

# Assessing Consumer Perceptions Towards the Risks Associated with Food and Waterborne Diseases in Sri Lanka

M.M. KARUNANAYAKE AND J.M.D.U.K. JAYASINGHE

*Department of Agribusiness Management, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka, Makandura, Gonawila (NWP)*

## ABSTRACT

Using primary data collected through a consumer survey conducted in the Gampaha district in Sri Lanka from April to May in 2005 with 100 randomly selected consumers, this study assesses their risk perceptions on two major aspects. First, the consumer risk taking behavior on a number of prominent diseases/incidents prevalent in Sri Lanka, which are associated with consumption of food and water and the second, a number of other risky incidents that can cause either hospitalization and/or death, but are not directly related with the consumption of food and/or water. The cases considered in both types were in turn classified as "acute" and "chronic", based on the time taken to show their real impact on the consumer.

The impact of a number of socio-economic characteristics pertaining to the consumers on their risk taking behavior is quantified, and the outcome of which was used to make comparisons with respect to these scenarios. The results highlight that there is a significant impact of these characteristics on consumer risk perceptions; especially with respect to the way they believed that the diseases and/or incidents considered in this analysis can cause an event of hospitalization and/or death will have a direct and immediate impact (acute) on their health.

**KEYWORDS:** Acute, Chronic, Consumer Risk Perceptions, Foodborne Diseases

## INTRODUCTION

Though the food supplies by processors are supposed to be safe, evidence from the food economics literature suggest that food borne illnesses are prevalent in each and every corner of the globe & that incidence of certain pathogens is ever-increasing especially in the third world countries (see, for example Antle, 1995; Henson and Caswell, 1999; Buzby *et al.*, 2001). Amongst the other things, the perceptions of a consumer towards the level of food safety, which is defined as "potential hazards associated with food that can cause ill health in humans", should she maintained in her day-to-day life to enjoy a quality lifestyle has been playing a significant role with respect to her decisions to consume certain commodities, especially those supposed be contained higher levels of pathogens (e.g. red meat and poultry), fat content (e.g. processed milk products) and cholesterol (e.g. eggs).

Consequently, a rational consumer may always take precautions to seek protection from suffering of food borne illnesses such as *Botulism*, *Diarrhea*, and *Shigellosis* etc., which can occur suddenly or in many occasions within a very few days after consumption of an unsafe food product (so, we referred as "acute" disease), and the level of precautions the consumer takes in these cases may be above or equal to the level that she takes on other diseases that can be resulting from over (or under) consumption of certain food items, for example diabetics (from sugar) and heart attacks (fat and cholesterol) and/or without any direct relationship to the food items she consumes, for example asthma, cancer etc. In both cases the disease and/or event may be occurred after a long period of time (-so referred as "chronic" diseases).

For example, the food economics literature suggests that people, in general, don't believe that "obesity" causes about 58 percent of diabetes, 21 percent of heart attacks, and 42 percent of cancers, although they know that spoiled meat can cause a food

borne disease without much uncertainty. Although people take precautions based on their perceptions on these diseases or events, the "losses" occurred by the death or being hospitalized due to such diseases lead to "waste" of a large sum of money and manpower in each year, for example Buzby *et al.*, 2001 showed that an estimated amount of 76 million cases of food borne illness occur each year in United States, costing between \$6.5 & 34.9 billion in medical care & lost productivity. Of which, *Salmonella* causes 31 percent of food related deaths followed by *Listeria* 28 percent, *Campylobacter* 5 percent, & *E. coli* 3 percent.

As many of us are believed, those risks associated with consumption of foods (for both acute and chronic) as well as that are associated with other events including natural disasters such as floods and droughts (i.e. non-food related) are greater in developing countries like Sri Lanka and it may be worst in other countries like India, Bangladesh, African countries and so on, because of the low level of economic development, poor climatic and weather conditions, cultural & social norms, and prevailing infrastructures. Within a society, however, the risk perceptions of consumers towards being died or hospitalized may also be related with socio-economic characteristics of a consumer, including his or her age, level of education, income level etc.

Henson (2003) has explained that consumers are under estimating the risk of death due to high probability events as Cancer while over estimating the risks due to low probability events as Botulism thus, consumers will tend to over-demand and in turn markets will tend to over-supply, foods that are more risky, whilst under-supplying products that are relatively more safe, in his study on evaluating economics of food safety in developing countries.

However, scientific information related to economics of consumer risk taking behavior with respect to both food and non-food related acute chronic diseases and other incidences are rare in the

context of developing countries and interestingly there is no, to the best knowledge of authors, such study has been conducted in the context of Sri Lanka.

One of the major problems associated with investigating such problems empirically is lack of accurate and timely data on these incidents, for example the "expected" and "actual" amount of deaths or hospitalizations resulting from such incidences are not available publicly, other than simple analysis such as analysis based on "extrapolations" of the prevalence rate of diseases to the current population in Sri Lanka (see, Table 1)<sup>1</sup>. However, making appropriate policy based on such incomplete data cause difficulties for economists and policy makers since these estimates may have limited relevance to the actual prevalence of diseases in any region in the island.

**Table - 1 Extrapolation of prevalence rate of disease in Sri Lanka:**

Disease	Cases
Botulism	11
Cancer	91395
Cholera	0
Diabetes	58398
Diarrhea	19905165
E. coli	1829
Heart	91975
Salmonella	102453
Tuberculosis	1343

Source: Author

Having stated the difficulties associated with getting accurate primary and secondary data for a comprehensive analysis, this study aims to find solutions for a number of economic research problems of interest, including:

(1) Whether there is any significant difference of the perceptions of consumers in Sri Lanka towards their risk taking behavior with respect to the diseases and/or events resulting from consumption of food and/or water, and that are not related with food and/or water;

(2) In terms of the diseases/events indicated above, will the perceptions of consumers for these diseases/events be significantly different in terms of the "time taken" to show the real impact of which on their status of health and nutrition (i.e. acute and chronic), and

(3) Finally, will the consumer risk perceptions on these diseases be significantly different with respect to their socio-economic characteristics such as gender, age, education income and geographical location.

## METHODS

Lack of availability of time series data on the estimated and actual deaths and hospitalizations resulting from acute and chronic food (and waterborne) diseases (botulism, cholera, diabetics) and other non food events (e.g. pregnancy and natural

disasters) in Sri Lanka make difficulties with respect to carrying out a comprehensive research similar to what conducted by Henson (2003). However, such information is vital for developing appropriate policy to minimize the impact of such incidences on consumer decision-making, for example to develop consumer education programs, to evaluate the effectiveness of advertising programs and consumer perceptions on immunization programs etc. While accepting the difficulties associated with conducting such a study in the context of Sri Lanka, the methods suggested in this study aims to evaluate the risk taking behavior of consumers using the primary data collected from sample of consumers.

## Hypotheses

From the economic research problems stated above, the following set of hypotheses were derived for the purpose of empirical analysis:

1. It was hypothesized that there is no significant difference of the perceptions of consumers in Sri Lanka towards their risk taking behavior with respect to the:
  - a. Diseases and/or events resulting from consumption of food and/or water,
  - b. Those are not related with consumption of food and/or water.
2. Referring to the diseases and/or events included in the two categories of (1) above (i.e. *a* and *b*), it was hypothesized that the perceptions of consumers in Sri Lanka are not significantly different.
  - a. With respect to the "time taken" to show the real impact of the disease and/or event on consumers' status of health and nutrition, i.e.
    - I. "Acute" (the signs of the disease can be observed within a shorter period of time, for example 2-3 days), and
    - II. "Chronic" (it takes a relatively long time to show the signs of the disease, for example more than 1 year).
  - b. With respect to their socio-economic characteristics such as gender, age, education etc.

## Classification of Diseases

For the purpose of this study, a number of prominent diseases and other events were considered, and subsequently classified as follows (Table 2):

<sup>1</sup> The base population considered in the analysis was 19,905,165 people.

Table 2- Classification of Diseases/Events

CATEGORY ONE		CATEGORY TWO	
Diseases And Events That Are Closely Associated With Consumption of Food And/Or Water		Diseases And Events That Are Not Directly Associated With The Consumption of Food And/Or Water	
“Acute”	“Chronic”	“Acute”	“Chronic”
Botulism	Diabetes	Bomb blast	Asthma
Cholera	GM food	Dengue	Cancer
<i>E.coli</i>	Heart attack	Natural disaster	Pregnancy
Hepatitis			
Salmonella			

### Data Collection

The next step of the analysis was to collect data from a representative sample of consumers to validate the hypotheses indicated above.

A questionnaire-based survey with a sample of 100 randomly selected consumers to reflect various socio-economic characteristics were carried out to collect data from April to May in year 2005. It was pilot tested prior to the real survey with a small sample of potential consumers ( $n = 10$ ) and minor modifications were made to the preliminary questionnaire. The respondents to the real survey were mainly selected from the areas of Negombo, Weyangoda, Mirigama and Seeduwa in the Gampaha district.

The questionnaire was designed to collect data on perceptions of consumers with respect to the diseases/events explained in Table 2 under two different scenarios: (1) the risk of being “died” due to a disease or an event ( $d$ ), or (2) “hospitalized” ( $h$ ). A psychometric five-point “*Likert scale*” (Oppenheim, 1992) was used to measure the perceptions of the respondents to the questionnaire on their susceptibility to all the diseases/events considered. In turn, they were asked extent to which they are “agreed” to the statement of – “in my case, there is a chance of being died (or hospitalized) due to suffering from (disease) within next five years<sup>2</sup>” on a scale of 5 (highly susceptible) to 1 (strongly disagree). In addition to this, the information pertaining to the socio-economic characteristics of the respondents were also collected.

### Data Analysis

Having tested the primary data collected in consumer survey for their accuracy and completeness, the “Mean Scale Value” (MSV) of a disease/event (together with its Standard Deviation) was calculated. This was carried out with: (1) the entire sample ( $N = 100$ ), and (2) after dividing the entire sample into various sub samples with respect to their socio-economic characteristics, namely: (1) gender (male vs.

female); (2) age (35 over vs.35 lower); (3) education (over AL vs. lower AL); (4) Income (high vs. low); and (5) geographical area (rural vs. urban). To estimate MSV for a given disease/event, the summation of the scale values given by respondents on the “*Likert scale*” was taken and then divided by the number of respondents included in that sample for the both cases of “death” (MSV-d) and “hospitalization” (MSV-h).

The next step was to get the “Average Mean Value” (AMV) of the diseases and events included in a particular category in Table 2 for the entire sample and five sub samples based on socio-economic characteristics. The AMV of the diseases/events included in the CATEGORY 1 (i.e. AMV-c1), for example was calculated by taking the summation of MSV of diseases/events ( $n = 8$ ) in that category and dividing the resulting value by number of diseases and events in it. In this way, we obtained the AMV-c1-d for the case of death and AMV-c1-h for the case of hospitalization in this category for all the samples, and, likewise, AMV-c2-d and AMV-c2-h for CATEGORY 2.

The same procedure was used to calculate AMV for diseases/events included in “acute” and “chronic” sub-categories for all the samples. For example, in CATEGORY 1, the MSV of the diseases/events included in the “acute” (ac) ( $n = 4$ ) and “chronic” (cr) ( $n = 4$ ) sub-categories were summated separately. The resulting values were divided by the number of diseases/events included in the respective sub-category to get the AMV, i.e. AMV-c1-ac and AMV-c1-cr (similarly, AMV-c2-ac and AMV-c2-cr for the CATEGORY 2). Like in the previous case, this was carried out for the cases of death (AMV-c1-ac-d) and hospitalization (AMV-c1-cr-h) in both categories.

To test the hypotheses for their significance, a “paired *t*-test” was conducted ( $\alpha = 0.05$ ) (Greene, 2000).

## RESULTS AND DISCUSSION

This section summarizes the descriptive statistics of the sample and an outcome of the quantitative analysis.

### Differences in Risk Taking Behavior

The results suggest that there are significant differences with respect to risk taking behavior of consumers exist for many cases indicated above depending on whether the risk is perceived on food and/ or waterborne disease/event and non-food related and whether they are acute or chronic in nature, as well as on the socio-economic characteristics of consumers.

### Descriptive Statistics

The descriptive statistics of the sample ( $n = 100$ ) is illustrated in Figure 1. In the sample, 45 percent of respondents were “males” (M), while 55 percent are “females”(F)and about 58 percent of which were “more than 35 years old”(>35) and about 58 percent were considered to be “high income”(HI) respondents. About 53 percent of respondents were

<sup>2</sup> The data were collected for 5, 10 and 25 years also for the cases of death and hospitalization. But this paper is limited to the analysis of the special case of 5 years.

from the "rural"(R) areas. There were 15 percent of the consumers included in the sample can be considered as "high income – urban (U) –educated (>AL) – young people" (<35) in compared to 85 percent of as "low income (LI) – rural – primary educated (<AL) – matured people".

Figure 1- Distribution of the sample

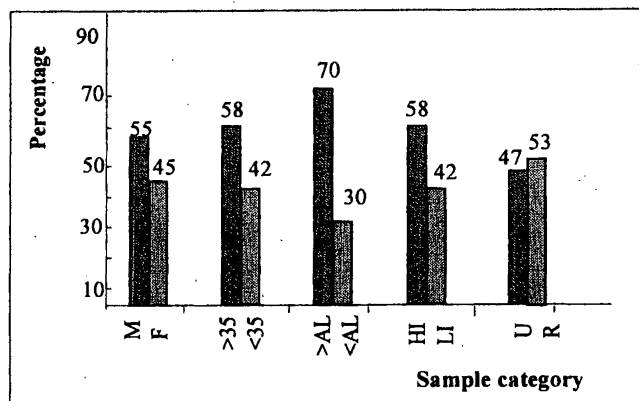


Table 3 shows the Average Mean Values of various categories considered in this analysis for a number of sub samples developed.

Table 3 - Summary statistics for food and Non -food diseases/events:

For Hospitalization		
Food	Non Food	Significance
3.7	3.46	1.73
For Death		
2.42	2.59	1.07

Consumers believe that their susceptibility of being hospitalized from a food borne disease (3.7) than from a non food disease/event (3.46) is higher, and of being died susceptibility from non food disease is high compared to food borne disease.

Table 5 - Effect of socio economic characters on consumer perceptions:

Description	For Hospitalization														
	Gender			Age			Education			Income			Location		
	M	F	sig	>35	<35	sig	>AL	<AL	sig	High	Low	sig	Urba	Rura	sig
No of sample	45	55		58	42		70	30		58	42		47	53	
1. Food	3.9	3.6	1.5	3.5	3.6	1.0	3.6	3.7	0.4	3.5	3.8	1.5	3.7	3.6	0.3
2. Nonfd (NF)	3.4	3.4	0.0	3.4	3.5	0.1	3.4	3.3	0.3	2.4	4.	8.6*	3.4	3.4	0.0
3. Fd Acute	3.9	3.7	3.0*	3.7	3.9	2.5*	3.7	3.8	1.0	3.6	3.9	1.1	3.9	3.7	0.8
4. Fd Chronic	3.5	3.4	0.2	3.3	3.6	1.2	3.4	3.5	0.4	3.3	3.5	0.9	3.3	3.5	0.8
5. NF Acute	2.9	2.9	0.0	2.9	2.7	0.9	2.9	2.8	0.3	2.8	2.9	0.2	2.9	2.9	0.0
6. NF Chronic	4.0	3.7	1.0	3.9	4.0	0.5	4.0	3.9	0.5	3.8	4.0	0.9	4.0	3.9	0.1
For Death															
1. Food	2.2	2.5	1.4	2.3	2.5	0.9	2.3	2.5	0.7	2.2	2.5	1.6	2.4	2.4	0.0
2. Non Food	1.2	1.2	0.8	1.2	1.2	0.0	2.6	2.5	0.0	2.4	2.6	0.8	2.6	2.6	0.0
3. Fd Acute	2.0	2.3	3.8*	2.1	2.3	2.2*	2.2	2.2	0.8	2.0	2.3	0.7	2.2	2.1	1.1
4. Fd Chronic	2.6	2.8	0.9	2.6	2.8	0.7	2.6	2.9	1.2	2.5	2.8	0.3	2.6	2.7	1.4
5. NF Acute	2.3	2.6	2.0*	2.5	2.4	0.6	2.5	2.4	0.5	2.4	2.5	0.6	2.4	2.	0.0
6. NF Chronic	2.6	2.7	0.3	2.6	2.7	0.2	2.6	2.7	0.	2.5	2.8	0.9	2.6	2.6	0.0

Note: \*Significant at 0.05 probability level

But results suggest that there's no significant difference with respect to risk taking behavior of consumers of being hospitalized and death, depending on whether the risk is perceived on food borne disease or non food disease {(1.73) and (1.07)} at 95 percent probability level. Summary statistics relating to hypothesis 2 are reported in Table 4.

Table 4 - Summary statistics on consumer perceptionson on "acute" and "chronic" diseases /events:

	For Hospitalization		
	Acute	Chronic	significance
Food	3.82	3.48	2.58**
Non Food	2.92	4.01	7.54**
	For Death		
	Acute	Chronic	significance
Food	2.22	2.74	3.99**
Nonfood	2.49	2.69	2.34**

Note: \*\* Significant at 0.05 probability level

Though there is no significant difference of consumer perceptions on food borne and non-food diseases/events, they are varying with sub categories, (acute, chronic) In Category1 risk of being hospitalized (3.82) is higher in "acute" diseases as Botulism compared with "chronic" diseases as Heart attack (3.48). But consumers are having a higher risk for being died in "chronic" food diseases as Heart attack (2.74) than "acute" as Botulism (2.22).

The risk of being died or hospitalized from a chronic non-food disease/event like Cancer, Asthma is high compared with acute diseases (Dengue, Natural disaster). Consumers are having a higher risk for both hospitalized and died in non food chronic diseases than non food acute disease /event. Summary statistics for hypothesis 2 .b. are illustrated in Table 5.

None of the socio economic characteristics (age, sex, edu etc) are significantly affecting consumer perceptions of being hospitalized or died from food borne diseases (without considering the time taken to show the impact). But there's a significant effect of gender and age to the risk of being hospitalized and died for food borne "acute" diseases. Males and people who are younger than 35 years are having a greater risk of being hospitalized from a food borne acute disease (Botulism, cholera) within next five years and risk of being died is high in females and younger people.

None of the considered socio economic characters are significantly affecting the risk of being hospitalized or died from a food borne "chronic" disease/events (cancer, GM food). Low income people are having a high risk of being hospitalized from non-food disease/event (Dengue).

Risk of being hospitalized from a non-food acute disease/event (bomb blast, dengue) is not significantly affected with any socio economic characters, but females are having a high risk of being died from a non-food acute disease/event (natural disasters, dengue) compared to males. Risk perceptions towards a non-food chronic disease/event (pregnancy, cancer) are not varying with any socio economic characters (gender, age, edu etc)

### CONCLUSION

There is no significant difference of the perceptions of consumers in Sri Lanka towards their risk taking behavior with respect to the diseases and/or events resulting from consumption of food and/or water (botulism, cholera) and that are not related with consumption of food and/or water (dengue, asthma). Consumers are having a similar risk taking behavior towards food borne diseases/events and non-food diseases/events. Sri Lanka consumers' perceptions towards their risk taking behavior with respect to the: "*time taken*" to show the real impact of the disease and/or event on consumers' status of health and nutrition, (acute, chronic) are significantly varying for both food borne and non-food diseases/events.

Sri Lanka consumers' perceptions towards their risk taking behavior with respect to socio economic characters (gender, age, location) are having a significant difference for food/water borne acute diseases (botulism, cholera) and non-food chronic diseases/events (pregnancy, cancer).

Results suggest implementing awareness programs for consumers on communicable and noncommunicable diseases that are caused by food and to maintain the food quality up to the standard levels. In the same time food processors should be educated through public health inspectors (PHI) with the help of health ministry. Well functioning programs as regular PHI inspections, product testing, suppliers that are found not to meet the standards are penalized in hotels and fast food centers, help to eradicate the misperceptions of consumers', when they make a decisions on food consumption.

### REFERENCES

- Antle, J. M. (1995). Choice and Efficiency in Food Safety Policy. The AEI Press. Washington D.C
- Buzby, J.C.T.Roberts, C.T.J.Lin, and J. M. MacDonald (2001). Bacterial Food borne Disease: Medical Costs and Productivity Losses. Agricultural Economic Report No 741. Economic Research Service, United States Department of Agriculture.
- Caswell, J.A; and N.H.Hooker.1996.HACCP as an International Trade Standard. American journal of Agriculture Economics78 (3):775-779.
- Greene, W (2000) Econometric analysis, Englewood cliff, N.J: Prentice Hall
- Henson, S. (2003). The Economics of Food Safety in Developing countries. ESA Working Paper No 03-19 Industry Food Safety Actions.
- Industry Food Safety Actions  
[http://w.w.w.ers.usda.gov/Briefing/Industry food Safety/](http://w.w.w.ers.usda.gov/Briefing/Industry%20Food%20Safety/)  
Accessed date 25/07/05
- Oppenheim, A. N. (1992). Questionnaire Design, Interviewing and Attitude Measurement. Printer publishers. London.
- Sri Lanka Health Overview.  
[http://www.worldtravels.com/Travel guide countries Lanka /](http://www.worldtravels.com/Travel%20guide%20countries%20Lanka/)  
Health Accessed on 2<sup>nd</sup> August 2005