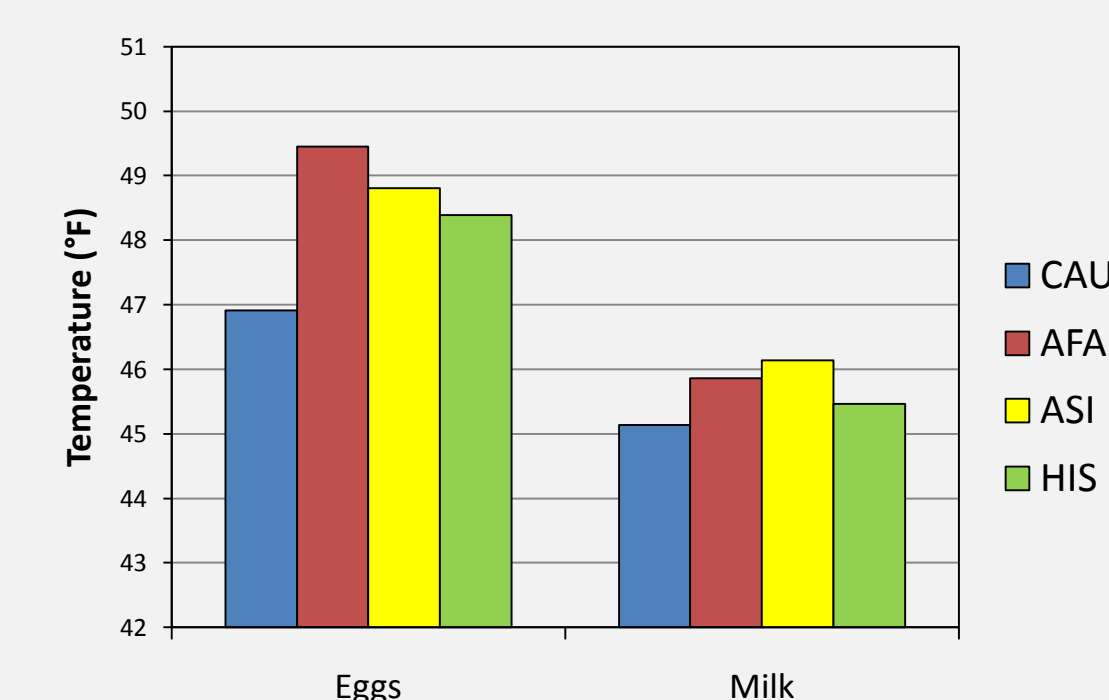


Figure 5. Census tracts identified in the city of Philadelphia, PA.

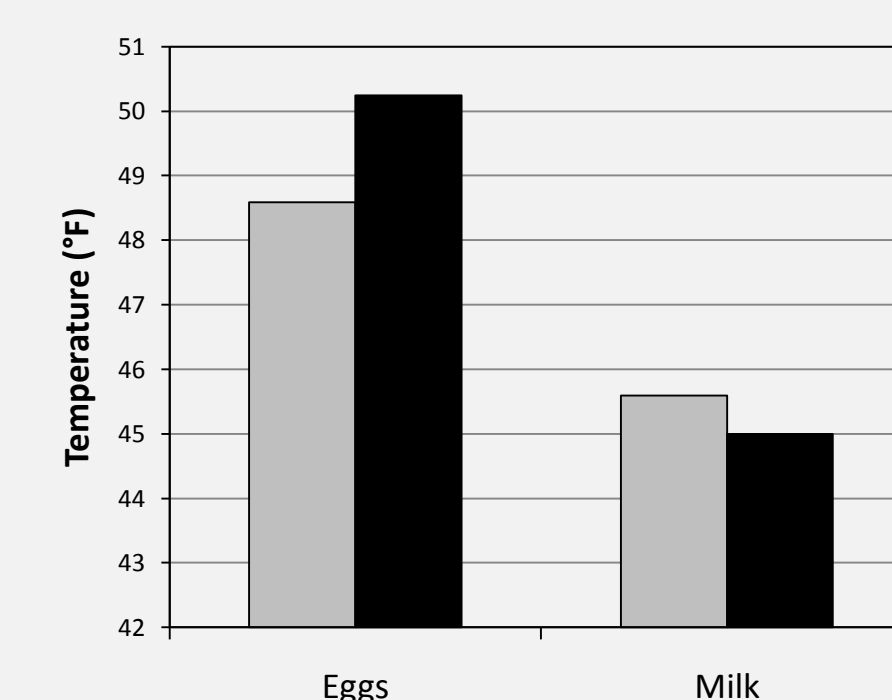
- Two hundred and thirteen (213) retail food stores from identified tracts were visited. One thousand and twenty three (1023) food samples were purchased (205 milk, 223 egg, 203 lunchmeat and 392 hoagies).

## TEMPERATURE



\* Temperature of storage of eggs - lower for retail stores located in Caucasian tracts (46.9°F) as compared to eggs sampled in African American, Asian and Hispanic tracts (49.4, 48.8 and 48.4°F, respectively).

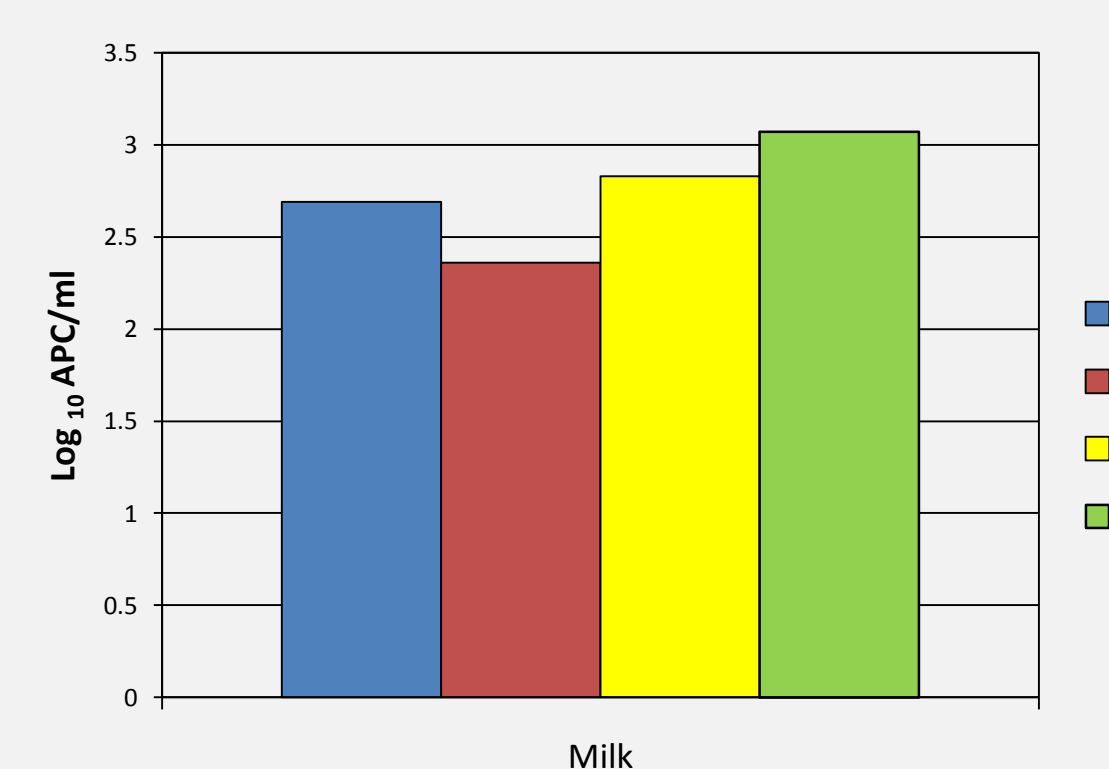
\* Temperature of storage of milk - lower for retail stores located in Caucasian tracts (45.1°F) as compared to milk sampled in African American, Asian and Hispanic tracts (45.8, 46.1 and 45.6°F, respectively).



\* Temperature of storage of eggs - lower for retail stores located in high SES tracts (48.6°F) as compared to eggs sampled in low SES tracts (50.2°F).

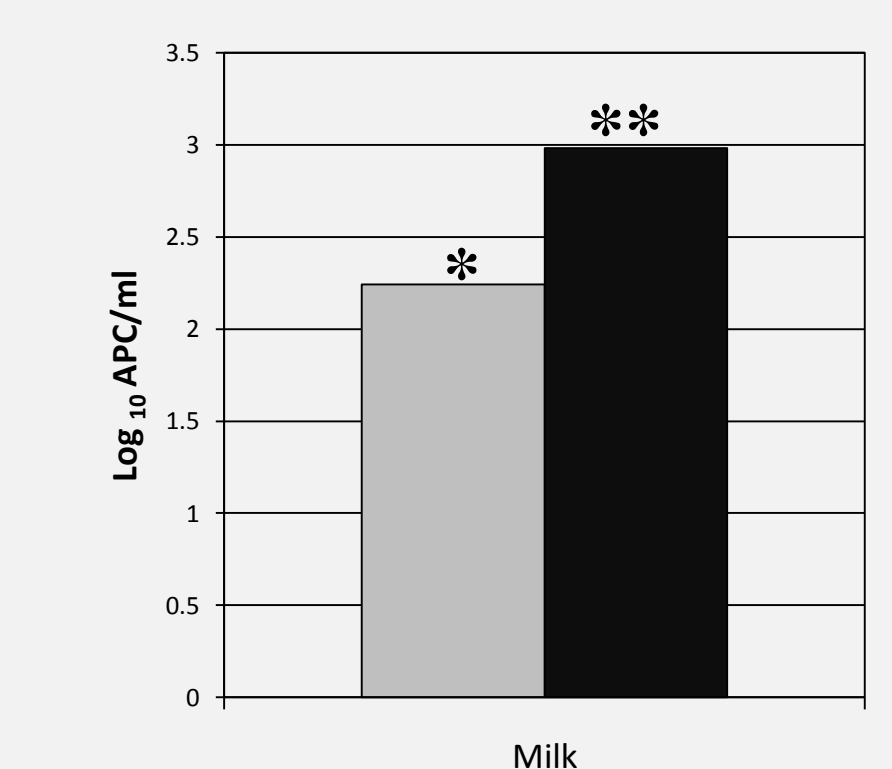
\* Temperature of storage of milk - lower for retail stores located in low SES tracts (45.6°F) as compared to milk sampled in high SES tracts (45.6°F).

## AEROBIC PLATE COUNT



\* Aerobic plate counts for milk were lower for retail stores located in African American tracts (2.36) as compared to the milk sampled in Caucasian, Asian and Hispanic tracts (2.69, 2.83 and 3.07, respectively).

\* Differences were not found to be statistically significant.

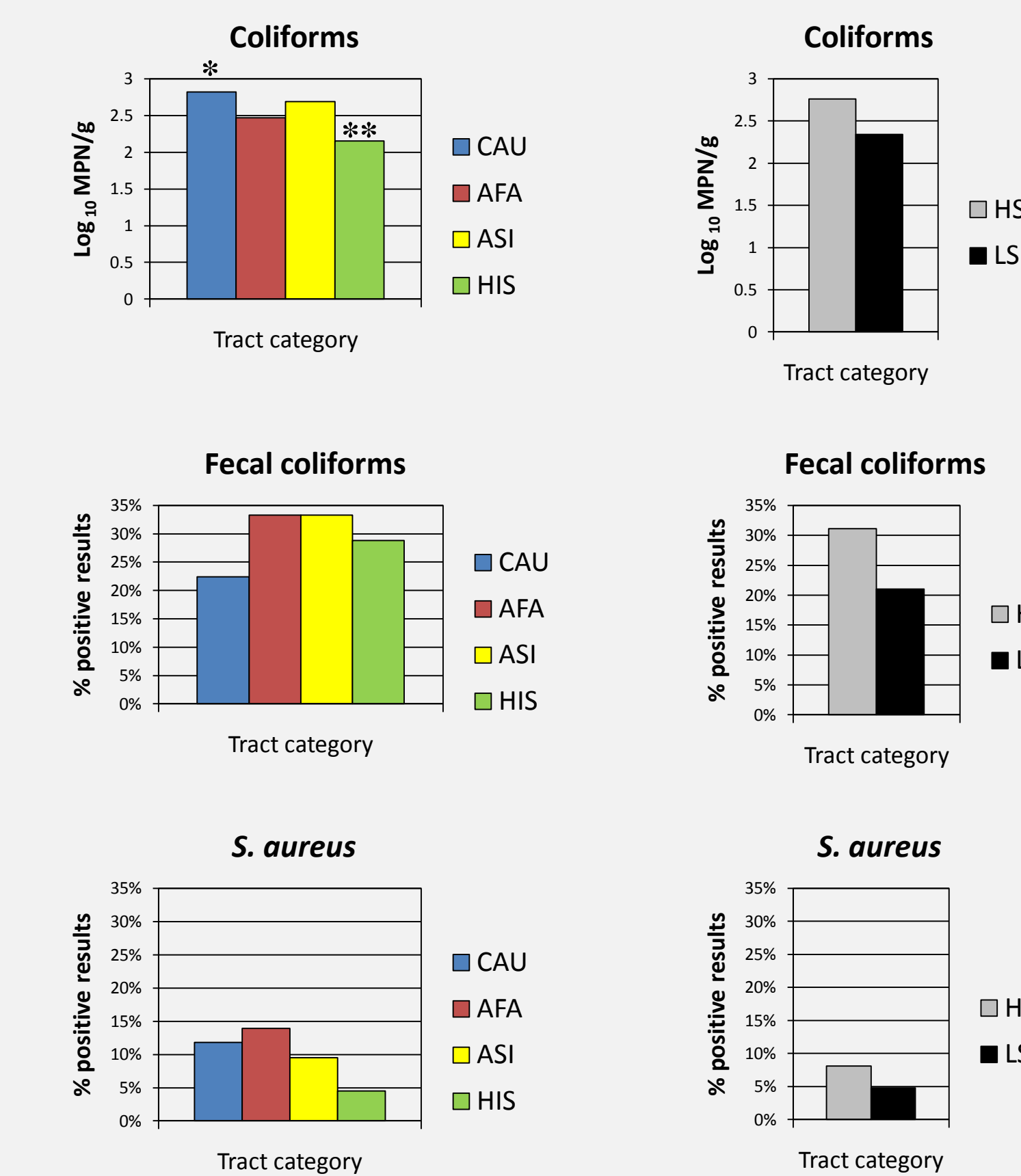


\* Aerobic plate counts for milk were lower for retail stores located in high SES tracts (2.24) as compared to milk sampled in low SES tracts (2.98).

\* Differences were statistically significant (p = 0.025).

## RESULTS

### HOAGIES



\* Levels of coliforms were higher for hoagies from food stores located in Caucasian tracts (2.82) compared to those from Hispanic tracts (2.15) (p<0.05).

\* Levels of coliforms were higher for hoagies from food stores located in high SES tracts (2.76) compared to those from low SES tracts (2.34).

\* Levels of fecal coliforms were lower for hoagies from food stores located in Caucasian tracts (22%) compared to those from African American (33%), Asian (33%) and Hispanic tracts (29%).

\* Levels of fecal coliforms were higher for hoagies from food stores located in high SES tracts (31%) as compared to those from low SES tracts (21%).

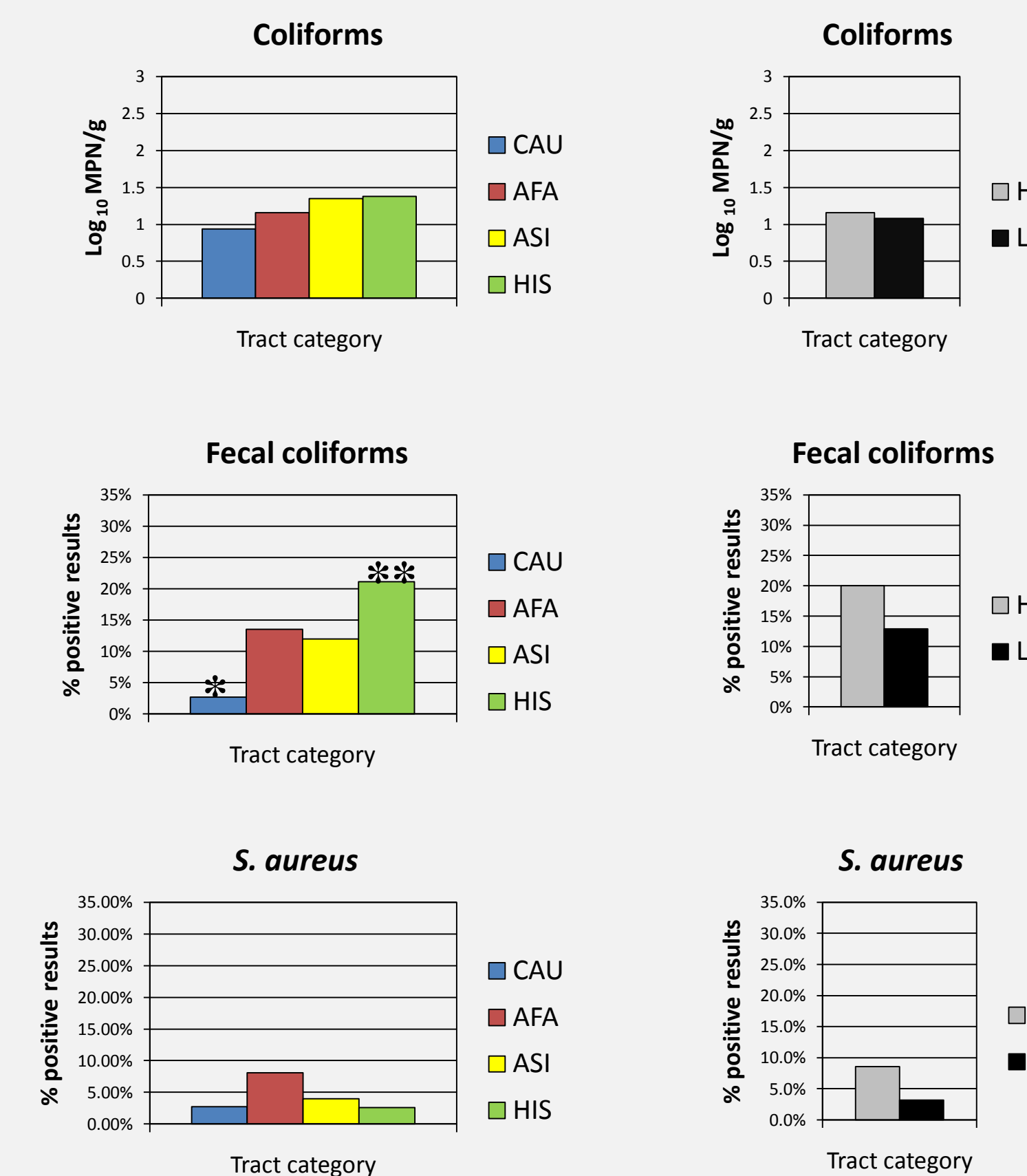
\* The percentage of positive samples for *S. aureus* was lower for hoagies from food stores located in Hispanic tracts (5%) compared to those from Asian (10%), Caucasian (12%) and African American tracts (14%).

\* The percentage of positive samples for *S. aureus* was lower for hoagies from food stores located in low SES tracts (5%) compared to those from high SES tracts (8%).

\* *E. coli* was detected in one sample from a food store located in a Hispanic tract.

\* *L. monocytogenes* was detected in one sample from a food store located in a Caucasian tract. *L. ivanovi* was detected in one sample each from food stores located in Hispanic, high and low SES tracts.

### LUNCHMEAT



\* Levels of coliforms were lower for lunchmeat from food stores located in Caucasian tracts (0.94) compared to lunchmeat from food stores in African American (1.16), Asian (1.35) and Hispanic tracts (1.38).

\* Levels of coliforms were higher for lunchmeat from food stores located in high SES tracts (1.16) compared to lunchmeat from food stores in low SES tracts (1.08).

\* Levels of fecal coliforms were lower for lunchmeat from food stores located in Caucasian tracts (3%) compared to lunchmeat from food stores in Hispanic tracts (21%) (p<0.05).

\* Levels of fecal coliforms were higher for lunchmeat from food stores located in high SES tracts (20%) compared to lunchmeat from food stores in low SES tracts (12.9%).

\* The percentage of positive samples for *S. aureus* was lower for lunchmeat from food stores located in Caucasian tracts (2.6%) compared to lunchmeat from food stores in Hispanic (2.7%), Asian (4%) and African American tracts (8.1%).

\* The percentage of samples positive for *S. aureus* was higher for lunchmeat from food stores located in high SES tracts (8.6%) compared to lunchmeat from food stores in low SES tracts (3.2%).

## CONCLUSIONS

- Generally, milk and eggs sampled from retail food stores in Caucasian and high SES census tracts were stored closer to proper refrigeration temperature than milk and eggs sampled from retail food stores located in minority and low SES census tracts.
- Aerobic plate counts in milk were found to be higher for retail food stores located in low SES census tracts compared to milk sampled in high SES tracts. Significant differences were not observed in APC's of milk sampled from retail food stores located in census tracts which represented different racial/ethnic groups.
- Lunchmeat samples generally had higher counts of coliforms, fecal coliforms and *S. aureus* from retail food stores located in census tracts which represented minority racial/ethnic populations when compared to samples from caucasian tracts. No consistent trends were observed for hoagie samples.
- Lunchmeat and hoagie samples generally had higher counts of coliforms, fecal coliforms and *S. aureus* for retail food stores located in census tracts representing high SES tracts when compared to low SES tracts.
- Overall the results of this study demonstrate that differences do exist in storage temperatures and microbial counts of foods available to populations of different demographics and highlight the need to better understand how food access may affect a populations risk for foodborne illness.

### References

- <sup>1</sup>Chang, M., S.L. Groseclose, et al., 2008. An ecological analysis of sociodemographic factors associated with the incidence of salmonellosis, shigellosis, and *E. coli* O157:H7 infections in US counties. *Epidemiol Infect.* 1-11.
- <sup>2</sup>Clifton, K.J., 2004. Mobility strategies and food shopping for low-income families. *Journal of Planning Education and Research* 23 (4): 402-413.
- <sup>3</sup>Moore, L.V. and A.V.D. Roux, 2006. Associations of neighborhood characteristics with the location and type of food stores. *American Journal of Public Health* 96 (2): 325-331.
- <sup>4</sup>Shiferaw, B., S. Shallow, R. Marcus, S. Segler, D. Soderlund, F.P. Hardnett, T. Van Gilder, 2004. Trends in population-based active surveillance for shigellosis and demographic variability in FoodNet sites, 1996-1999. *Clin Infect Dis* 38: 175-180.