Food Policy 38 (2013) 92–104

Contents lists available at SciVerse ScienceDirect

Food Policy

journal homepage: www.elsevier.com/locate/foodpol

Food health risk perceptions among consumers, farmers, and traders of leafy vegetables in Nairobi

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ARTICLE INFO

Article history:
Received 10 January 2012
Received in revised form 1 November 2012
Accepted 10 November 2012
Available online 13 December 2012

Keywords:
Food health risk
Peri-urban farming
Consumers
Farmers
Traders
Risk perception
Vegetables
Short supply chains

ABSTRACT

Urban and peri-urban farming and supply chains are becoming increasingly important for delivering perishable produce to the urban centers of the developing world to meet the demands of a growing population. However, some production and handling practises and a short supply chain may expose consumers to substantial health risks. This study of consumers, peri-urban farmers, and traders attempts to quantify subjective risk judgments with regard to food safety hazards, and examines the extent of discrepancies in perceived risk relating to vegetables in domestic urban markets among the three groups. A conceptual model was developed to elicit subjective risk perceptions for a multidimensional construct. In general, differences were found between respondent categories in terms of both specific source risks and overall risks. Differences were also found with respect to the socio-demographic and structural determinants of the levels of perceived risks. These findings can help improve policies to promote food safety and reduce risky food handling along the supply chain, and present opportunities for change.

Introduction

Urban and peri-urban farming and supply chains (UPFS) in the developing world encompass a wide spectrum of exposure to food health risks for consumers. Access to clean water for irrigating vegetables represents a major challenge. Sewage water containing a broad spectrum of pathogens, many that survive for several weeks in the field, is commonly used in urban areas (Amoah et al., 2006). The use of sewage or polluted water results in excessive accumulation of heavy metals in soils, which leads to elevated levels of heavy metal uptake by crops (Karanja et al., 2010). The use of uncured animal manure is an additional source of micropathogen contamination and heavy metal uptake. Other hazards associated with fresh produce contamination result from transport, handling, and hygiene practises. Examples include exposure to polluted water used for moistening produce during retailing, vehicle exhaust, and road dust (Hide et al., 2001).

In addition, the demand by urban consumers for blemish-free and attractive produce encourages excessive use of pesticides and nitrate-rich chemical fertilizers (e.g., Okello and Swinton, 2010). The tropical climate in some developing countries also encourages the build-up of pests and diseases, making the use of pesticides unavoidable. The short distance to market associated with UPFS can increase exposure to risks from pesticide residues, as the time between harvesting and selling is typically short.

A rapid transformation of food systems in developing countries is ongoing (Lippe et al., 2010). A dual situation seems to be emerging in which food safety conditions at supermarkets or high-end markets driven by consumer lifestyle changes and income, among other factors (Henson and Reardon, 2005), are perceived by their customers as providing safer and higher quality vegetables than traditional markets. However, studies on the prevalence of objective risk do not support this perception. A recent study by Kutto et al. (2011) in Nairobi showed that postharvest handling and retailing practises are the major contributors to microbiological contamination of fresh vegetables. The study also found that, although the prevalence of pathogens was higher in traditional markets than high-end markets, the prevalence of *Escherichia coli* was as high as 20%, even in high-end markets, which poses a significant health risk to consumers. Traditional outlets (open-air markets, kiosk vendors, on-farm purchases) remain significant points of purchase for many urban consumers. Despite having poor hygiene and sanitation, these traditional markets still serve the majority of urban consumers in developing countries (Tshirley and Ayieko, 2008).

Given the rapid growth in the urban population, rising urban poverty, and problems with food supply and distribution systems,

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0306-9192/$ - see front matter © 2012 Elsevier Ltd. All rights reserved.
http://dx.doi.org/10.1016/j.foodpol.2012.11.001

the development of local supplies of perishable produce with safe and good nutritional value requires that consumers and major actors within UPFS chains perceive and understand the potential risks of specific foods. Undoubtedly, consumption of unsafe food is a major cause of preventable illnesses, and perception of food health risk has consequences for consumer welfare and the welfare of value chain stakeholders, and for the effectiveness and efficiency of UPFS. This statement is particularly true when considerable divergence exists between consumer perceptions and value chain actors. Consumer perceptions are likely to represent potential determinants of their food choices (Verbeke et al., 2005). In addition, UPFS chain actors may guide decisions, ranging from choice of production methods to product presentation at market places, based on their beliefs about consumer perceptions.

Therefore, the aim of this study was to investigate differences in, and determinants of, perceptions of food-related health risk for fresh vegetables that consumers and major actors hold within an urban and peri-urban supply chain in a metropolitan area of the developing world. Discrepancies in perceptions of food health risk may drive potential market failures and create negative externalities, which would highlight the need for a public health-driven approach to food safety. Consumers may select points of purchase through beliefs in risk reduction and trust, but may not reap all of the benefits of selecting these purchase locations. Similarly, lack of information and distrust between producers and consumers has been found to adversely affect the introduction of changes to the food delivery system in developing countries (Hoan et al., 2005). Understanding the scope and determinants of the perception of food health hazards among the major actors within UPFS, including consumers, is crucial in the development and implementation of effective food safety policy and risk communication. Preventive intervention to reduce food-related health hazards is also important for the performance of markets and institutions: a recent review found that risk prioritization is often argued for, but is typically lacking (Anders and Schmidt, 2011). Importantly, such prioritization should be able to capture the many health risks related to food safety along UPFS chains that have longer-term health consequences rather than the acute consequences that make them less visible and less attractive from a policy perspective.

The analysis was based on data collected through personal interviews with 449 urban consumers, 120 kale farmers, and 100 kale traders (*Brassica oleracea* O.) in peri-urban areas of Nairobi, Kenya. Peri-urban areas were defined as those within approximately 20 km of the city center and controlled by the City Council. Although the geographical coverage of existing data is rather limited, food safety challenges are typical of informal market outlets throughout the developing world (FAO, 2011). Because farmers can also supply more elaborate market outlets, the health risk situation most likely extends beyond the poorest consumers and is a public health concern at a wider level.

Kale is one of the most important green leafy vegetables consumed in Nairobi and peri-urban farming supplies the full range of market outlets, from traditional to specialty stores. Kale for domestic consumption does not undergo the same production certification as fresh vegetables grown for export, but it does play an important nutritional role in developing countries (World Health Organization, 2004).

The remainder of this paper begins with a background on the research field pertaining to perception of food health risk in Section 'Previous research on the perception of food health risk – and aims of this study'. This serves as input for developing a set of specific research aims relating to the measurement of individual risk perceptions and their determinants. The research approach, including details of the data and survey, the measurement and conceptualization of perceived food health risk, the measurement of social pressure, knowledge and trust, and details of the data analysis, is described in Section 'Data and methodology'. Section 'Results' presents the results, while Section 'Discussion' discusses the policy implications based on our findings of the differences in perceived food health risk between consumers, farmers, and traders, and on the findings related to determinants of food health risk perception.

Previous research on the perception of food health risk – and aims of this study

In developing a model that integrates multidimensional perceptions of risk over several sources of risk, this study extends the existing knowledge in two ways. First, at the level of each source of risk, the traditional model of probability and consequences based on Bauer (1967) and Vann (1983) is extended by introducing a third risk component related to the immediacy of health consequences. This immediacy component explicitly introduces an inter-temporal aspect into the formation of perceived food health risk, and allows different sources of risk to differ as the time horizon between exposure and occurrence of symptoms changes. Such an immediacy component is consistent with the unknown risk characteristic described by Slovic (1987). Frederick et al. (2003) argued that if the potential consequences of a health hazard are closer in time, the risk will be easier to visualize and, therefore, the sense of danger will be heightened.

Second, because the expectation is that people do not have well-formed risk preferences in relation to food health risks, the discovered-preference hypothesis (Plott, 1996) was introduced into the assessment of perceived risks. Through this approach, people gained successive experience with a particular risk and were allowed to provide their perception weights step-wise with focused attention throughout the elicitation procedure. This approach was important from a dual processing perspective that allows people to process the information thoughtfully, thus reducing the task-specific cognitive burden. In risk psychology, information processing is related to subsequent risk perceptions (Griffin et al., 1999). Finally, integrating risks from various sources introduced an overall evaluative assessment of the relative importance of each attribute.

Taken together, the model developed in this paper represents an alternative to the psychometric approach (e.g., Fischhoff et al., 1978) which involves obtaining separate ratings for hazards in terms of sets of risk characteristics that vary from study to study (for example, seriousness, likelihood of occurrence, and the extent to which hazards are identifiable and understood). Then, typically, after averaging across all participants, data in the form of ratings $\times$ risk characteristics are subjected to a principal components analysis (Siegrist et al., 2006).

An advantage of the approach used in this study is that it permitted characterization of a total risk perception measure for each individual, without using multivariate methods or making assumptions about the distribution of perceptions throughout the population. The measure of total risk, which is the outcome of the analysis, is then not a set of inferred distributions, but rather a direct observation of individual differences in risk perceptions. As such, greater confidence should exist that the heterogeneity observed represents true differences in risk perceptions. The setup was also intended to reduce potential response biases typical of rating scales (for example, acquiescence bias, focusing illusion, and extreme response bias), as identified by Paulhus (1991).

Food-related health risks related to vegetables fall into several broad categories, including microbiological risks, physical and chemical contaminants related to production, and processing and handling risks. Such complexity and multidimensionality is common in many areas in which consumer-perceived risk is studied (Mitchell, 1999). Most previous studies on food quality and safety