

***E. coli* and Fresh Produce: Comparing Media Coverage and Market Effects in the U.S. and in Germany**

Vera Bitsch

Technical University of Munich, Chair Economics of Horticulture and Landscaping
Alte Akademie 16, 85453 Freising/Germany

bitsch@tum.de

Phone: +49 8161 71-2532

Fax: +49 8161 71-2530

Nevena Koković

Technical University of Munich, Chair Economics of Horticulture and Landscaping
Alte Akademie 16, 85453 Freising/Germany

nevena.kokovic@tum.de

Phone: +49 8161 71-2546

Fax: +49 8161 71-2530

Meike Rombach

Technical University of Munich, Chair Economics of Horticulture and Landscaping
Alte Akademie 16, 85453 Freising/Germany

meike.rombach@tum.de

Phone: +49 8161 71-2536

Fax: +49 8161 71-2530

**Paper presented at the 24th Annual World Forum and Symposium of the
International Food and Agribusiness Management Association
in Cape Town, South Africa, June 15-19, 2014**

Acknowledgements

The authors thank Hans-Christoph Behr of Agricultural Market Information Inc. (AMI) for generously providing the German cucumber market data, and Stefan Balling and Marianne Kreissig for contributing to data coding and analysis.

Copyright 2014 by Vera Bitsch, Nevena Koković, Meike Rombach. All rights reserved. Readers may make verbatim copies of this document for non-commercial purposes, provided that this copyright notice appears on all such copies

***E. coli* and Fresh Produce: Comparing Media Coverage and Market Effects in the U.S. and in Germany**

Abstract

The study explores the *E. coli* outbreaks in the U.S. in 2006, and in Germany, in 2011. Horticultural producers in both countries suffered economic losses, and reputational damages. Market data and consumer purchasing behavior before and after the outbreak were analyzed for affected vegetables. Further, outbreak-related media reports by national and local newspapers, were compared. Results show, that media affected consumer purchasing behavior and trust in food safety in both cases.

Key words: *E. coli* outbreaks, consumer purchasing behavior, media analysis, food safety

JEL codes: Q11, Q13, Q18

***E. coli* and Fresh Produce: Comparing Media Coverage and Market Effects in the U.S. and in Germany**

Problem Statement

Worldwide, food safety and consumer trust are increasingly at the center of media attention. Scandals such as the *Bovine Spongiform Encephalopathy* (BSE) crisis in 1996, several outbreaks of foot-and-mouth disease after 2000, and the so-called Horse meet scandal in 2013 are affecting entire food supply chains. According to Tauxe (2010) food scandals trigger a large amount of public attention, since they impose high costs on society, and show high levels of public health vulnerability. Regarding fruit and vegetables, *Escherichia coli* (*E. coli*) is among the pathogens that cause the majority foodborne illnesses. Painter et al. (2013) attribute 46% of foodborne illnesses in the U.S. to fresh produce.

Our study compares, media reporting on two *E. coli* outbreaks linked to fresh produce, in the U.S. and in Germany. In 2006, 205 people in 26 U.S. states were infected by a dangerous strain of *E. coli*, later attributed to contaminated spinach. Five years later, in 2011, an *E. coli* outbreak in Germany infected 3,842 consumers and led to 53 deaths. The source of the infection was attributed to sprouts.

Both outbreaks caused severe damages to vegetable producers and retailers. In the U.S., estimated costs to the industry were \$200 million. Many spinach growers ploughed under their fields and stopped planting new produce due to the drop in demand. Retailers and foodservice buyers removed spinach from their assortment (Arnade, 2008, p. 5-6). In the European Union (EU), estimated losses to the vegetable sector were over \$1,000 million. To mitigate damages, the EU supported farmers in 22 member states with over \$300 million (EU, 2011). In both countries, regulations require the recall of all produce identified as cause of an outbreak.

The *E. coli* outbreak raised questions about the food safety standards of the entire chain in the U.S. (Pouliot and Sumner 2013). Before, U.S. producers could voluntary apply good agricultural practices (GAPs), or other commodity-specific food safety standards. GAPs were able to reduce the risk of contamination. However, occurrence of foodborne illnesses showed that the standards could not fully eliminate risks. As a reaction to the *E. coli* outbreak linked to fresh spinach in 2006, several additional voluntary food safety programs were developed. In 2007, Californian farmers formed the California Leafy Green Products Handler Marketing Agreement (LGMA). In order to increase food safety in the leafy greens industry, LGMA members (i.e., the majority of Californian handlers) comply with the food safety practices prescribed by the LGMA board (LGMA, 2013). In addition, in 2011, the U. S. government signed into the law the Food Safety Modernization Act. The main objective of the law is to develop minimal standards required for the safe production and harvesting of raw fruits and vegetables (Calvin, 2013, p. 1).

In Germany, comparable food safety standards were already established before the *E. coli* outbreak (Gawron and Theuvsen, 2009; Gay and Schneider 2007). In addition to standards prescribed by law, private standards serve to increase minimum food safety levels. In Europe, more than 300 certification schemes are in use, about 40 in Germany alone (Gawron and Theuvsen, 2009, p. 2). Even though a wide range of standards are applied in Europe and in Germany, the 2011 *E. coli* outbreak still occurred.

Considering the consequences of the two *E. coli* outbreaks, including personal tragedy and death, the study analyzes the media coverage of the events and the market reactions in the aftermath of the outbreaks. The market situation was assessed before and after the outbreaks with the objective to compare how media coverage influenced consumption patterns, in both countries.

Literature Review

According to Richards et al. (2009), firms in the U.S. food supply chain appear to be reluctant to invest in safety technologies and practices. In the ex-ante analysis of investments in food safety technologies by members of the Californian spinach industry, hysteresis effects and free riding have played the crucial role. Richards et al. (2009) pointed out that free-riding depends on the structure of the market, where firms in more competitive industries are less likely to invest in such standards. When fewer firms compete, each individual firm is able to appropriate more of the benefits of its own investments, and less likely to be affected of the failure of others to invest. Calvin (2007, p. 26-27) indicated that spinach growers did not receive premium prices for produce grown with safer practices. This implies that no immediate monetary benefits could be appropriated. On the other hand, she emphasized that application of food safety standards still bears incentives, such as protection of sales, reputation, and assets. Moreover, many retailers and foodservice buyers require that producers apply specific production practices against food safety risks. Accordingly, food safety techniques and practices are necessary to maintain market access.

Media reporting facilitates communication of food safety issues to consumers. Nucci et al. (2009, p. 258) emphasized the power of journalists in structuring the media agenda. Since knowledge about food-related hazards stems from specialists in science, medicine, or technology, journalists have a crucial role in shaping the information released, and transmitting it to the wider community.

De Jonge et al. (2010) show a relationship between newspaper coverage and consumer trust in food safety depending on the recency of the media coverage. When newspaper articles from national and daily newspapers were published more recently, consumer confidence with respect to food safety was weaker than in cases when some had time passed. It can be concluded that over time, when the release of information decreases, the effect of newspaper coverage on consumer behavior wanes. De Jonge et al. (2010) highlight that media coverage provides an important link between the occurrence of food safety incidents and consumer trust in the safety of food.

Klonsky (2006) analyzed the spinach market with respect to food safety and consumer purchasing behavior concerning the 2006 *E. coli* outbreak in the U.S. Her study reports that during the outbreak the FDA advised consumers to avoid bagged spinach. In the short term, consumers started avoiding all types of spinach and other leafy greens. Several studies confirm her results, which demonstrate that consumer demand declines during food related outbreaks. Media play an essential role in the process of food avoidance (Richards and Patterson, 1999, McCluskey et al., 2005; Zhang, 2010). Calvin (2007) and Arnade et al. (2008) also analyzed consumer purchasing behavior during the 2006 *E. coli* crisis in the U.S. They found that early during the *E. coli* outbreak, consumers also moved away from bagged salads without spinach. However, these products quickly regained trust (Arnade et al., 2010). According to Calvin (2007), consumers changed their consumption habits within the leafy green category, because they considered salads as adequate substitutes for bagged spinach. Contrary, Arnade et al. (2008) suggested that consumers changed their preferences to other green vegetables.

Methods

To explore the relationship between media reporting and consumer behavior, the study analyzes articles related to *E. coli* outbreaks for selected media outlets in the U.S. in 2006/2007 and in Germany in 2011. Two U.S. dailies were included in the study, *USA Today*, a national newspaper, and *The Sacramento Bee*, a local newspaper published in the region of California, where the source of *E. coli* was detected. *The Sacramento Bee* can be considered likely to reflect producers' interests. In Germany, *Die Welt*, was selected as media outlet. *Die Welt* is a German national newspaper covering major fields of the economy, comparable to *USA Today*. Due to the character of the outbreak in Germany, and the implication of many European production regions, a comparable local daily was not available.

For all relevant articles published by the selected media sources a qualitative content analysis was carried out. As part of the analysis, articles were classified into five categories (process, politics, source, value chain, and medicine). The process category refers to the process of the outbreak. It includes information concerning cases of illness and death, as well as the spreading of the disease. The politics category includes reports on governmental institutions, and administrative bodies. The category source addresses the origin of the outbreak and suspected sources. The category value chain comprises all actors in the chain from production to consumption. The category includes topics, such as payment and support for farmers, litigation, and trade activities. The category medicine comprises information related to health issues and results by research institutions, for instance new forms of therapy against *E. coli* infections.

To explore the effect of the outbreak on consumer purchasing behavior of spinach and related produce in the U.S., previous studies by Arnade et al. (2011), and Calvin (2007) served as data sources. These studies are based on scanner data. Because the U. S. Department of Agriculture (USDA) does not collect comprehensive price data on bagged spinach and salads (see Calvin, 2007, p. 28), a direct comparison of primary market data on the same level for the U.S. and for Germany was not possible.

For Germany, weekly, monthly, and annual market data on household purchasing, and retail prices of cucumbers, collected by the Agricultural Market Information Inc. (AMI), were analyzed. The analysis focuses on cucumbers because cucumbers were most affected during the outbreak. Cucumbers were among the vegetables, such as tomatoes and lettuce that had been falsely identified to be the source of the *E. coli* outbreak before fenugreek sprouts were confirmed as the source.

Results and Discussion

The results section consists of three parts. The first part presents U. S. media reporting, and a summary of the market developments regarding the 2006 *E. coli* outbreak. The second part presents the German media reporting and consumer purchasing data on cucumber. Finally, both cases are compared in the third part.

U.S. media reporting and market data

Media reporting plays a central role in communicating food related issues. In the U.S., the dailies *USA Today* (figure 1) and *The Sacramento Bee* (figure 2) released the highest number of articles during the first three weeks of reporting on the outbreak, weeks 37, 38, and 39 of 2011.

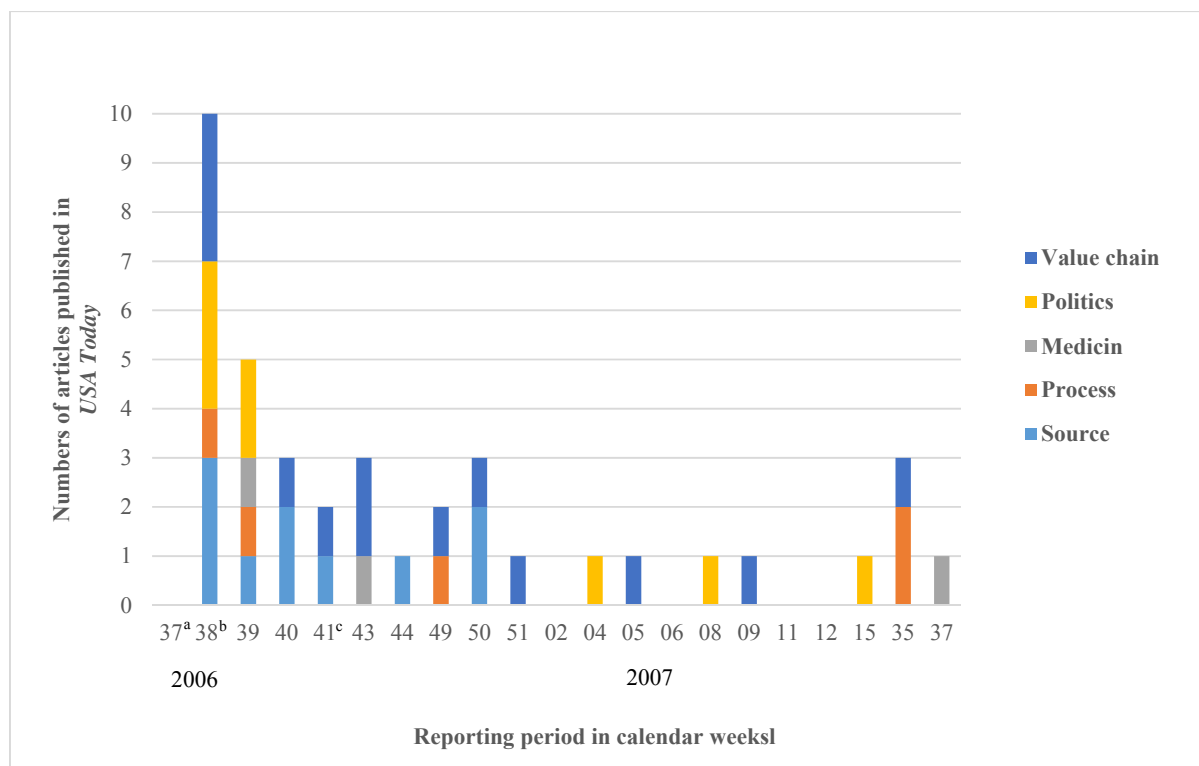


Figure 1: Media coverage of *USA Today*

^aW37: *E. coli* outbreak occurred, ^bW38: First recalls, ^cW41: Source identified

During that period, *USA Today* released 15 articles and *The Sacramento Bee* released 17 articles. The articles focused on the categories politics, source and value chain. Relatively little attention went to the categories process and medicine. One reason for the focus of the media reporting could be that the source of the *E. coli* outbreak was unknown yet. Since FDA reported on the state of the outbreak and gave advice to the public, these categories also appeared more frequently in the media. Two weeks later, in calendar week 41, the source of the outbreak was identified. In weeks 40 and 41 the number of articles in both dailies decreased to a total of five in each. In addition, the focus of media reporting changed. *The Sacramento Bee* released five articles concerning the categories source, value chain and politics, while *USA Today* concentrated on the categories value chain and source. On first glance, it may seem surprising that *The Sacramento Bee*, and not the national newspaper *USA Today*, showed a focus on politics. *The Sacramento Bee* counts the farmers being affected by the *E. coli* outbreak among their major target audiences. This could be the explanation of the additional focus on politics.

From calendar week 44 in 2006 to week 05 in 2007 pronounced differences in reporting can be observed. *USA Today* released nine articles, four articles addressed the value chain, two the source of the outbreak, and one article each on the categories politics, and process. *The Sacramento Bee* released seven articles focusing on the value chain. The stronger focus on the value chain and the source is likely due to a second *E. coli* outbreak affecting lettuce and the foodservice industry. From weeks 06 to 37 in 2007, *USA Today* released seven articles, including two articles addressing the value chain, two articles addressing politics, two articles addressing process, and one related to medicine. In *The Sacramento Bee*, four articles addressed politics, two addressed the source,

and two addressed the value chain. The rationale behind these distributions remains unclear. Furthermore, articles published in week 37 of 2007 recaptured the most important events of the outbreak. This is due to the one-year anniversary of the *E. coli* outbreak.

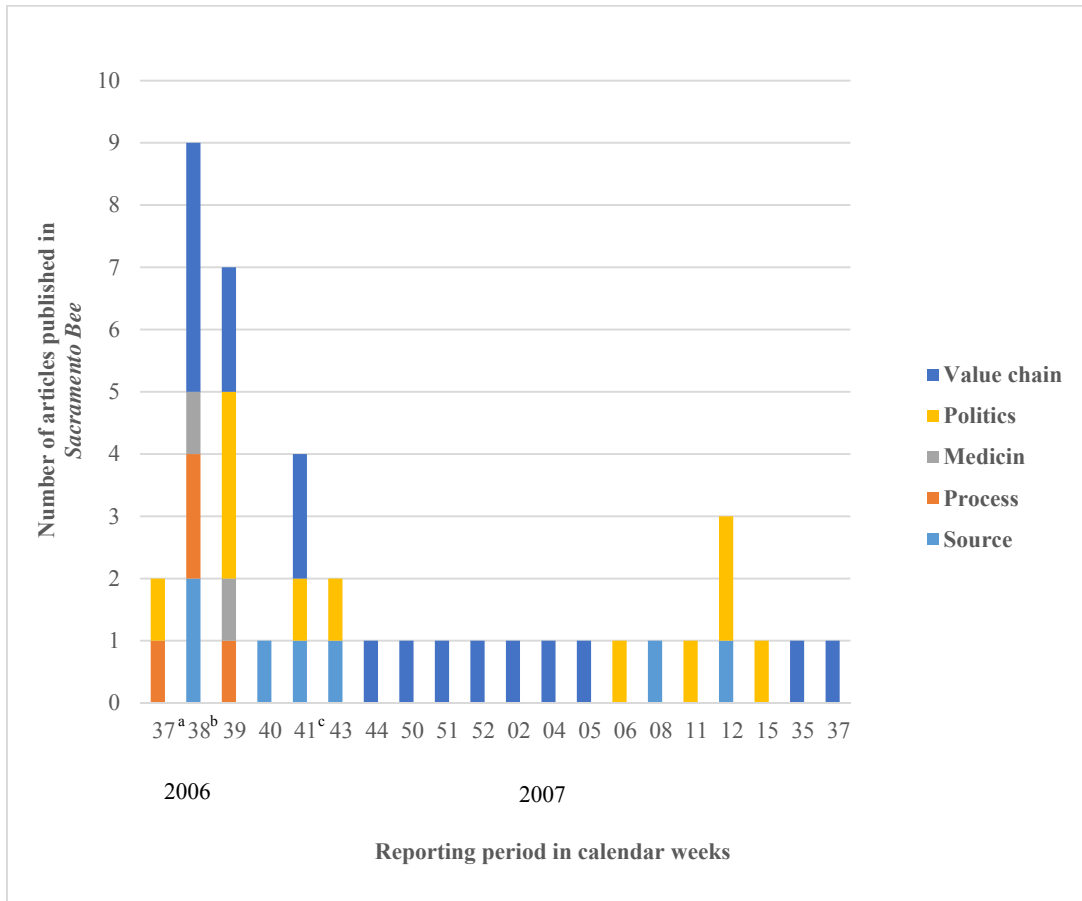


Figure 2: Media coverage of *The Sacramento Bee*
^aW37: *E. coli* outbreak occurred, ^bW38: First recalls, ^cW41: Source identified

Market data for the U.S. show that sales of fresh-bagged spinach decreased after the recalls in week 38 of 2006. When the FDA announced the end of the outbreak, sales increased only slowly. The lower sales can be attributed to a reduction in demand, as well as a decrease in acreage. The market recovery process lasted until 2007, because consumers did not directly resume their previous consumption habits (Arnade et al., 2008).

German media reporting and market data

In Germany, the *E. coli* outbreak started in week 20 of 2011. In this week, *Die Welt* started reporting on the categories process, source, and politics (figure 3). At that time, governmental authorities informed the public about the occurrence of the dangerous pathogen. As the number of articles increased during the following three weeks, all categories were addressed, in keeping with the mission of *Die Welt* as a national newspaper that covers the major fields of the economy.

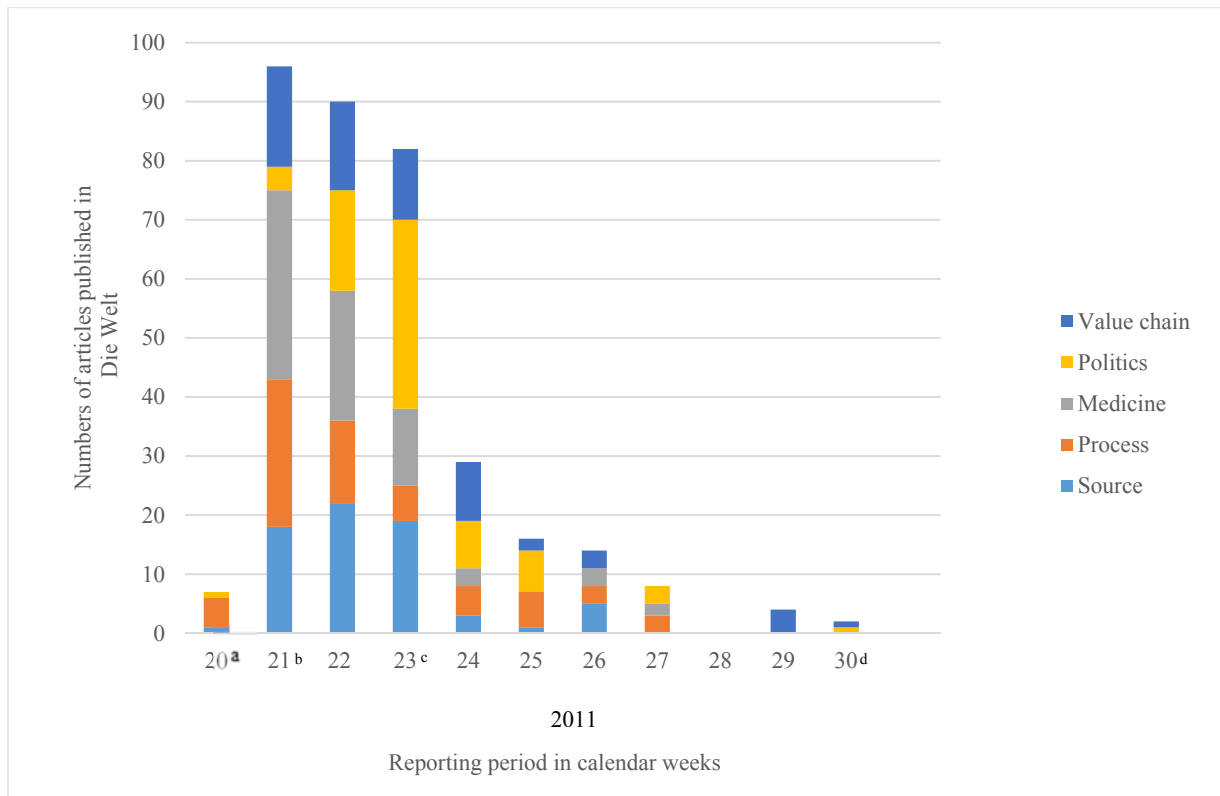


Figure 3: Media coverage of *Die Welt*

^aW20: *E. coli* outbreak occurred, ^bW21: First recalls, ^cW23: Source identified, ^dW30: Outbreak ends

After the source of *E. coli* outbreak was confirmed as fenugreek sprouts imported from Egypt in week 23, *Die Welt* decreased the number of published articles. At that time, the outbreak situation began to stabilize. The number of released articles gradually decreased until week 30, when the end of the outbreak was officially declared. In week 24, all categories were still present. In the following three weeks, *Die Welt* reported mostly on process, source of the outbreak, and the value chain. In the last two weeks of reporting, namely weeks 29 and 30, *Die Welt* informed on the value chain, and also politics in week 30. By the end of the outbreak, actual damages incurred by members of the value chain could be calculated. Moreover, the EU supported farmers in 22 states to mitigate the damages. Therefore, the categories value chain and politics were included in the last *E. coli* related articles of *Die Welt* in 2011.

The market data show that consumer purchasing behavior was impacted by media reporting. Figure 4 shows the percentage of households buying fresh cucumbers in the year of the outbreak, as well as two years before and two years after the outbreak. The outbreak occurred in week 20, when the percentage of households buying fresh cucumbers started to decrease sharply. Recovery began only after the source of the outbreak was confirmed in week 23. In the following weeks, consumption increased, at times reaching a higher level than in 2010. By the end of the year, consumption followed the tendency of the previous years, meaning that the *E. coli* outbreak had no impact on cucumber purchases in 2012 and 2013.

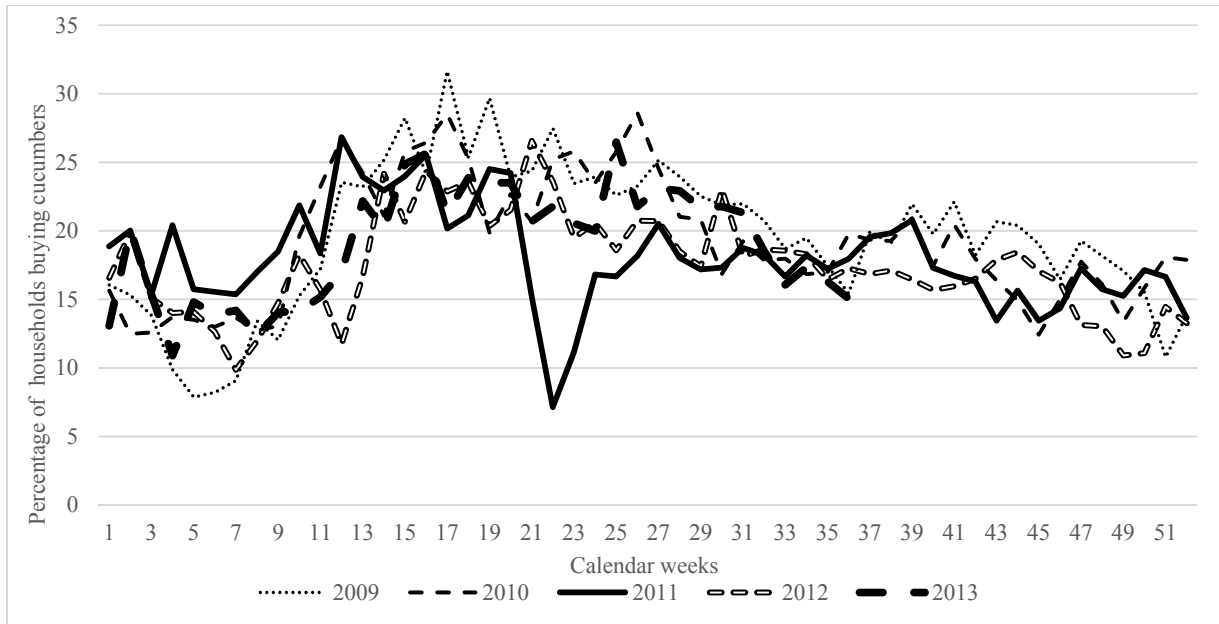


Figure 4: Percentage of households buying fresh cucumbers (based on data provided by AMI, 2013)

Case comparison

The emphases of reporting in the examined media outlets in both countries were impacted by their orientation and target audiences. *USA Today* and *Die Welt*, national newspapers, showed a broad focus, while the Californian newspaper *The Sacramento Bee* specifically addressed the interests of horticultural producers.

During the U.S. outbreak, the FDA advised consumers to avoid bagged spinach, which led to consumers avoiding all types of spinach and other leafy greens that were not implicated in the outbreak. In Germany, authorities released announcements identifying the source of the outbreak as different vegetables, including cucumbers, tomatoes, and lettuce. After further investigation, fenugreek sprouts were confirmed as the source of the outbreak. While in the U.S. consumers misinterpreted the official advisory, in Germany, the official advisories contributed to public confusion, which resulted in consumers not purchasing cucumbers.

The findings of Calvin (2007) and Arnade et al. (2008), as well as the German market data (figure 4) show that once the actual source of the outbreak was confirmed, purchases started to recover. The sales of cucumbers in Germany recovered faster than the sales of bagged spinach in the U.S. However, bagged spinach in the U.S. was the actual source of the outbreak, whereas sprouts were the source of the outbreak in the German case, not cucumbers.

Conclusions

For the products implicated in the outbreaks, but not the actual source, the findings show that the media reporting on the *E. coli* outbreaks had only short-term effects on purchasing behavior. Nevertheless, for the product that was both implicated and identified as the source of the outbreak, namely bagged spinach, the situation was different. Sales of bagged spinach in the U.S. required a long recovery period.

According to Pouliot and Sumner (2013), product litigation and economic damage to the spinach industry required improvements of food safety standards in the U.S. After the *E. coli* outbreak, food safety standards developed from voluntary initiatives to requirements, in order to minimize the risk of serious health consequences. In Germany, several food safety standards have been prerequisites for marketing produce, even before the *E. coli* outbreak. Although such standards have been applied for over a decade, and upgraded over time, foodborne illnesses still occurred. It is questionable if further incentives for improving food safety management exist in Germany, since lawsuits were not successful and farmers were compensated by the European Commission.

Media reporting played a role in changing consumer purchasing behavior, and consumer trust in food safety. Consumers showed distrust in food safety in the short-term, but restored their previous consumption patterns when the outbreak was over, albeit at varying speeds. The study also confirms findings of Nucci et al. (2009) that journalists have the crucial role in shaping the information released, and transferring it to the wider community. Further research should investigate how social media reporting impacts consumer behavior during foodborne illnesses, especially considering the increased influence of social media compared to traditional media. Additional information outlets to investigate are news on radio and television.

References

- Arnade, C., L. Calvin and F. Kuchler. 2008. Market Response to a Food Safety Shock: The 2006 Foodborne Illness Outbreak of *E. coli* O157:H7 Linked to Spinach. Paper presented at the 2008 American Agricultural Economics Association Annual Meeting, July 27-29, 2008, Orlando, Florida.
- Arnade, C., L. Calvin and F. Kuchler. 2010. Consumers' Response to the 2006 Foodborne Illness Outbreak Linked to Spinach. USDA Economic Research Service. Online: <http://www.ers.usda.gov/amber-waves/2010-march/consumers%E2%80%99-response-to-the-2006-foodborne-illness-outbreak-linked-to-spinach.aspx#.UuPNihCIUuU> [accessed November 12, 2013].
- Arnade, C., L. Calvin and F. Kuchler. 2011. Food Safety and Spinach Demand: A Generalized Error Correction Model. *Agricultural and Resource Economics Review* 40 (2): 251-265.
- California Leafy Green Products Handler Marketing Agreement (LGMA). Online: <http://www.caleafygreens.ca.gov/> [accessed November 12, 2013].
- Calvin, L. 2007. Outbreak Linked to Spinach Forces Reassessment of Food Safety Practices. *Amber Waves* 5 (3): 24-31.
- Calvin, L. 2013. *The Food Safety Modernization Act and the Produce Rule*. Vegetables and Pulses Outlook: Special Article (VGS-353-SA2). Economic Research Service, USDA, March 29, 2013.
- De Jonge, J., H. Van Trijp, R. J. Renes and L. J. Frewer. 2010. Consumer Confidence in the Safety of Food and Newspaper Coverage of Food Safety Issues: A Longitudinal Perspective. *Risk Analysis* 30 (1): 125-142.
- European Commission. 2011. Lessons learned from the 2011 outbreak of Shiga toxin-producing *Escherichia coli* (STEC) O104:H4 in sprouted seeds. Commission staff working document, Brussels.

- Gawron, J.C. and L. Theuvsen. 2009. Agrifood Certification Schemes in an Intercultural Context: Theoretical Reasoning and Empirical Findings. Paper presented at the 113th EAAE Seminar, A resilient European food industry and food chain in a challenging world, September 3-6, 2009, Chania, Crete, Greece.
- Gay, S.H. and A. Schneider. 2007. A comparative analysis of food quality assurance schemes: The case of Neuland and EurepGap. Paper presented at the 47th GEWISOLA and the 17th ÖGA conference, September 26-28, 2007 Freising/Weihenstephan, Germany.
- Klonsky, K. 2006. *E. coli* in Spinach, Foodborne Illnesses, and Expectations about Food Safety. Agricultural and Resources Economics Update. Gianni Foundation of Agricultural Economics, University of California 10 (2): 1-4.
- McCluskey, J. J., K. M. Grimsrud, H. Ouchi and T. I. Wahl. 2005. Bovine spongiform encephalopathy in Japan: consumers' food safety perceptions and willingness to pay for tested beef", *Australian Journal of Agricultural and Resource Economics* 49 (2): 197-209.
- Nucci, M. L., C. L. Cuite and W. K. Hallman. 2009. When Good Food Goes Bad. Television Network News and the Spinach Recall of 2006. *Science Communication* 31 (2): 238-265.
- Painter, J.A., R.M. Hoekstra, T. Ayers, R.V. Tauxe, C.R. Braden, F.J. Angulo and P.M. Griffin. 2013. Attribution of foodborne illnesses, hospitalizations, and deaths to food commodities by using outbreak data, United States, 1998-2008. *Emerging Infectious Diseases* 19 (3): 407-415.
- Pouliot, S. and D.A. Sumner. 2013. Traceability, recalls, industry reputation and product safety. *European Review of Agricultural Economics* 40 (1): 121-142.
- Richards, T.J. and P.M. Patterson. 1999. The Economic Value of Public Relations Expenditures: Food Safety and the Strawberry Case. *Journal of Agricultural and Resource Economics* 24(2): 440-462.
- Richards, T.J., W. E. Nganje and R. N. Acharya. 2009. Public Goods, Hysteresis and Underinvestment in Food Safety. *Journal of Agricultural and Resource Economics* 34(3): 464-482.
- Tauxe, R. V., M. P. Doyle, T. Kuchenmüller, J. Schlundt and C. E. Stein. 2010. Evolving public health approaches to the global challenge of foodborne infections. *International Journal of Food Microbiology* 139 (Supplement): 16-28.
- Zhang, H., Marsh, T and J. McCluskey. 2010. A Generalized Event Analysis of the 2006 *E. coli* Outbreak in Spinach and Lettuce. Online: http://www.impact.wsu.edu/MarshFiles/E.coli_paper_V1.pdf [accessed September 12, 2013].