

# Beliefs about Sources of Gastrointestinal Illness: What Factors are Associated with People's Beliefs that a Meal Eaten Outside of the Home Made Them Sick?

**Laura Green<sup>1\*</sup>, Carol Selman<sup>2</sup>, Tim Jones<sup>3</sup>, Elaine Scallan<sup>4</sup>, Ruthanne Marcus<sup>5</sup>,  
and the EHS-Net Population Survey Working Group<sup>2</sup>**

<sup>1</sup>Health, Social, and Economics Research, RTI International, Research Triangle Park, North Carolina

<sup>2</sup>National Center for Environmental Health/Agency for Toxic Substances and Disease Registry,  
Centers for Disease Control and Prevention, Atlanta, Georgia

<sup>3</sup>Tennessee Department of Health, Nashville

<sup>4</sup>National Center for Infectious Diseases, Centers for Disease Control and Prevention, Atlanta, Georgia

<sup>5</sup>Connecticut Emerging Infections Program, New Haven

\*Presenting author

RTI International

Koger Center, Oxford Building, Suite 119  
2951 Flowers Road South, Atlanta, GA 30341

*Phone* 770-488-4332

*Fax* 770-488-7310

*Email* LRG0@cdc.gov

*Presented at* The 91st Annual Int'l Association for Food Protection  
Mtg, Phoenix, AZ, Aug. 8–11, 2004

# Introduction

Despite the fact that foodborne illnesses are common (8), many members of the general public have inaccurate beliefs about foodborne disease (1, 4). The public health implications of inaccurate knowledge and beliefs about foodborne illness are substantial, as those with inaccurate beliefs may not implement behaviors to prevent foodborne disease or report suspected foodborne illnesses to agencies responsible for investigating them. Thus, increasing the general public's knowledge of foodborne illness is important to reducing its occurrence. To be effective, health education programs must incorporate information on program recipients' knowledge and beliefs concerning the topic of interest (e.g., food safety and foodborne illness) (3, 5, 10). To that end, this study was conducted to increase understanding of the general public's experiences with and beliefs about gastrointestinal illness. As recent studies have indicated that restaurants are an important source of foodborne illness (6, 7, 9, 11), this study focused on those who attributed their gastrointestinal illness to a specific meal eaten outside the home.



# Method

## Data Source

This study was conducted by the Environmental Health Specialists Network (EHS-Net), a consortium of federal and state public health staff who investigate the environmental antecedents of foodborne illness. To collect data for this study, EHS-Net collaborated with Foodborne Diseases Active Surveillance Network (FoodNet), a similar consortium focused on the epidemiological investigation of foodborne disease. FoodNet periodically conducts a population-based telephone survey on foodborne illness topics, which asks respondents' about eating outside the home and gastrointestinal illness symptoms in the past month. These questions were the basis for this study, along with a set of questions, developed by EHS-Net and added to the survey, concerning beliefs about gastrointestinal illness.

## Sample

The survey was conducted in the nine FoodNet areas (all or parts of the states of California, Colorado, Connecticut, Georgia, Maryland, Minnesota, New York, Oregon, and Tennessee) from March, 2002 to February, 2003. The sample was randomly selected from households with telephones. The data were weighted by the number of eligible respondents and telephone lines in each household, and to the 2000 U.S. population by age, gender, and FoodNet site. Thus, the weighted results from this survey can be generalized to the population of the FoodNet sites. In total, 16,435 respondents were interviewed over the survey period, yielding a Council of American Survey Research Organizations (CASRO) upper-bound response rate of 47%. This response rate includes information on those who completed, refused, or terminated the interview before completion. Data from respondents were included if they were over the age of 17 and did not have an underlying chronic gastrointestinal disorder with diarrhea or vomiting symptoms; 13,157 respondents met these criteria. Of these respondents, 1,508 had experienced vomiting or diarrhea within the month prior to their survey interview; the weighted estimate of the proportion of the population that had experienced vomiting or diarrhea within the month prior to interview is 11%.

# Method (Cont'd)

## Survey Questions

All respondents were asked about their age, education, gender, whether or not they had eaten at a food service establishment in the seven days prior to interview, and whether or not they had any chronic conditions with gastrointestinal symptoms. They were also asked if they had experienced vomiting or diarrhea in the month prior to interview.

Those that had experienced vomiting or diarrhea in the month prior to interview were asked:

- If you work, did you miss any time from work because of the illness?
- Do you think your illness resulted from eating a specific meal eaten outside the home, for example, at a restaurant, cafeteria, lunchroom, catered event or street vendor?

Those that attributed their illness to a specific meal eaten outside the home were asked:

- How long after this meal did you first experience symptoms of diarrhea or vomiting?
- What led you to believe that you got sick from a specific meal that you ate outside your home?
- Did you notify the restaurant or food service facility of this illness?
- Did you notify a health department that you had an illness that you believed was due to eating at a restaurant or food service facility?

# Key Findings

## Attribution of Illness to Outside Meal

- 22% of ill respondents attributed their illness to a meal eaten outside the home.

## Actions Taken

- 7% of ill respondents said that they had notified the restaurant of their illness.
- 2% of ill respondents said that they had notified the health department that they had an illness that they believed was due to food eaten in a food service establishment.

## Reasons Illness was Attributed to Outside Meal

- 42% of ill respondents attributed their illness to the specific outside meal because of the timing of the illness (See Table 1).
- Other reasons included: the food tasted bad or didn't look cooked, others who ate with the respondent got sick also, and the restaurant, kitchen, or workers didn't look clean.

**Table 1. Respondents' Reasons for Attributing Illness to Outside Meal**

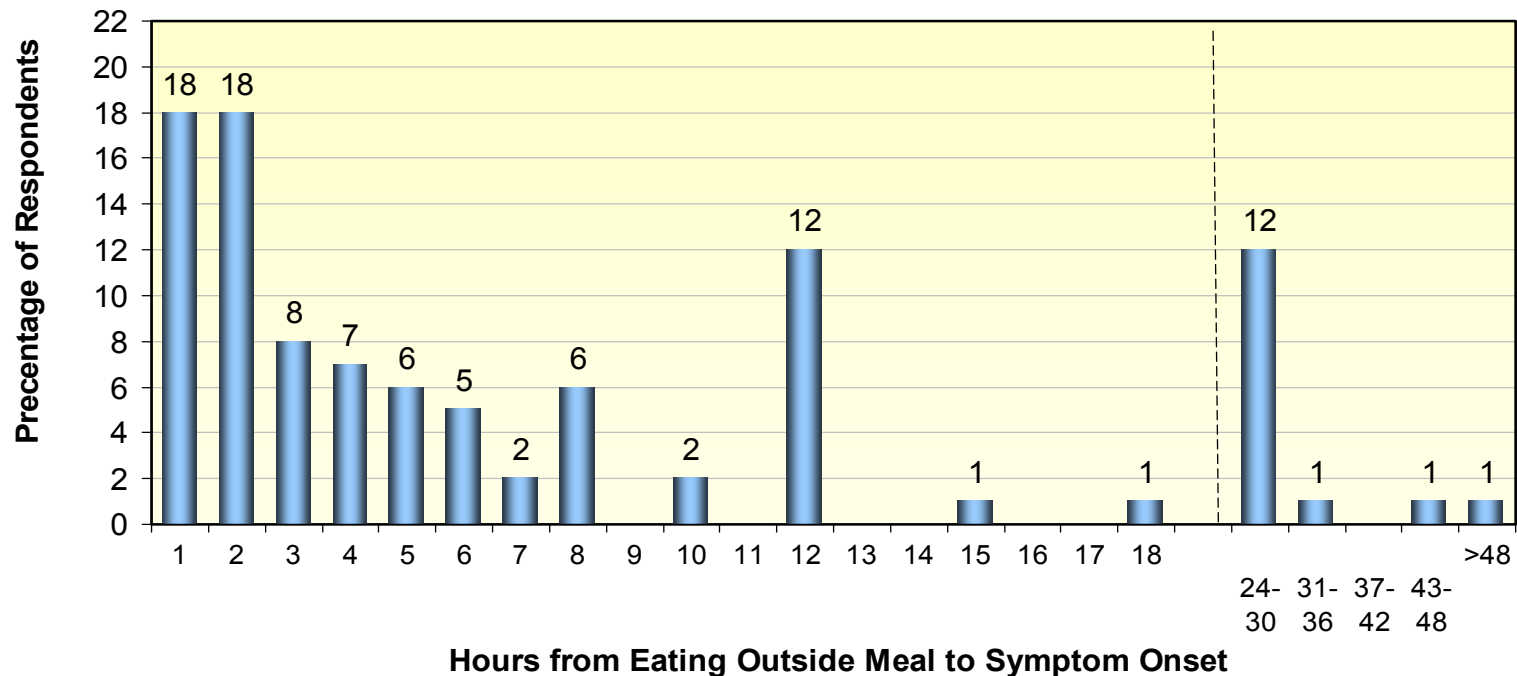
Reason	Weighted %
Timing of illness	42
Food tasted bad or spoiled/didn't look cooked	16
Type of food (e.g., junk food, greasy or spicy food)	11
Others who ate got sick as well	6
Unfamiliar food/restaurant/country	3
Restaurant/kitchen/food workers weren't clean	2
Other (e.g., germs, just an idea, etc.)	20

# Key Findings (Cont'd)

## Onset of Symptoms

- 57% of ill respondents said their symptoms began within five hours of eating the outside meal (See Figure 1).
- 62% of ill respondents who based their outside meal attribution on the timing of the illness said that their illness symptoms began within five hours of eating the outside meal.

**Figure 1. Respondents' Reports of Hours from Eating Outside Meal to Symptom Onset**



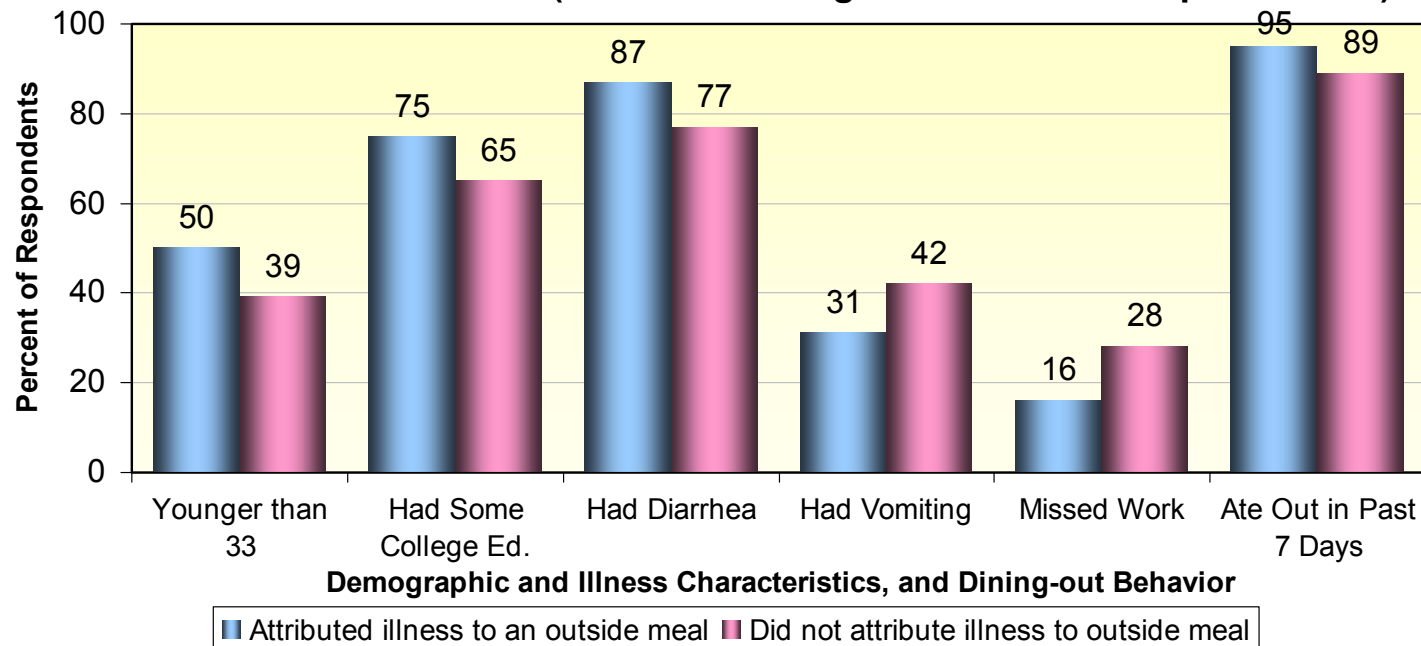
# Key Findings (Cont'd)

## Relationship Between Attributions of Illness to Outside Meal and Other Variables

As can be seen in Figure 2, those who had been ill with vomiting or diarrhea and attributed their illness to an outside meal, compared to those who did not attribute their illness to an outside meal, were:

- more likely to be younger than the median age of 33,  $p < .0009$ ;
- more likely to have had some college education,  $p < .02$ ;
- more likely to have had diarrhea,  $p < .003$ ;
- less likely to have had vomiting,  $p < .006$ ;
- less likely to have missed work as a result of the illness,  $p < .003$ ; and
- more likely to have eaten out in the past seven days,  $p < .0001$ .

**Figure 2. Significant Differences between Those Who Attributed Their Illness to an Outside Meal and Those Who Did Not (illness=vomiting or diarrhea in the past month)**



# Summary and Discussion

- Over 20% of those who had been ill with vomiting or diarrhea in the month prior to interview believed that their illness resulted from a meal eaten outside the home.
- Those below the median age of 33 or who had had some college education were more likely to attribute their illness to an outside meal.
- Those with diarrhea but not vomiting and those who did not miss work as a result of their illness were more likely to make outside meal illness attributions, suggesting that those who made outside meal illness attributions experienced a milder illness than those who did not make these attributions.
- Those who had been ill in the month prior to interview and attributed the illness to an outside meal were more likely than those who did not attribute the illness to an outside meal to have eaten out in the seven days prior to interview. Those who have eaten out in the past seven days are likely to be people who eat out more than others, in general; this finding suggests that attribution of illness to an outside meal is associated with eating out frequently.
- Respondents reported using several sources of information to make their illness attributions, including the timing of the illness, the look or taste of the food, and the fact that others who ate with them also got sick.
- However, over 60% of those who based their attribution on the timing of the illness also said that their illness symptoms began within five hours of eating the outside meal. Although incubation periods of five hours or less are possible for a few of the known foodborne pathogens, for the most common foodborne pathogens (Norovirus, Rotavirus, Astrovirus, *Campylobacter*, *Salmonella*, *Giardia lamblia*), incubation periods are substantially longer than five hours (2, 8). This finding suggests that our respondents incorrectly believe that illness symptoms typically occur shortly after exposure to foodborne pathogens, and may therefore have been frequently incorrect in their illness attributions.
- Respondents did not often contact the establishment that they suspect made them ill and even more rarely contacted the health department about their belief that a food service establishment made them ill. Because accurately investigating and preventing foodborne illnesses depends on public health authorities knowing about them, it is important to explore ways to improve rates of reporting.
- This study increases our understanding of the population's beliefs about foodborne illness. Findings suggest that education in the areas of the timing of symptom onset for foodborne illnesses and the public health importance of reporting suspected foodborne illnesses should be improved.



# Acknowledgements

The authors wish to thank: the EHS-Net Working Group (National Center for Environmental Health/Agency for Toxic Substances and Disease Registry, CDC), for their assistance with survey development, FoodNet (National Center for Infectious Diseases, CDC), for their assistance with administration of the survey questions; and Anyana Banerjee (National Center for Infectious Diseases, CDC) and Curtis Blanton (National Center for Environmental Health/Agency for Toxic Substances and Disease Registry, CDC), for their assistance with data analysis.

# References

1. Altekruise, A., D. Street, S., Fein, and A. Levy. 1995. Consumer knowledge of foodborne microbial hazards and food-handling practices. *J. Food. Prot.* 59:287-294.
2. Centers for Disease Control and Prevention. 2004. Diagnosis and management of foodborne illnesses: A primer for physicians and other health care professionals. *MMWR.* 53:RR-4.
3. Ehiri, J., and G. Morris. 1996. Hygiene training and education of food handlers: Does it work? *Eco. Food Nutr.* 35:243-251.
4. Fein, S., T. Lin, and A. Levy. 1995. Foodborne illness: Perceptions, experience, and preventative behaviors in the United States. *J. Food. Prot.* 58:1405-1411.
5. Foster, G., and F. Kaferstein. 1985. Food safety and the behavioural sciences. *Soc. Sci. Med.* 21: 1273-1277.
6. Jones, T., B. Imhoff, M. Samuel, P. Mshar, K., McCombs, M. Hawkins, V. Deneen, M. Cambridge, S. Olsen, for the Emerging Infections Program FoodNet Working Group. 2004. Limitations to successful investigation and reporting of foodborne out-breaks: An analysis of foodborne disease outbreaks in FoodNet catchment areas, 1998-99. *Clinical Infect. Dis.* 38:S297-S302.
7. Kassenborg, H., K. Smith, D. Vugia, T. Fiorentino, M. Bates, M. Carter A. Davington, M. Cassidy, N. Marano, F. Angulo, and the EIP FoodNet Working Group. Eating Chicken or Turkey Outside the Home Associated with Domestically Acquired Fluroquinolone-Resistant *Campylobacter* Infections: A FoodNet Case-Control Study. July, 2000. 2nd International Conference on Emerging Infectious Diseases. Atlanta, GA.
8. Mead, P., L., Slutsker, A. Dietz, L. McCaig, J. Bresee, C. Shapiro, P. Griffin, and R. Tauxe. 1999. Food-related illness and death in the United States. *Emerg. Infect. Dis.* 5:607-625.
9. Olsen, S., MacKinion, L., Goulding, J., Bean, N., and Slutsker, L. 2000. Surveillance for foodborne disease outbreaks—United States, 1993-1997. *MMWR.* 49:1-51.
10. Rennie, D. 1995. Health education models and food hygiene education. *J. Royal Soc. Health.* 115: 75-78.
11. Sobel, J., A. Hirshfeld, K. McTigue, C. Burnett, S. Altekruise, F. Brenner, G. Malcolm, S. Mottice, C. Nichols, and D. Swerdlow. 2000. The pandemic of Salmonella Enteritidis phage type 4 reaches Utah: a complex investigation confirms the need for continuing rigorous control measures. *Epidemiol. Infect.* 125:1-8.

# NOTE : Following illustration shows how the original poster was laid out for IAFP 2004 Poster Session. Please refer to previous pages for details of the study that were presented on the poster.



## Beliefs about Sources of Gastrointestinal Illness: What Factors are Associated with People's Beliefs that a Meal Eaten Outside of the Home Made Them Sick?

Laura Green<sup>1</sup>, Carol Selman<sup>2</sup>, Tim Jones<sup>3</sup>, Elaine Scallan<sup>4</sup>, Ruthanne Marcus<sup>5</sup>, and the EHS-Net Population Survey Working Group<sup>6</sup>

<sup>1</sup>Health, Social, and Economics Research, RTI International, Research Triangle Park, North Carolina; <sup>2</sup>National Center for Environmental Health/Agency for Toxic Substances and Disease Registry, Centers for Disease Control and Prevention, Atlanta, Georgia;

<sup>3</sup>Tennessee Department of Health, Nashville; <sup>4</sup>National Center for Infectious Diseases, Centers for Disease Control and Prevention, Atlanta, Georgia; <sup>5</sup>Connecticut Emerging Infections Program, New Haven



Presented at the  
11th International Conference  
on Emerging Infectious Diseases  
Atlanta, Georgia, USA  
November 11-15, 2004  
Abstract ID: 11111  
Session: 11111  
Abstract ID: 11111  
Session: 11111

### 1. Introduction

Despite the fact that foodborne illnesses are common, many members of the general public have inaccurate beliefs about foodborne disease (1, 2). The public health implications of inaccurate knowledge and beliefs about foodborne illness are substantial, as those with inaccurate beliefs may not implement behaviors to prevent foodborne disease or report suspected foodborne illnesses to agencies responsible for investigating them. Thus, increasing the general public's knowledge of foodborne illness is important to reducing its occurrence. To be effective, the public education programs must incorporate information on program objectives, knowledge and beliefs concerning the topic of interest (e.g., food safety and foodborne illness) (3, 4). To that end, this study was conducted to increase understanding of the general public's experiences with and beliefs about gastrointestinal illness. As recent studies have indicated that restaurants are an important source of foodborne illness (5, 7, 8, 10), this study focused on those who attributed their gastrointestinal illness to a specific meal eaten outside the home.

### 2. Methods

**Data Source**  
This study was conducted by the Enteric and Health Surveillance Network (EHS-Net), a consortium of state and local public health staff who investigate the environmental antecedents of foodborne illness. To collect data for this study, EHS-Net established a Foodborne Disease Active Surveillance Network (FoodNet), a national consortium focused on the epidemiological investigation of foodborne disease. FoodNet periodically conducts appraisals of telephone surveys on foodborne illness topics, which are representative of eating outside the home. Six gastrointestinal illness symptoms in the past month were the basis for this study, along with a set of questions developed by EHS-Net and added to the survey, concerning beliefs about gastrointestinal illness.

#### Survey Questions

All respondents were asked about their age, education, gender, whether or not they had eaten at a food service establishment in the seven days prior to the survey, and whether or not they had any chronic conditions with gastrointestinal symptoms. They were also asked if they had experienced vomiting or diarrhea in the month prior to the survey.

Those that had experienced vomiting or diarrhea in the month prior to the survey were asked:  
 • If you work, did you miss any time from work because of the illness?  
 • Do you think your illness resulted from eating a specific meal eaten outside the home. Six example meals (e.g., lunch, dinner, fast food, etc.) were listed, and respondents were asked to select one or more that they ate.  
 • How long after this meal did you first experience symptoms of diarrhea or vomiting?  
 • What did you believe that you got sick from a specific meal that you ate outside your home?  
 • Did you notify the restaurant or food service facility of this illness?  
 • Did you notify a health department that you had an illness? If you believe the meal was due to eating at a restaurant or food service facility?

The survey was conducted in the nine FoodNet sites (all or part of the states of California, Colorado, Connecticut, Georgia, Maryland, Massachusetts, New York, Oregon, and Tennessee) from March, 2002 to February, 2003. The sample was randomly selected from households with telephones. The data were weighted by the number of eligible respondents and telephone lines in each household, and to the 2000 U.S. population by age, gender, and FoodNet site. Thus, the weighted results from this survey can be generalized to the population of the FoodNet sites. In total, 15,435 respondents were interviewed over the survey period, yielding a response rate of 75.6% (upper-bound response rate of 71%). This response rate includes information on those who completed, refused, or terminated the interview for any reason. Data from respondents were included if they were over the age of 15 and did not have any limiting chronic gastrointestinal disorder with diarrhea or vomiting symptoms; 13,857 respondents met these criteria. Of these respondents, 1,508 had experienced vomiting or diarrhea within the month prior to their survey intake. The weighted estimate of the proportion of the population that had experienced vomiting or diarrhea within the month prior to their intake is 11%.



### 3. Key Findings

**Attribution of Illness to Outside Meal**  
 • 52% of all respondents attributed their illness to a meal eaten outside the home.

#### Actions Taken

• 7% of all respondents said that they had notified the restaurant of their illness.  
 • 2% of all respondents said that they had notified the health department that they had an illness that they believed was due to food eaten in a food service establishment.

#### Reasons Illness was Attributed to Outside Meal

• 42% of all respondents attributed their illness to the specific outside meal because of the timing of the illness (See Table 1).  
 • Other reasons included: the food tasted bad or didn't look cooked, others who ate with the respondent got sick also, and the restaurant, kitchen, or workers didn't look clean.

Table 1. Respondents' Reason for Attributing Illness to Outside Meal

Reason	Weighted %
Timing of illness:	42
Food tasted bad or spoiled/didn't look cooked	16
Other who ate got sick as well	11
Unfamiliar food (e.g., restaurant, cafeteria, lunchroom, catered event or street food, etc.)	6
Restaurant/kitchen/workers were not clean	2
Other (e.g., germs, just an idea, etc.)	20

#### Onset of Symptoms

• 51% of all respondents said their symptoms began within the hours of eating the outside meal (See Figure 1).  
 • 62% of all respondents who based their outside meal attribution on the timing of the illness said that their illness symptoms began within the hours of eating the outside meal.

#### Relationship Between Attributing Illness to Outside Meal and Other Variables

As can be seen in Figure 2, those who had been ill with vomiting or diarrhea and attributed their illness to an outside meal, compared to those who did not attribute their illness to an outside meal, were:  
 • more likely to be younger than the median age of 33,  $p < .0009$ ;  
 • more likely to have had some college education,  $p = .02$ ;  
 • more likely to have had diarrhea,  $p < .003$ ;  
 • less likely to have had vomiting,  $p < .005$ ;  
 • less likely to have missed work as a result of the illness,  $p < .003$ ; and  
 • more likely to have eaten out in the past seven days,  $p < .0001$ .

Figure 1. Respondents' Reports of Hours from Eating Suspected Meal to Symptom Onset

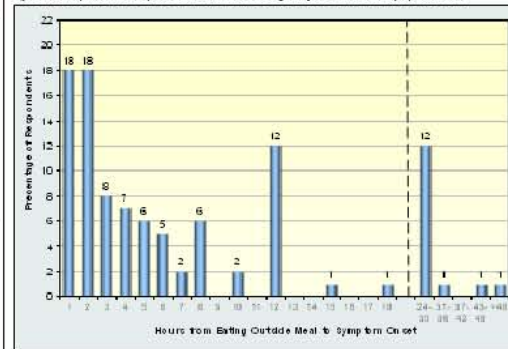
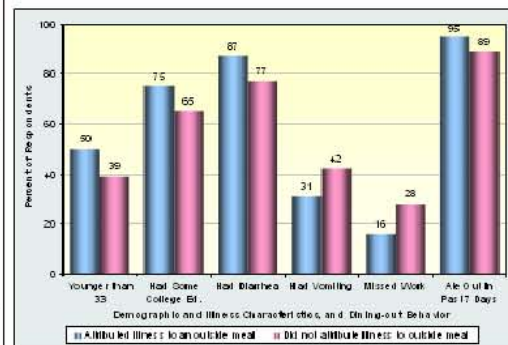


Figure 2. Significant Differences between Those Who Attributed Their Illness to an Outside Meal and Those Who Did Not (Timing of vomiting or diarrhea in the past month)



### 4. Summary and Discussion

• Over 50% of those who had been ill with vomiting or diarrhea in the month prior to the survey believed that their illness resulted from a meal eaten outside the home.  
 • Those below the median age of 33 or who had had some college education were more likely to attribute their illness to an outside meal.  
 • Those with diarrhea but not vomiting and those who did not miss work as a result of their illness were more likely to make outside meal attribution, suggesting that those who made outside meal attribution experienced a milder illness than those who did not make these attributions.  
 • Those who had been ill in the month prior to the survey and attributed the illness to an outside meal were more likely than those who did not attribute the illness to an outside meal to have eaten out in the seven days prior to the survey. Those who have eaten out in the past seven days are likely to be people who eat out more than others. In general, this finding suggests that attribution of illness to an outside meal is associated with eating out frequently.  
 • Respondents reported using several sources of information to make their illness attributions, including the timing of the illness, the look or taste of the food, and the fact that others who ate with them also got sick. However, over 60% of those who based their attribution on the timing of the illness also said that their illness symptoms began within the hours of eating the outside meal. Although incubation periods of the hour or less are possible for a number of the known foodborne pathogens, for the most common foodborne pathogens (norovirus, rotavirus, adenovirus, campylobacter, salmonella, shigella, listeria, incubation periods are substantially longer than the hours (2, 9). This finding suggests that our respondents inaccurately believe that illnesses typically occur shortly after exposure to foodborne pathogens, and may therefore have been incorrectly attributing their illness attribution.  
 • Respondents did not often contact the establishment that they suspected made them ill and even more rarely contacted the health department about the incident that a food service establishment made them ill. Because accurately identifying and preventing foodborne illness depends on public health authorities knowing about them, it is important to explore ways to improve rates of reporting.  
 • This study increases our understanding of the population's beliefs about foodborne illness. Findings suggest that education in the areas of the timing of symptoms and foodborne illness, and the public health importance of reporting suspected foodborne illnesses should be improved.

### Acknowledgments

This research was supported by the EHS-Net Working Group (National Center for Environmental Health/Agency for Toxic Substances and Disease Registry, CDC), in collaboration with the Agency for Toxic Substances and Disease Registry, Centers for Disease Control and Prevention, Atlanta, Georgia; the Tennessee Department of Health, Nashville, Tennessee; the Connecticut Emerging Infections Program, New Haven, Connecticut; and the Oregon Health Division, Salem, Oregon.

### References

- Abelove A, D. Shost, E. Papp and J. Levy. 1995. Consumer knowledge of foodborne control hazards and food handling practices. *J. Food Prot.* 58: 207-214.
- Centers for Disease Control and Prevention. 2004. The grasp and misperception of foodborne diseases: A survey for physicians and other health care professionals. *Abstract 1339A-1.*
- Chen J, and G. Nelson. 1984. Hospitalization and attribution of food handlers. *Am J Epidemiol.* 120: 204-210.
- Papp, S., E. Lee, and J. Levy. 1995. Food safety beliefs: Perceptions, perceptions, and perceptions in the United States. *J. Food Prot.* 58: 1463-1471.
- Truett, C., and J. Kaper. 1995. Food safety and public health: A national survey. *Am J Epidemiol.* 142: 1025-1037.
- Jones, T., B. Jureff, M. Berman, P. Mohr, K. McCord, M. Hargrett, V. Chantrel, M. Campbell, S. Chen, P. Ho, M. Emergence Infections Program FoodNet Working Group. 2004. Knowledge of necessary investigation and reporting of foodborne outbreaks: An analysis of foodborne disease outbreaks in FoodNet surveillance sites. *J. Food Prot.* 67: 1202-1207.
- Kawachi, H., K. Smith, D. Varga, P. Francisco, M. Rubin, M. Carter, A. Davidson, G. Cantor, W. Stewart, F. Argente, and the EHS-Net Working Group. Eating Out: A Survey of Food Safety Beliefs and Attitudes. *Abstract 1339A-1.*
- Centers for Disease Control and Prevention. 2003. The National Food Safety Inspection Service's Food Safety Inspection System (FSIS) for the United States. *Abstract 1339A-1.*
- Chen, S., W. Chen, J., Chang, J., Chen, H., and Shost, L. 2003. Survival rates for foodborne illness in the United States. *MMWR* 52: 55-57.
- Parsons, D. 1993. Health status of children and food hygiene education. *J. Food Prot.* 56: 150-151.
- Parsons, D., H. Haveland, M. McTigue, C. Haveland, S. Haveland, P. Haveland, S. Haveland, C. Haveland, and D. Haveland. 2003. The prevalence of salmonella infections in the United States. *Abstract 1339A-1.*
- Parsons, D. 1993. Health status of children and food hygiene education. *J. Food Prot.* 56: 150-151.