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**MICROBIAL FOODBORNE ILLNESSES IN BAHRAIN:  
A STRATEGY TO EMPOWER THE COMMUNITY, ENHANCE THE  
ENVIRONMENT AND IMPROVE RESOURCES TO CONTROL SUCH  
HAZARDS**

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## Summary

This descriptive study was conducted in the State of Bahrain using: firstly, a questionnaire for students in the final year of their school education, together with a similar questionnaire for their parents, teachers and all Bahraini health promoters; secondly, focus group interviews; thirdly, hazard analyses critical control point (HACCP) model and a checklist to assess schools' canteen, and finally, an evaluation of school's textbooks and health education materials. The study was designed to answer three principal research questions: 1. Do Bahrainis have appropriate knowledge, healthy beliefs and opinions which will empower them to control food poisoning; 2. Are the canteen environments and the practices within the canteens supportive to health; 3. Do school textbooks and health education materials empower the community in food safety.

Students were recruited from 17 schools, and each was handed a questionnaire for their parents. Teachers were recruited from 35 schools. All health inspectors and health educators who were on duty during the course of the study were involved. Students were stratified according to sex and speciality. Teachers were stratified according to sex and their level of teaching. Random samples of 400 students, 400 parents and 340 teachers were selected. All 72 health promoters were studied. Series of semi-structured focus group interviews with 5 groups of teachers, 9 groups of students, and 3 groups of health promoters were also carried out. These provided important insight into the subjects' awareness and beliefs. Sixty-five textbooks and 72 health education materials were also assessed.

Analysis suggests that the subjects have good knowledge in some areas of food safety. However, a lack of knowledge and conflicting information was noticed in other areas.

Findings of the HACCP revealed critical control points which included critical foods and unsafe practices. Preparing foods well in advance, inadequate transportation and improper storage temperatures were the main poor practices identified.

Health education is well covered in the curriculum, hygiene has a wide coverage in the textbooks, though health education materials are not appropriate to the students' knowledge, attitudes and beliefs and do not help to empower them.

This study describes for the first time the knowledge, attitudes, beliefs of students, parents, teachers, and health promoters in food safety and HACCP in schools and TLMs and linked these three areas to suggest empowering control measures.

The results of this study indicate that future health promotion programmes should start at primary school level and teachers need to be further trained in environmental health issues. Canteen environment, and practices need to be further addressed by authorities. Particular attention should be focused on the critical control points which are the time of preparation, transportation, storage and temperature control during display of foods. There is a need for providing appropriate resources which influence learning and community empowerment. Recommendations also suggested the implementation of the Ottawa Charter for Health Promotion which mobilises all the community, resources and the media.

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**To my parents, my wife, my son Hamad and my daughter Basma**



# **CHAPTER ONE**

## **Chapter 1**

### **1. Introduction:**

#### **Overview:**

This chapter highlights the following subjects: Rationale and the purpose of the study, history and definition of foodborne illnesses, review of some control measures, nature and magnitude of the problem under investigation, health and economic implications, food environment and man, food behaviour and culture, health promotion and self empowerment, empowerment through involvement, importance of health promotion, teaching and learning materials, teaching/learning materials as empowering resources and finally school teaching and learning materials.

#### **1.1. Rationale and the purpose of the study:**

There are many health problems among children. More problems might develop later in life because of childhood exposure to risk factors.

Foodborne illnesses are one of these problems which are responsible for high levels of mortality, morbidity and suffering all over the world.

With recognition of new public health, emphasis has been laid on health promotion. International agencies such as WHO as well as health authorities have introduced the concept of health promotion as an important component of primary health care and the new public health movement. Health promotion has become a discipline to protect health, prevent disease and promote the health of people; it unifies a number of different disciplines under one umbrella. Varieties of settings have been selected for health promotion activities; For example, hospitals, clubs, nursing homes, nurseries, schools, factories etc.

School health education programmes which contain important health topics have been developed all over the world. However, none of these programmes were found to contain significant information on risk factors related to foodborne illnesses.

If a programme in food exists, it is likely to be dealing with nutritional aspects, and not risk factors. Nutrition is extremely important but serves no use if contaminated by microbes or their poisons. In fact nutritious but contaminated foods cause risk and suffering. The importance of food safety suggests that it should be reflected in educational programmes. In addition to nutrition, there are some aspects of food safety which are covered in educational programmes but these are mainly related to hygiene and in the form of suggestions. This information is helpful, but not adequate and does not include, on many occasions, the actual risk factors, or the critical control points.

## **1.2 History and definition of food poisoning:**

FAO/WHO expert committee on food safety (WHO, 1984), and (WHO, 1991e), reported that foodborne diseases due to contaminated food are one of the most widespread health problems in the world and an important cause of reduced economic productivity. Furthermore, the effect of foodborne diseases on health due to contaminated food stuffs has not been adequately recognised by governments, and the efforts to prevent these illnesses have not been effective (WHO, 1984; WHO, 1991e).

Food poisoning is defined as.” Any disease of an infectious or toxic nature caused by or thought to be caused by the consumption of food or water”. This definition is currently used by WHO and also used in Great Britain (Advisory Committee on the Microbiological Safety of Food, 1993). For the purpose of this study, only the microbial part will be included.

It is a world wide problem which causes a great deal of damages to health of the community and to the economy of the countries.

Food poisoning is as old as the beginning of the universe. Islam, Hinduism, and Judaism, came with laws to protect their followers from foodborne hazards; laws that include personal hygiene and foods which are allowed and others which are prohibited. Many of these foods are major sources of food pathogens and parasites.

According to Hobbs & Roberts (1993) the science of microbiology started when Van Leeuwenhock discovered bacteria in 1675 in Holland by his primitive microscope. This was followed by an important discovery by Louis Pasteur, a French chemist and microbiologist who demonstrated the role of bacteria in fermentation process in 1859. Pasteur studied bacterial behaviour and proved the link between bacteria and many diseases. He disproved the theory of spontaneous generation; that is, life arising from the inanimate. He later developed sterilisation of food, which had a great contribution to food hygiene. At the same time, another scientist, Robert Koch, a German, found that anthrax, tuberculosis and cholera were caused by bacteria. In Britain, Edwin Chadwick initiated the awareness in cleanliness and the relationship between environment and well-being of individuals in 1842. Hygiene was further studied and enlightened by Florence Nightingale in 1859. In 1854, John Snow found that drinking water could spread cholera. William Budd, in 1856, recognised that typhoid fever was spread by milk or water polluted with excreta of infected persons (Hobbs & Roberts, 1993).

The authors continued that the first food poisoning bacteria was described by Gaertner in 1888 after isolating them from persons who died during an outbreak of gastro-enteritis. These micro-organisms were later called *Salmonella*.

They also stated that in 1896, E Van Ermengem, a Belgian, described *Clostridium botulinum*, an organism responsible for a deadly food-poisoning (botulism). The

authors mentioned that in 1909 to 1923 many microbes were known and grouped together under the generic name *Salmonella*. Furthermore, from 1945 to 1953, *Clostridium perfringens*, was recognised as a causative agent of food poisoning. Other microbes, such as *Bacillus cereus*, *Staphylococcus aureus*, *Escherichia coli*, *Campylobacter* and others were recognised.

Hobbs & Roberts (1993) continued that a bacteriological laboratory for public health was established in England and Wales in 1939 to aid public and private analysts during World War II and later it became the Public Health Laboratory Services (PHLS).

They also stated that food poisoning outbreaks and incidents were studied in detail from 1950 in which reports of food poisoning available to PHLS and the Ministry of Health were combined. In 1968, reporting of foodborne disease outbreaks was made statutory. In 1955, legislation on food safety was passed in England and Wales.

### **1.3. Review of current control measures:**

Many efforts have been taken to control microbial food borne hazards, however, the majority of these efforts have failed to solve or even significantly decrease the incidence of food borne diseases, although the causative agents, the type of foods involved and the contributing factors for the outbreaks are usually known to us. Many

countries still and will continue to face the problem of food poisoning even those with the most sophisticated and advanced control measure.

Control measures can contribute significantly to the quality of food and reducing danger of foodborne diseases. Examples of such measures are: personal hygiene of food workers, heat treatment of foods, inspection of food establishments, implementation of a comprehensive approach for control of food borne hazards and assurance of food quality which is hazards analysis critical control point (HACCP), training of food workers and health inspectors and enforcing legislation and policies in favour of food hygiene. All these efforts need money and other resources. Despite all the measures and the resources allocated for the control of foodborne problems and protection of community's health, foodborne diseases still exist and continue to increase even in countries with the most developed control programmes. These control programmes have the distinct character of offering a seemingly temporary solution. Lacey (1993) stated that even the UK 1990 Food Act failed to have an influence on the increasing trend in the statistics of food poisoning. This doesn't mean that the control measures are a failure or the jobs are not being carried out efficiently. However, it is time to look at the problems in a different way, and from a different angle. The community should play the major role to help themselves to solve their own problems, and create support, alliances and a lobby and act as change agents. Despite the wide diversity of research suggesting control measures, not much attention has been given to health promotion and community based preventive programmes for food related illnesses.

The most successful research to date in food hygiene is hazard analysis critical control point. HACCP has contributed significantly to control programmes in which important data have been revealed for the first time by this model. However, an important part of health promotion, community participation, was not considered by this and other studies. This research should introduce a different perspective into food safety. The current research aims at shifting the focus towards socio-cultural approaches in conjunction with HACCP and teaching and learning materials (TLMs) to achieve better results.

According to Kaferstein et al. (1990), WHO suggested the combination of food safety infrastructure with a sufficient educational programmes for consumers on food safety aspects. They also suggested that education programmes should be an integral part of primary health care.

#### **1.4. Nature and magnitude of foodborne illnesses:**

In the last few years, there has been an alarming increase in the incidence of microbial foodborne illnesses. Norman (1990) said that statistics indicate a substantial and sustained increase in foodborne illnesses. However, the author cautioned about the reliability of such data. To some extent, these figures reflect improved epidemiological surveillance and better technology and skills for detection of causative agents.

Almost all countries, which have surveillance programmes, reported a significant increase in the number of outbreaks and an increase in the number of victims in each outbreak, causing significant levels of damage to health and economy.

WHO (1988a) believe that cases of food related illnesses remain mainly unreported and under estimated. In developing countries, the ratio between the real and the reported numbers may be as high as 100:1, while in developed countries the cases probably represent much less than 10% of the actual total.

In developed countries more surveillance of foodborne illnesses has been carried out thus more information is available to the researchers and educators on these hazards.

Lacy (1993) indicated that food poisoning in the UK has been increasing tremendously since the mid-1980s. Lacey (1993) identified two reasons for the rise in food poisoning in UK: a) the method used for intensive rearing and automated slaughtering of animals and birds to provide large amounts of affordable meat, and b) changes in retailing and in social aspects of consuming food. Gray & Mossel (1992) gave their views on the reasons for the rise in the incidence of food poisoning which they believe to be due to the increase in the scale of production and the degree of distribution of foodstuffs. However, Norman (1990) felt that human ignorance will inevitably serve as a limiting factor and ensure the continuance of foodborne problems.



Many outbreaks have occurred during the last years and different micro-organisms were responsible in each incident in UK (Bone et al., 1989; Wieneke et al., 1993; Skirow et al., 1993; Cartwright & Evans, 1988; Gilbert et al., 1993; WHO, 1992).

Sockett (1991) reported food poisoning outbreaks in England and Wales during 1980-1989. In this report, Sockett mentioned that the majority of the outbreak were due to salmonella infection and that meat and meat products mainly pork and their products were incriminated in the outbreaks.

The increase of foodborne illnesses became a major concern to researchers and politicians (Lacey, 1993). However, Norman (1990) stated that the increase in the incidence of foodborne illnesses in UK has raised public and professional concern and brought the new food safety bill before parliament.

Important legislation was passed in 1990 and 1991 which had an effect on food safety in UK. The Food Safety Act 1990 and Food Hygiene (Amendment) Regulations 1990 were the most important ones. (Woolfe, 1992).

In Europe, 28 countries reported significant increases in the levels of food-borne infections and intoxication during 1985-89 (WHO, 1992). According to WHO (1992), countries such as Finland, Hungary, Poland, Switzerland and the Federal Republic of Germany all reported high levels of food poisoning even higher than England and

Wales. Finland was rated the first in a sample of 14 countries in 1988, over 150 reported cases per 100,000 population; Hungary the second, about 140 reported cases per 100,000. WHO (1992) also reported that *Salmonella* species are still the number one causative agent of food borne diseases. Next in importance in outbreaks are *Staphylococcus aureus* and *Clostridium perfringens*.

In the USA, the problem of food-borne hazards is no better than other countries. Many outbreaks occur every year (Bryan, 1975).

In Japan, foodborne illnesses have been reported by several authors. For example, Kobayashi et al. (1991) and Tanaka (1993).

Researchers in the Arabian Gulf and other Arab countries have also reported foodborne illnesses outbreaks. In Bahrain, for example, (Ali et al., 1986; Ministry of Health, 1993a; 1993b), in Riyadh (Saudi Arabia) Jarallah et al. (1993) and, in Jordan Khuribulos et al. (1994) and Asharq Al-Awsat (1994).

Many authors have questioned the reason for the increase of foodborne illnesses and the poor food safety record in industrialised countries, despite the fact that they possess a strong food safety infrastructure, food safety laws, standards, technology, and tremendous information on factors that contribute to the occurrence of such a

problem (Kaferstein et al., 1990; Bryan, 1988; WHO, 1988b). Hence, an additional approach for food safety is urgently needed.

Despite the tremendous amount of information and research on the causes, foods responsible and contributing factors, foodborne illnesses are occurring everywhere and in increasing numbers.. It is apparent from the literature that foodborne hazards continue to be a major health problem in many parts of the world although they are preventable.

#### **1.5. Health and economic implications of foodborne illnesses:**

Food poisoning is extremely expensive in terms of the pain and sufferings it creates, and in terms of the hospitalisation of victims. The clinical symptoms of foodborne illnesses are often mild and self limiting, but they can be serious causing severe disorders of the nervous and circulatory systems, jaundice or life-threatening diarrhoea and others (Kaferstein et al., 1990).

Food poisoning can lead to loss of work days which will result in the loss of income. The cost to the reputation of the institution where the outbreak took place is on the top of the list. According to Trickett (1992a), it takes many years for a food service establishment to recover its reputation if an outbreak is shown to be their responsibility. Trickett (1992a), stated that food poisoning has ruined holidays.

weddings, or other celebrations, important meetings or trips. The cost of food poisoning has not affected individuals and institutions only, yet countries spend extensive amounts of money on the control programmes and on ensuring wholesomeness of food. For example, Salmonellosis is one of the major food borne diseases which causes morbidity and economic losses in the world (Blaser et al., 1981).

In the United States, one to two million salmonella infections are estimated to occur annually and more than 100 people die each year (Doyle et al., 1984). The average cost per case of Salmonellosis was \$480 - \$645 in 1978-80, and the approximate total annual cost of Salmonellosis is \$ one billion (Todd, 1984).

Todd (1989) estimated the annual cost of bacterial food poisoning to be nearly 1.1 billion US dollar in Canada and nearly 7 billion in US. Loss due to food spoilage will add to the bill (Kaferstein et al., 1990).

In UK, Sockett & Roberts (1991) presented the results of a national survey of 1482 cases of Salmonellosis which were reported to the health authorities in England and Wales between August 1988 and March 1989. The findings clarified the costs which affected public health authorities, the health sector, the community and the costs to the wider economy in terms of lost production. It was estimated that £996, 339 was the overall cost of Salmonellosis alone.

In the UK, thousands of pounds are spent on control programmes, and on training of personnel in food hygiene (Arkin, 1991; Rudnitsky, 1989). For instance, in January 1991, the UK government introduced a new Food Safety Act giving environmental health officials power to shut down evasive premises in short order and hold suspect food before it reaches shops (Greenberg, 1989). This has added a lot to the cost of foodborne disease control. Besides, in 1991 in England and Wales, 22,000 tons of foods, most of it from the European Community (EC), were rejected by Port Health Authorities (Jukes, 1993). This also adds to the rise of the cost of food safety. Moreover, foods being destroyed by different countries because such foods are considered to be un-fit for human consumption are very serious in terms of loss. In some countries, the cost of food spoilage was estimated to be as much as 25 to 50% of the total crop (WHO, 1988c).

In Bahrain, for example, thousands of Bahraini Dinars (BD) are spent on treating victims of food borne illnesses and on examining food handlers. Thousands of food handlers are examined for food borne pathogens each year. However, the costs of food borne diseases to the country are more extensive than just examining food handlers. In addition to the sufferings and cost mentioned above, tons of food items have been either destroyed or rejected by health authorities every year. For example, in 1991, 882.5 metric tonnes were considered to be unfit and 1,449.325 metric tonnes were rejected by Port Health Authority (Ministry of Health, 1991).

In addition to the loss of foods in Bahrain, several large outbreaks have occurred during the last few years in which thousands of people were victims.

Bahrain as a tourist country needs a good reputation and any outbreak of food poisoning will cause great damage and losses to the income of the country and to the tourist industry.

WHO (1988a) identifies illnesses caused by contaminated food as the leading cause of death in the developing world and they affect millions in all countries. However, precise figures of food borne illnesses are not known because of inadequacy or non-existence of surveillance and reporting systems in many countries. However, Macdonald (1993) reported that over 9,000 people die every year from food borne diseases. As UNICEF (1990) also points out, four million annual child death occur as a result of diarrhoeal illnesses out of which 60% are attributed to the effect of dehydration.

Kaferstein et al. (1990) estimated the number of children under five who are affected by diarrhoeal episodes to be about 1,300 million annually, out of these 4 to 5 million die. WHO (1990b) believe that up to 70% of these diarrhoeal diseases in developing countries are due to food.

## **1.6. Food, environment and man:**

Health status is directly affected by environmental conditions, behaviour of the individuals and the resources available. Behaviour influences environment and the environment affects behaviour.

Food is the most important necessity for survival of mankind. It is a political issue which countries and societies make decisions about, a social and cultural issue which gathers members of families and other groups in ceremonies; for many countries, it is an economic issue.

Food determines the health and well being and enjoyment of people. Local governments, people and international organisations are struggling to secure food for the massive growing of the population for today and the future needs. There are many countries which are unable to feed their people because of several reasons i.e. political instability, poverty, improper distribution of food or lack of knowledge and proper technology to produce, preserve and distribute foods and secure the supply. Substantial amount of foods are wasted in the developing world because of spoilage. The growth of population has placed pressure on agriculture and food production. The demand has increased dramatically which adversely affects the environment. Deforestation is currently a major issue in the developing world. Soil degradation, shrinking of the agricultural lands due to rapid growth of population and degradation of underground water all are problems which affect the availability of food. Not only

growth of population, but significant change has occurred in the structure of the families. Families used to live together in one house even after marriage; but not anymore. People make their private residences; living with parents is no more accepted as a norm in many developing countries. More people reside in cities leaving the agriculture behind.

### **1.7. Food, behaviour and culture:**

In industrialised countries, highly sophisticated methods of food production, harvesting, transportation and processing are used. Thus the shelf-life of food is increased and such food can be consumed long after and can be transported to countries far away from the source of production.

In less developed countries, however, large amounts of such foods are spoiled. Waites & Arbuthnott (1990) estimated the spoiled food to be up to 30% of the total food produced.

Automation and technology increased food production and replaced many traditional food production and processing. There are also hazards associated with this shift in food production and processing. Sockett (1991) mentioned that manufactured foods were not only associated with outbreaks, but they are even more serious because manufactured foods are geographically more distributed thus the risk of outbreak



cover wider geographical areas. Hobbs & Roberts (1993) reported this danger and suggested not to abandon the traditional methods of food preserving and processing in favour of untried new methods.

Foods whether they are perishable or not pose a certain risk to human health (Sockett, 1991).

Almost all raw foods are potentially contaminated (Waites & Arbuthnott, 1990; Charles, 1983). It is unrealistic to prevent food from becoming contaminated with micro-organisms. Micro-organisms are omnipresent, they are widespread in nature, in foods, animals, man and the surrounding environment. No matter what control measures are adopted, microbes will find their way into food in any stage of the food chain (Waites & Arbuthnott, 1990). Charles (1983) stated that foods should be of reasonable microbiological quality, but they need not necessarily be free from pathogenic organisms if they are to be cooked or treated in such a way as to kill micro-organisms or render them non-infective.

Raw foods of animal origin are the most important source of pathogenic microbes. Food workers, pets, dust, and vegetables which are irrigated or sprayed with contaminated water also act as sources of microbes in foods. For foods which will receive thorough cooking, initial contamination of that particular food is not that critical; however, it is extremely dangerous when foods which will not receive further

cooking are contaminated especially if these foods are not adequately washed or disinfected.

Food items that serve as vehicles of transmission of food borne disease could differ slightly from one country to another. For example, in the United States, beef, turkey and home made ice cream were the most frequently reported vehicles of transmission during 1968-77 (Bryan, 1981a). Hamburgers were responsible for over 400 inhabitants of Washington state suffering from food poisoning and two deaths in just one outbreak (Anonymous, 1993).

Most of the European countries reported meat and meat products as the foods most often incriminated in outbreaks. Poultry and poultry products and eggs are also other foods which are often found as responsible vehicles (WHO, 1992).

On the 16th of September 1994, an outbreak of Salmonellosis occurred in Jordan. 220 people were affected by this outbreak in which ground chick peas (Houmous) was found to be contaminated with *Salmonella* (Asharq Al-Awsat, 1994).

Cooked foods and other uncontaminated foods usually become contaminated through cross-contamination. Cross-contamination occurs from contaminated foods, food workers, kitchen equipment, such as cutting boards, utensils, sponges and cleaning clothes. Cross-contamination also occurs by sneezing or coughing on foods, or via

working surfaces. Insects were also demonstrated as important carriers and disseminators of bacteria to food (Rivault et al., 1993; Kopanic et al., 1994; Haddock & Nocon, 1993).

Food poisoning is a threat to the health and well being of the community. Although everybody is at risk of acquiring a foodborne illness, children, elderly, sick, malnourished and persons with immune incompetence are more likely to acquire foodborne diseases than the rest of the population (Blaser et al., 1981; Bryan, 1975; Yew et al., 1993). Moreover, the severity of the illness is greater with these groups of people. In a study of *Campylobacter* bacteraemia in England and Wales, Skirrow et al. (1993) reported that the highest number was in patients aged 65 or over and the second highest in children.

### **1.8. Health Promotion and self empowerment:**

There have been a number of authors defining health promotion (Baric, 1985; Seymour, 1984; Speller, 1985; O'Donnell, 1987). WHO (1986) defined health promotion as the process of enabling people to increase control over, and to improve their health.

Health promotion is more concerned with changing policies, preventive health services, community-based work, organisational development, environmental health

measures, economic and regulatory activities and health programmes. The over-all aim of health promotion is to increase control, and improve the health or empower people. WHO and many researchers in the field of health promotion support the issue of self empowerment for healthy decisions. Information and education provide the basic knowledge and skill that equip people with power to make a positive healthy choice. Empowered people also require a supportive environment, positive policies and accessible services that are supportive and responsive to the needs of the people. Empowering is achieved through active involvement of the community, supporting them and stressing their importance, considering their local language, respecting local culture and tradition and valuing their beliefs.

According to WHO (1990a), strategies of empowering people equip individuals, families and communities with the knowledge and skill which will enable them to take positive actions for health and make sound healthy choices. Such individual and collective choices also require a supportive physical, social and economic environment and accessible services. Information, communication and health education of the public are the soul of this empowering process. Empowering could mean that consumers identify their own health needs, weaknesses and strengths taking action to address them. Empowering strategies should help people to learn about specific behavioural choices that influence their own health, and that of their families and communities. This includes helping people to recognise factors that influence healthy lifestyles, including beliefs, attitudes, opinions and skills as well as health knowledge.

In addition to helping people to acquire the ability to practice a healthy lifestyle, empowering strategies should enable full participation in national and community level health actions. They should help people to develop social and political skills, such as resource mobilisation, negotiation, lobbying, problem solving, and networking skills, so that people can take steps to meet their needs and aspirations and influence the physical, social, cultural and mental status of the community.

For the community to have control over their health and the environment, WHO has identified four key public health strategies. They are: strengthening advocacy, enabling communities, building alliances, and mediating (WHO, 1990a; WHO, 1991a).

Empowerment according to Adams (1990), is " a process by which individuals, groups and/ or communities become able to take control of their circumstances and achieve their own goals, thereby being able to work towards maximising the quality of their lives". Other definitions of empowerment for different segments of populations are also given by several authors French (1990) and Bradley (1992).

Chally (1992) said that empowerment results from teaching characterised by caring, commitment, creativity, interaction, and recognition of the humanity of both educators and students. Empowering was first discussed by WHO in the First Conference on Health Promotion which was held in Ottawa, Canada in November 1986. In that conference, health promotion was defined as "a process of enabling people to increase control over and to improve their health. WHO (1986).

As Yeo (1993 p. 232) puts it "empowerment, I submit should be the primary goal and guiding value of health promotion". The author continued, "people are not simply empowered by simply saying you are responsible, however empowerment depends on whether they do indeed have the power and resources to take control over the problem".

Empowerment has several advantages. Bradley (1992) stated that empowerment enhances the quality of the care provided by the empowered person whereas according to Boyadjis (1990) empowerment promote individuals' abilities, motivates people to improve personally and professionally, and maximises productivity in health care and finance.

Empowerment is a continuous process of individual growth and development which promotes and sustains the development of healthy behaviour.

Self empowerment through health promotion is a proposed supportive approach to other control measures which hopefully would mobilise all the forces to solve foodborne illnesses.

### **1.9. Empowerment through involvement:**

The Declaration of Alma-Ata on Primary health (1978) states that "people have the right and duty to participate individually and collectively in the planning and implementation of their health care".

At the International Conference on Primary Health Care organised by WHO, and UNICEF in Alma Ata in the former USSR in 1978, countries affirmed that:

"school could indeed provide efficient means of educating young people on major health issues and ensuring that young people are educated to have a good understanding of what health means, how to achieve it, and how it contributes to social and economical development."

No matter how much training and resources are put together for health personnel, yet it is impossible to achieve the health and well-being of the community without involving the community itself. School children are the best to start with. Health learning among school age children is the focus of this paper.

Educating school children and involving them in health issues is fundamental for the following reasons according to Dhillon & Philip (1992): 1- school children represent the largest segment of population in all developing countries. 2- school children are

readily accessible and 3- they are receptive to learning. They also stated that the school setting serves as a great opportunity for giving health knowledge, developing appropriate values and attitudes and encouraging health behaviours.

Dhillon & Philip (1992) estimated the number of school-age children to be over a thousand million in the world. The authors indicated that in developing countries about 80% of children are enrolled in primary or elementary schools. In Bahrain, however twenty-one percent of Bahraini population were students in 1992.(Central Statistics Organisation, 1993).

Since tomorrow's doctors, nurses, other health workers and parents are today's school children, the literature, however, suggest that they deserve proper attention during their educational growth. WHO, UNESCO, UNICEF (1991) for example, recommend education for health to school children and believe that by acquiring knowledge, values and skills, children can be empowered to pursue a healthy living and they become health promoters and health advocates.

School children must receive some teaching on health topics before leaving schools so that they become informed and are able to protect their own and their families' lives. Health promotion is the future immunity against all sorts of bugs that threaten the nation's health and well being. Clay (1992) and Chally (1992) support WHO by mentioning that knowledge is a fundamental element of empowerment and that



empowering school children has significant influence on their own health and that of their families.

To improve the community's health, they must be empowered by knowledge, skills, attitudes, and resources. Empowerment should help community to voluntarily adopt behaviours, skills conducive to their health.

Green et al. (1980 p. 7) stated that the majority of health education activities are hidden in other programmes, they are not autonomous, free standing programmes in themselves. In addition, many health education activities are not even identified as health education and that various titles are used to label health education.

In Bahrain, there are many health education activities which are embedded in different disciplines within Ministry of Health (MoH) or other organisations. There is a health education section within MoH which stands as an autonomous section and provides health education in different settings.

There is variation in the extent and the way health education is offered. According to Green et al. (1980), in some situations, health education is offered as a unit within a course in biology, behavioural sciences, home economics or physical education. In other instances, health education is offered as an independent course or semester.

Green et al. (1980) stated that only few schools provide comprehensive health education in each grade from kindergarten to twelfth grade.

In Bahrain, health education in schools is offered as topics and units of study in almost all biology courses, home economics, and science subjects from first primary class to the third high class (last grade). Moreover, there are sporadic subjects which are offered on an occasional basis, during crises or based on requests from various settings. Health education is offered to selected grade levels by health educators, community health nurses, doctors, and other health members. Subjects which have been covered include smoking, dental hygiene, nutrition, accidents, pollution, breast self examination. Health topics which are offered to students and the units which are within the courses are planned by a committee which consists of representatives from the MoH and the Ministry of Education (MoE). The contents, objectives and goals of the curriculum are decided by this committee. However students, parents and other community members are not involved in planning of school curriculum.

Green et al. (1980) said:

"The chances for positive educational outcomes diminish when curriculum plans fail to take into account community needs. The assessment of these needs seems to be critical, and it is in this connection that PRECEDE framework can be helpful". Note that the PRECEDE framework is explained in section (2.5).

If the health problem is studied in this manner, several questions will surface: Do all groups lack awareness and have negative beliefs? who has the worst? and also high risk group can be identified within each group.

Although an increase in knowledge does not guarantee a change in behaviour, there is a positive association between knowledge and behaviour (Brown et al., 1989)

WHO, UNESCO, UNICEF (1991), Biswas et al. (1990) and Ross et al. (1991) documented that school health education can have significant influence on students' health, knowledge, attitudes and behaviours.

Health knowledge is essential before any performance occurs but the desired health behaviour will probably not occur unless someone receives motivation (Green et al., 1980).

Communities, neighbours, and other segments of the population can organise, vote, boycott, support or prevent certain changes in the environment and technology (Green et al., 1980 p. 55).

FAO and WHO proposed public education and community participation in learning the important issues in food hygiene as areas for which there is the greatest need (WHO, 1984).

WHO (1988b), a well-informed, strongly motivated and widely representative community is also extremely important in improving the safety of food. They add that education in proper food practices is probably the single most effective control measure of foodborne disease and unnecessary food wastage. Moreover, education cannot change practices which are deeply rooted in a society unless there is knowledge and understanding of the beliefs and practices of that community.

Kaferstein et al. (1990) noted the importance of community participation in food safety. By community, they meant food workers whether working in food industries or women at homes who prepare food for the family.

Community participation in a way is decentralisation of health care delivery. WHO (1988a) believe that motivating and involving the community and social institutions is important and is a motivating pressure for allocation of resources and supporting and adopting policies. More advantages of community participation are given by Baric (1990).

Involving the community at the early stage of planning and development ensures that beliefs, customs and opinions are adequately reflected in a programme (WHO, 1988a).

Before designing a control measure, beliefs, values and practices of the community and knowledge of the critical control points of food must be considered (WHO, 1988a).

Knowledge by itself is not enough (WHO, 1988a; Ewles & Simnett, 1992). The health promotion intervention must be based on knowing the people's knowledge, beliefs, customs, and opinions.

#### **1.10. Importance of health promotion:**

Health promotion is considered to be the backbone of primary health care. Moreover, it is the pillar that many scientists and WHO have been working on to improve and to involve in their plans to achieve health for all.

There has been much empirical evidence of the benefits and success of health promotion. The literature is full of findings which reveal such success.

Health promotion was found to be more effective and cost effective in engaging groups of the community in activities that reduce their risks and protect their health (Erfurt et al., 1992; Pollakoff, 1991). In fact, health promotion is seen to be the most effective way of decreasing mortality and morbidity, primarily because of increased public awareness. It is estimated that people in the US could prevent 40% to 70% of all premature death. It is also believed that more than 1/3 of acute disabilities and over 2/3 of chronic disabilities are preventable by health promotion (Belinoff, 1991; Lawrence, 1990). Aziz et al. (1990), Thongkrajai et al. (1990), and Wilson et al. (1991) also demonstrated the importance of health promotion in reducing diarrhoeal

diseases in Bangladesh, Thailand and Indonesia respectively. In Sweden, Lithell (1991) found that health information was linked to a decrease in infant mortality.

Health promotion has been used by industrial countries to influence healthy life styles and behaviour that reduce the risk of disease and on creating supportive environments for health. However, in the developing countries emphasis was laid on ensuring active community involvement and in securing basic sanitation and water supply, maternal and child care, nutrition, and control of communicable diseases, though the importance of life style issue is also recognised (Ewles & Simnett, 1992).

An important philosophical component of health promotion is to encourage individuals to adopt and maintain personal behaviours that would prevent disease, protect and promote health and make the physical and social environment more empowering by eliminating health hazards.

Since food safety is the theme of this research, WHO (1991e) stated that proper health promotion in food safety can not be achieved without the application of all available relevant resources. WHO (1991e) continued that authorities must first clearly understand that:

"1. food borne diseases are a major public health problem facing all societies.

To a large extent these can be prevented if proper measures are taken.

2. A formal food safety infrastructure alone (e.g. legislation, enforcement, compliance) will not prevent the spread of foodborne disease.
3. The provision of safe food for a population is the result of concerted efforts by governments, industry and groups or associations representing the interests of consumers, and the consumers themselves. These three sectors share the responsibility for food safety.
4. The consumers and all food handlers are important targets in the fight against foodborne disease. Through primary health care programmes they should be taught how to handle, prepare and store food so as to minimise biological and chemical contamination and proliferation of micro-organisms.
5. An effective, culturally appropriate educational programme for food handlers and consumers should be designed and implemented in all countries".

WHO (1991e) also mentioned that improvements in food safety through health education programmes throughout the food chain will depend on the interaction between physical environment and socio-cultural and economic variables.

Evaluation of the current situation is an essential component in the planning and development of health promotion interventions in food safety.(WHO, 1988a).

### **1.11. Teaching and learning materials as an empowering resource:**

Training of the community is the key issue in achieving maximum health and well being of the nation. Researchers have suggested many strategies and approaches for the training of the community. Training is shifting from teacher to student-centred. This approach has proved to better enable the learner and give them a thrust for deciding for themselves.

Empowerment by this method is impossible without availability of proper and adequate physical and other resources. These resources are: relevant health promotion intervention which include, proper teaching and learning materials (TLMs), the physical and social environmental resources, and political support.

There is particular shortage of TLMs in the developing countries (WHO 1991d). In Bahrain, however textbooks for school children seems to be promising. Many printed and audio visual materials are developed by the MoE in Bahrain. There is a determination in Bahrain to produce our own materials to meet the specific requirements of our population and become self reliant. TLMs are not useful learning tools if the target group are unable to understand and make full use of them. Materials should be written within the reading level of the population.



Researchers found that writing materials beyond or below the reading level of the target group will not guarantee comprehension (Estey et al., 1993; Mcleod, 1991; Charlton, 1986). For TLMs written in English, researchers showed that there are several tests that can be used for assessment of reading level of the materials (Fry, 1968; Jastak & Wilkinson, 1984; Taylor, 1953).

Evaluation of TLMs by researchers involved evaluation of content, the instructional design, the technical production of the instructional and the packaging (Discenza, 1993; Valaitis & Shea, 1993; Bernier & Yasko, 1991; Charlton, 1986; Mcleod, 1991). When evaluating the content, the following questions should be taken into consideration: Is the information provided by the material current? Is it accurate and scientific? Is it at the level of the intended audience?

Empowering school children and other members of the society in health areas requires resources such as proper TLMs, well-trained personnel, health policy and a supportive healthy environment.

Out of date materials will convey out of date messages. These messages, consequently, will produce an “out of date community”. Such a community will be dis-empowered and hindered in their attempts to achieve optimum health.

As an integral segment of the community, the MoE in collaboration with the MoH and other institutions are responsible for provision of adequate and proper health topics and comprehensive health promotion to school children. Training of future health workers requires inter disciplinary co-ordination efforts between school educators and health providers. There is no doubt that some degree of co-operation exist between the MoE, the MoH and other related institutions on the islands and outside.

### **1.12. School teaching and learning materials:**

School TLMs are any materials that are given by school to students or used by students, from other sources to achieve the predetermined objectives of learning. They can be classified as textbooks, handouts, audio-visual (films, videotapes, slides, transparencies,...), models and computer software.

School TLMs are the integral component of the overall training that the communities receive. Maximum benefit will be achieved if facilitators and trainers use effective strategies in the learning process particularly if the materials are properly designed and written within the reading levels of the students.

There is a shortage of proper TLMs and whenever TLMs do exist , they are often poor quality, out of date, and not relevant to local needs of the community and the country. Such poor quality TLMs might be difficult to understand, confusing, threatening and

could be socially and culturally unacceptable. School TLMs must contain health topics which represent the nation's needs. According to Dhillon & Philip (1992), WHO, UNESCO, UNICEF argued that school health education can have significant influence on students' health, knowledge, attitudes and behaviours.

The proposed research is to study risk factors associated with foodborne illnesses in Bahrain. It is based on identifying knowledge, attitude and beliefs of a cross section of the community in areas of food hygiene and assess the environment and practices where foods are prepared and health teaching / learning materials so that we are able to develop better strategies to empower individuals and the community. There is, therefore, a pressing need to investigate what Bahraini students, parents, teachers, and health promoters know, their attitudes and beliefs, the environmental conditions in the school canteen and how much the teaching / learning materials and health education materials are relevant to the problem under the study. If these questions are answered, then it will be possible to design, with the assistance of the community, better health promotion programmes.

There is no comprehensive research in this field particularly in the less developed countries. A survey study of this type is valuable in interventions which may reduce future incidents of food poisoning.

In a study on AIDS conducted by Kann et al. (1989), the authors stated that surveys can help to focus HIV educational programmes on critical knowledge, beliefs and

behaviour of the community at risk. The authors also added that results of such surveys can provide information about the trends in variables over time. It will be extremely helpful to survey our community and learn about knowledge and belief to know and monitor food hygiene risk factors, canteen environment and teaching learning materials which are used by the majority of the community. Once data is gathered, it can be compared from time to time and from one area to another hence health promotion decision makers should be able to use the results as a guide in planning food hygiene promotion activities.

Knowledge, and methods of disease prevention, protecting and improving health are available. Unfortunately, the knowledge and facilities are not well disseminated among people who are concerned and who are in actual need; moreover, community needs are not reflected in such programmes. Also health information are not appropriately used by people who have access to.

Students, parents, and teachers are members of the community, they should have some level of education in areas of environmental health. Teachers should not be working in isolation but there should be a link between Primary Health Care providers, curriculum designers, teachers, students, parents and other members of the community. Teachers might not be able to handle all environmental health problems but they should be able to deal, to some extent, with the most common ones and they should be able to make good decisions about what, when, how, and where to transfer health knowledge and how to protect and preserve the environment.

Learning from the community, understanding their knowledge, attitudes, beliefs, values and identifying risk factors will make health promoters and consumers more aware of the health problems and will also facilitate a rationale and scientific planning and adoption of control measures. This research, in foodborne illnesses and health promotion involved students, parents, teachers and health promoters. This category would help in planning and implementing relevant health promotion activities.

Creating a health promotion strategy to solve microbial foodborne illnesses does not mean that this strategy is unique to those problems only; in fact, a similar approach could be used to handle other health problems among the same or different community groups. Health needs as well as health promotion strategies are dynamic in nature, problems change, not only in type but also in magnitude. Health promotion, as well, should be reoriented to adapt to these changes.

Contribution to health promotion can be made possible by involving the whole community including students. Students should not be ignored at any stage of planning, implementation and evaluation of health promotion and should be considered as the most influential individuals among the community.

Investigations of food safety are not complete without knowing the knowledge of the consumer, beliefs, opinions and culture.

Surveillance of foodborne diseases is essential for any scientific control effort. In many developing countries, there are no such surveillance activities and if there is any information available, such information may be scanty and unreliable (Bryan, 1992).

To produce effective health promotion programmes, whether for the control of food borne illnesses or other health related problems, it is essential that consumer's and providers knowledge, attitudes, and beliefs are understood and considered and the environment be understood, protected and supported during the overall programme development.

This research is one of the few studies to measure level of knowledge of the community, beliefs and attitudes towards foodborne illnesses, causes and control. It is an exploratory research to study a genuine health problem and to develop a model to tackle this or similar problems in the future.

## CHAPTER TWO

### Chapter 2

## **2. Conceptual framework:**

### **Overview:**

This chapter highlights aims, objectives, research questions, the models used to design research instruments and analyse data, and expected outcomes of the research.

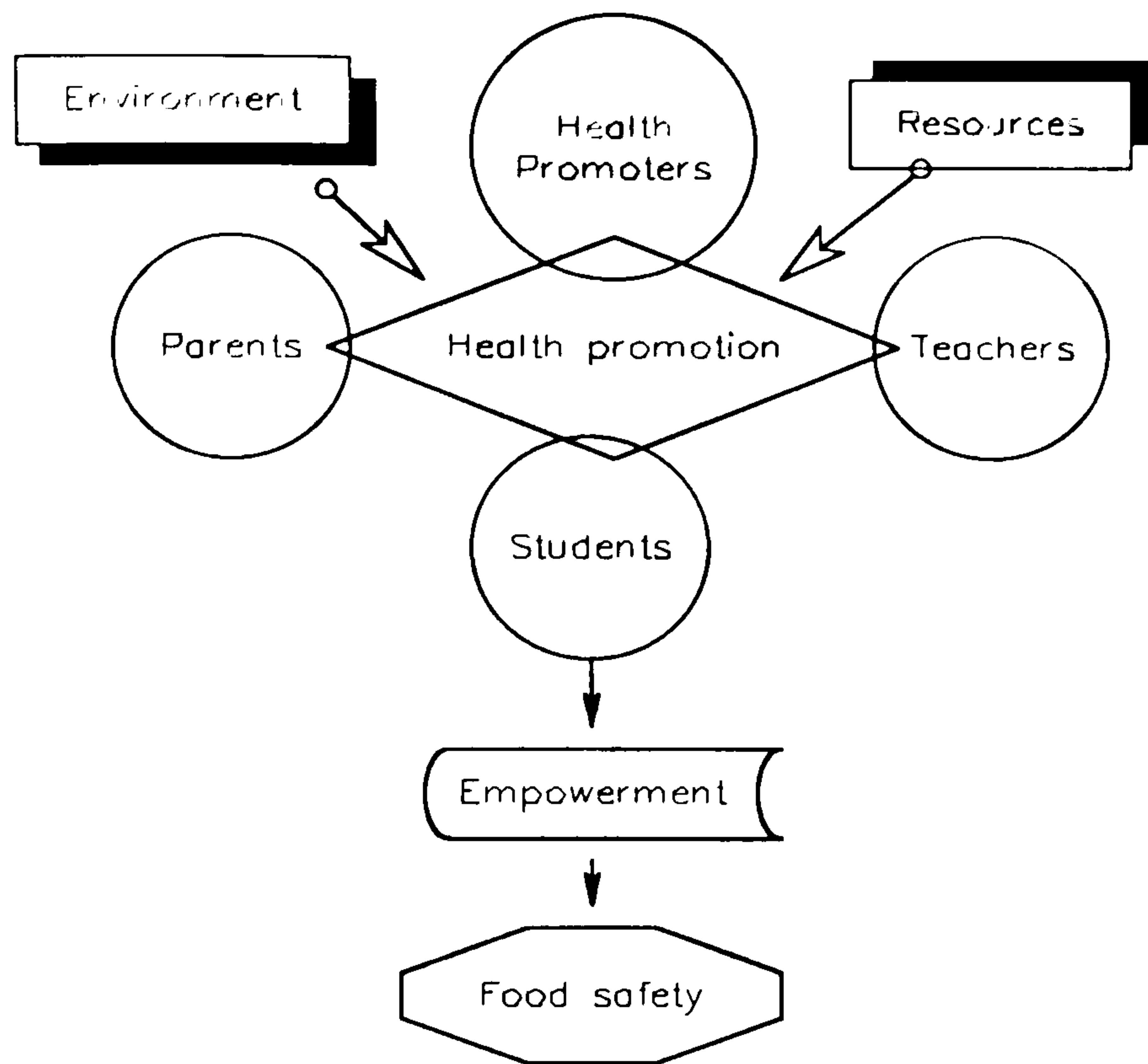
### **2.1. Aim of the research:**

The major purpose of this research is threefold. One is to determine the level of knowledge and beliefs of a cross section of the community in food safety. The second purpose is to discover if there is any significant link between food poisoning and environmental conditions and operation in schools' canteens through identifying critical control points. Finally, to determine if the textbooks and health education materials are supportive i.e. contain appropriate topics on food hygiene which are empowering to the community.

Therefore the central focus of this research is to identify knowledge, attitudes, and beliefs of the community in the field of food hygiene and to evaluate the contents of teaching/learning materials, health promotion materials and to assess the canteen environment. It is the first time this kind of research has been carried out. The results of this study should identify key factors in food safety i.e. what are the current status

of people's perception, the environment and practices within which foods are being prepared and cooked and the TLMs. Understanding these elements will facilitate empowerment of the community. As stated by Greenberg (1989), health education should be designed to free people so that they make health-related decisions. The findings of this research should facilitate development of promotion programmes in food hygiene. Programmes with specific content which will target specific segments of the community with the aim of empowering them. Also the current research should open areas for more research in foodborne hazards and self empowerment. The subjects which are selected in this study are the best to start with. Teachers, students, parents and health promoters should be the power generators. Empowering them should distribute the power to the public at large. School setting, where empowering process should start at, has been recommended by many authors. If health is properly defined and needs are mutually understood and planned by the community, health promotion should be the means through which empowerment will be achieved. The aim is probably best understood by illustrating the following model.





Model 2.1: Health promotion as an interaction between man, environment, and resources to empower the community.

The model suggests that health promotion is an interaction between man, environment and resources. This interaction will eventually lead to empowerment of individuals and foster their personality. This model of health promotion does not contain new ingredients. The upper part of it is adapted from the health promotion model stated by Tannahill (1985).

It is known that there is a large gap in our knowledge in all areas of health including food safety (WHO, 1988a). Also (WHO, 1988a) considers knowledge, beliefs in food hygiene and safety are important areas for future research.

A substantial amount of research has been done on foodborne illnesses and food hygiene; however, no research which uses similar approach could be found in the published literature.

After completion of the study, recommendations which will help in protecting the health of the community will be suggested. These suggestion, hopefully would be used to develop a programme which will enable and empower the community to ensure better health and decrease and/or prevent food-borne diseases and also would support the professionals to plan any health promotion programmes in the future.

## **2.2. Research objectives:**

The main objectives of this research are to:

1. Study knowledge, attitudes, and beliefs of the community in terms of causes, predisposing, enabling and reinforcing factors which are associated with food borne illnesses..
2. Identify health promotion priorities which consider community needs.
3. Identify more effective ways of creating supportive physical environments and improving practices within canteens.
4. Examine limiting factors affecting health promotion in schools.

5. Evaluate school textbooks and health promotion materials for food hygiene content.
6. Suggest recommendations to help in prevention of foodborne illnesses and promoting the health of the community.

### **2.3 Research problem:**

Three major research problems were considered in the present study. Factors associated with unsafe practices and perception in food hygiene of students, parents, teachers, and health promoters in the State of Bahrain, the condition of school canteens and food preparation areas and practices within them and association between TLMS and empowerment of the population in food safety.

Kok (1992) stressed that people overlook diagnosing the health problem and jump from the problem to the intervention. It is a mistake to plan health promotion activities without diagnosing the situation. According to Kok (1992), in Netherlands, a large health education campaign was considered to prevent alcohol consumption by pregnant women when this problem did not exist initially. Moreover, another public campaign to prevent sports injuries was conducted, despite the fact that they lacked adequate knowledge about the exact behaviours that cause injuries.

The communities are expected to make health-related decisions which will affect their well-being. This suggests a framework to measuring and assessing knowledge, skills and resources available to this particular community.

Knowing about the knowledge, attitude, belief and resources in the community can give significant insight into the importance of the problem and planning of preventive measures not only in school but also in other community settings. Green et al. (1980) stated that every effort should be made to include representation from all groups in diagnosing a health problem. Having many representatives and amplifying the diagnosis might be difficult and time consuming but it is worth doing.

#### **2.4. Research Questions:**

The following research questions guided the research presented in this thesis.

1. What is the knowledge, of students, parents, teachers, and health promoters about the risk factors associated with foodborne illnesses?
2. What are the beliefs, and opinions which affect food safety within the community?
3. Are facilities and practices in school canteens and food preparation sites effective to control contamination, survival and multiplication of microbes?

4. Do school textbooks and health education materials contain information on food hygiene? are they appropriate?

Obtaining such information would be extremely valuable for empowerment of the community and improving the surrounding environments and other resources related to food hygiene.

## **2.5. Theoretical framework:**

For the purpose of this research, PRECEDE, Health Belief Model (HBM), self-empowerment and hazard analysis critical control point (HACCP) models were used as diagnostic and evaluation tools to design and carry out the research and to help with identifying and focusing on the important factors related to the cause, control of food poisoning and empowering the community. These models are explained below as follows:

The theoretical framework for this study is derived from the PRECEDE model (Green et al., 1980). This framework has been widely used in the health promotion research. PRECEDE is an acronym stands for Predisposing, Enabling and Reinforcing factors.

1. Predisposing factors which involve responses related to knowledge beliefs, and attitude of a specific population responsible for generating and sustaining certain behaviours. Green et al. (1980) stated that predisposing factors are the attitudes, values, and perceptions that facilitate or hinder personal motivation for change,

2. Enabling factors are the barriers made mainly by societal forces or systems. They include limited facilities, lack or inadequate public resources, lack of income and even restrictive laws. According to Green et al. (1980), the skills and knowledge required to perform specific behaviour are also part of enabling factors, and
3. Reinforcing factors in educational diagnosis and evaluation. Reinforcing factors are those which are given as a feedback by members of the society which will positively or negatively affect behaviour.

Determining the predisposing, enabling and reinforcing factors in the PRECEDE model is vital because the researcher then can decide which factors within the three stages to be emphasised and receive intervention. Dabbagh et al. (1992) felt that PRECEDE model helps un-ravel a wide spectrum of determinants of a particular health problem and the quality of life associated with it. Green et al. (1980) stated that PRECEDE should be looked at: "as a tool to use intelligently in drawing on and applying the most appropriate scientific theories and educational technology in planning effective health education".

PRECEDE model is intended to help health personnel to identify priorities among the types of health promotion interventions which are most likely to resolve the problem under study.

In the current study, the PRECEDE model was then used to classify the responses into diagnostic groups. The predisposing factors are variables related to knowledge, beliefs and attitudes which are responsible for certain behaviours related to food hygiene. Enabling factors were mainly resources available and accessible by the community such as health education materials, training in food hygiene and facilities within the canteens and facilities for transportation of foods. Finally, reinforcing factors which are the existence of rewards which assist in the maintenance of specified behaviour.

Kok (1992) summarised PRECEDE model by asking some questions. The diagnostic part was adapted to relate to the current research as follows:

- How serious is food poisoning?
- What resources, behaviours, and environmental elements are involved in food operation?
- What are the determinants (predisposing, enabling, and reinforcing factors)?
- Which health promotion intervention might change the behaviour?
- How can they be implemented?

PRECEDE model has been successfully used as a framework by several authors to study and diagnose health problem and to identify variables relevant to a particular health problem. For example, Selby et al. (1989) used the PRECEDE model as a base for developing a model to improve the use of the early and periodic screening, diagnosis and treatment programmes in rural North Carolina. Dabbagh et al. (1992), however, used this model to study diarrhoea among children in Egypt. Moreover,

Wilkinson (1992), used the same model to study HIV/AIDS among homosexual and bisexual men in the West Midlands, UK.

The research also includes the Health Belief Model (HBM) (Becker, 1974; Becker & Maiman, 1975) which is based on the following steps. For health behaviours to occur,

1. the person must believe that he is susceptible.
2. must perceive the seriousness of the ill health in terms of pain, discomfort, time lost from work and other sufferings.
3. must believe that there are benefits stemming from the healthy behaviour which outweigh the costs and that the benefits are possible and accessible.
4. the person must receive a strong enough cue to motivate him to participate or take an action.

The self empowerment model was also used. Empowerment can be said to stem from WHO's definition of health promotion as a process of enabling people to increase control over and to improve their own health. Empowerment in health has been discussed by several authors. Examples are, Chally (1992), Raeburn (1992), French (1990), French & Adams (1986), Yeo (1993), Clay (1992) and D'Onofrio (1992). Empowerment has been used in health care management for developing and promoting employees to improve productivity (Boyadjis, 1990). Also this model has been adopted in other work settings to promote employees involvement so that they perform as a whole and lead to success (Goski & Belfry, 1991).



For canteen assessment, hazard analysis critical control points (HACCP) was used. HACCP is a detailed and systematic investigation used in food production, preparation and distribution sites to control microbiological hazards associated with food, ensure quality and wholesomeness of food and to avoid many weaknesses associated with the traditional approach of inspection (Bryan, 1992; Munce, 1984; ICMSF, 1988).

The HACCP approach begins with investigation of food production, processing and distribution. The process might involve measuring temperatures, pH, at various stages of food processing. Furthermore, HACCP might involve microbiological testing of food samples at each appropriate operation point (Bryan, 1981b; Bryan, 1981c).

Sources of contamination, process which enhance survival and multiplication of micro-organisms are identified by this model, corrected and monitor at later supervisions.

HACCP has successfully been implemented in many food preparation plants, restaurants, and street-vending operations (Bryan, 1981b; Bryan, 1992; Bryan et al., 1992a; Bryan et al., 1992b; Bryan, 1992c; Bryan, 1992d; Goff, 1988; Munce, 1984).

## **2.6. Expected outcome of the research:**

The information obtained through this research will give us a better view of what is happening with regard to food hygiene, the environment and the teaching/learning materials in Bahrain. Such information should contribute greatly to the body of

literature and to the society. It will enable the development and implementation of educational programmes through involvement of the community. Therefore data are needed about the incidence, behaviour and the environment that increase risk of food poisoning among the community and about the determinants of these behaviours.

## **CHAPTER THREE**

### **Chapter 3**

#### **3. Background on Bahrain:**

##### **Overview:**

The aim of this chapter is to introduce Bahrain: geography, climate, economy, food production, hygiene practices, food poisoning in Bahrain, educational system, health care delivery, and food in relation to culture.

##### **3.1. Land, climate and people:**

The State of Bahrain is an Archipelago of about 36 small islands located in the Arabian Gulf. Bahrain is about 25 km off the eastern coast of Saudi Arabia and 240 km from the southern coast of the Islamic Republic of Iran. The total land area of Bahrain is 692.5 sq. km. The main inhabited islands are Bahrain which covers 85%; Muharraq 3%; and Sitra 2% of the total area. All these islands are connected to the main island by fly-over bridges. In 1986, a 25 Km causeway was opened to connect Bahrain with Saudi Arabia (King Fahad Causeway).

Oil was discovered in Bahrain in 1932. Before oil discovery, Bahrain's economy depended on pearling, agriculture and trading. Since the oil discovery, the economy has depended solely on oil. However, Bahrain's oil reserves are the smallest compared

to the other neighbouring countries and are projected to exhaust by the end of this decade. Thus the need for diversifying sources of income was crucial. The government of Bahrain created a balanced economy and reduced the dependence on oil. The government developed other avenues as a source of income. Bahrain today relies on financial and banking sector, tourism, oil fields, refinery, Aluminium factory, ship building and repairing, petrochemicals, and light industries. Such shifts helped accelerate the economic growth rate and led to rapid economic progress under the leadership of his highness Sheikh Isa Bin Salman Al--Khalifa, the Amir of Bahrain. Bahrain declared independence from the British in 1971. Since then, the leaders have built a strong economical infrastructure.

The Population of Bahrain was 518,243 in the last census conducted in 1991, one third of the population are Non-Bahrainis. 85% of the population live in the urban areas (Central Statistics Organisation, 1992). Further details about the population of Bahrain according to the 1991 census are given in table 3.1.

Table 3.1 population by age groups and nationality in 1991 census, Bahrain.

Age groups (Years)	Bahraini	Non-Bahraini	Total
1-9	91,848	22,182	114,030
10-19	72,622	10,889	83,511
20-29	59,230	48,353	107,583
30-39	44,028	69,385	113,413
40-49	21,659	25,513	47,172
50-59	16,553	6,629	23,182
60-69	11,344	1,342	12,686
> 69	6,021	439	6,460
Total	323,305	184,732	508,037

Source: Central Statistics Organisation (1993).

The climate of Bahrain is cool in winter with temperature reaching to as low as 12° C and with sparse rainfall to hot and humid summer with temperature over 40° C and humidity over 90%.

### **3.2. Food production in Bahrain:**

In Bahrain, the arable land is decreasing because of expansion of urban, commercial, industrial and other developments. The arable land is degrading because of over-cultivation, salinity of under-ground water and improper cultivation practices. Water availability and quality is rapidly deteriorating in Bahrain. Water salinity is increasing because of intrusion of sea water due to over using of the aquifers. Meeting water demands in Bahrain is becoming costly to the government, particularly in the summer season, posing greater burden on the environment leading to further deterioration of the resources and particularly to food and agriculture.

Traditionally food used to be caught fresh, eaten instantly and little preserved for later use. However, many outbreaks used to occur and many people became victims. But fewer victims in each outbreak compared to today's situation. Although proper transportation, and storage facilities were not present, very few foods use to spoil. This is because foods were produced on a daily basis to be consumed, in addition, the amount which exceeded the daily requirements were preserved by traditional methods (drying, salting, and curing). Smoking as a traditional method of preserving fish, which was common in other parts of the world, was not practised in Bahrain. In

Bahrain, locally produced foods were mainly fish, vegetables, fruits and to lesser extent animal products. Fish was the main food item which was plentiful and easily affordable and people used to eat it fresh without keeping it for future use, except some people preserved them by salt and dehydrated them in the sun. However, due to the growth of population and reclamation of sea to accommodate such growth, over fishing and improvement in fish catching facilities many fish environments were destroyed. Fish became less and more expensive. Therefore, they were replaced by pre-packaged chicken and meat which were imported from many parts of the world.

### **3.3. Hygiene practices:**

Personal hygiene is highly appreciated by Bahrainis. Cleanliness is an important part of the Islamic faith. Muslims have to wash five times a day before performing prayers (five times prayers). Most important is washing of hands, face, mouth, nose, ears and feet. Each of these organs has to be washed three times before each prayer. Clothes washing is done by mechanical methods. Almost every house in Bahrain has a washing machine and everybody has access to washing detergents. Drying is usually in the sun. Dish washing is often performed by hands using washing detergents. Toilet practices in Bahrain are similar to those in other Mediterranean, Gulf, Asian and Indian Subcontinent countries. Hands and water are used to clean anal area after visiting the toilet. In two comparative investigations which were carried out in an eastern Mediterranean country and north-western Europe, faecal organisms, including a wide selection of intestinal pathogens were isolated from the hands of over half the people examined in the eastern Mediterranean but not in the north-western Europe. The

author attributed this to thorough washing with soap and warm water in north - western Europe (Charles, 1983). Charles continued that toilet practices and hygiene are unsatisfactory throughout the population of Mediterranean countries because of religious and cultural reasons. The majority of food workers are from the Indian-subcontinent, of low level of education. Generally, the standards of personal hygiene among Bahrainis is high.

#### **3.4. Food Poisoning in Bahrain:**

In Bahrain, the number of foodborne diseases have been increasing steadily since 1980s. The most reported cases have been Salmonellosis. Eighty-nine different serotypes of *Salmonella* were isolated in Bahrain in 1981 (Ministry of Health, 1981) and a total of 96 different serotypes of *Salmonella* other than *S. typhi* and *S. paratyphi* were isolated in 1984 (Ministry of Health, 1984).

Several large outbreaks of food poisoning had occurred lately in Bahrain and many people were victims (Akhbar Alkhaleege, 1993; Ministry of Health, 1990; Ministry of Health, 1993a; Ministry of Health, 1993b; Ali, 1986). The largest outbreak occurred in January 1993 when thousands suffered symptoms of food poisoning after attending an open day party honoured by a company. A nine year old girl died as a result of the poisoning (Akhbar Alkhaleege, 1993; Ministry of Health, 1993a).

Ahmed et al. (1993) studied injury and poisoning in Bahrain for the period starting on January 1987 until March 1990. They found that the total number of injuries was 5178 of which 378 cases (7.3 %) were due to poisoning.

Although specific causative agents for food-borne diseases are not always identified, during 1986-1992, the leading causes of food-borne hazards, in Bahrain, were due to Salmonella species, Shigella, Viral hepatitis A and food poisoning. The latter is actually an ill-defined term which includes Salmonella and other micro-organisms. With regard to Salmonellosis during 1985-1989, 44% of the cases were among children. In 1990, 43% of Shigellosis were among children 0-4 years of age group. However, Viral Hepatitis A seems to be a big problem which threaten the community in Bahrain. In 1990, a total 380 cases were reported and the vast majority 89% of Hepatitis A cases were among children between 0-14 years of age (Table 3.2) (Ministry of Health, 1991; Ministry of Health, 1992).

Table 3.2: Reported incidence of Foodborne diseases - Bahrain 1986-92.

Years	86	87	88	89	90	91	92
<b>Illnesses</b>							
Typhoid fever	51	68	78	66	70	77	82
Paratyphoid fever	12	239	30	25	16	15	18
Other salmonella infection	239	231	159	174	284	272	315
Shigellosis	163	180	222	161	121	140	141
Amoebiasis	44	49	66	55	33	27	35
Viral Hepatitis	355	167	190	324	380	302	255
Food poisoning (infection)	104	122	23	25	135	61	30

Source: Ministry of Health (1991 & 1992).



preparing food long time before consumption and improper hot holding temperatures are the main contributing factors in the outbreaks.

In Bahrain the available data are insufficient to determine the vehicles of transmission. However, poultry, meat, eggs and dairy products are incriminated in one of the major outbreaks (Ali et al., 1986). In another outbreak, however, chicken was the main responsible food (Ministry of Health, 1993a).

### **3.5. Educational system:**

This section highlights the structure of the educational system, describes characteristics of students and finally, eating in school premises.

#### **3.5.1. Structure of the educational system:**

Bahrain was the first among the Arabian Gulf countries to start formal education. The first boy's school opened in 1919 followed by a girl's school some nine years later in 1928.

Management of the educational system in Bahrain is the responsibility of the Ministry of Education.

Education in Bahrain is provided free at all levels. There are three levels of education: primary education, starts at age of six (six years of study), the intermediate (three years of study), and secondary (three years of study).

**a. Secondary education:**

After completing the intermediate level, students are enrolled in the secondary education. This is a three year programme in which students select their desired field.

The fields consist of:

- **Scientific section:** all students in the scientific section study the same courses in the first year, but in the second year they join one of the following two streams: physics and mathematics, or chemistry and biology.
- **Literary section:** in this section, students study the same subjects in the first year as in science section, but join one of the following four streams in the second year: language, economics and office practice, home economics, and fine arts.
- **Commercial section:** Variety of subjects are taught to these groups. Graduates of this section are meant to work in governmental departments and commercial sector.
- **Industrial section:** only boys join this section. Graduates of this section are expected to work as technicians in the industrial fields.

As Bahrain is diversifying its economy, other sections in the schools have come into existence lately to meet new demands. Among these sections are: catering and tourism, animal and agriculture, textiles and clothes, and printing.

Top students are granted scholarships and fellowships to continue their higher studies in Bahrain or abroad.

Higher education is available in Bahrain through Bahrain University, Arabian Gulf University and specialised institutes (Central Statistics Organisation, 1993).

The literacy rate is over 70% for Bahrainis and 79.8% for Non-Bahrainis. (Bahrain Health Information Centre, 1992). The illiteracy proportion among population over nine years of age has declined from 53 per cent in 1971 to 17 per cent in 1991 (Central Statistics Organisation, 1992). This massive decline is due to the fact that the government of Bahrain is working hard to eradicate illiteracy among both sexes, through regular schooling and through adult literacy classes.

### **3.5.2. Schools and students:**

Based on 1991 census, there are 162 schools and a total 101,070 students in different levels of education and 3,743 class rooms in both the government and the private sector with an average of 30 students per class room (Central Statistical Organisation, 1992). Boys and girls schools are separate in public schools but mixed in private schools. In all sections of public schools, students go to schools from 7 a.m. until

13:00 p.m. except in the industrial section where students go in the afternoon as well. In the private schools, however, some students go in the morning and others go in the afternoon.

### **3.5.3. Eating in school:**

It is the responsibility of the MoE to build canteens and cafeterias in schools. Every school has a canteen, but very few have cafeterias. Cafeterias should have more facilities such as cooking and places for students to sit and dine. Cafeterias are supposed to cater for students who stay to late afternoons such as those in the industrial section. Canteens, however are places where foods are only sold to student, have no other facilities. All foods in schools are prepared outside school premises and brought to schools before the breaks to be sold. Contractor employees, and some students are responsible for selling of foods.

### **3.6. Health Care Delivery:**

Health care delivery in Bahrain started early in 1900's. The aim of the government is to provide high standard of preventive and curative care to all inhabitants and to achieve the World Health Organisation's Goal " Health For All By The Year 2000".

### **3.6.1. Structure of health care system:**

Health care is provided free of charge to all inhabitants of Bahrain. Governmental medical care are provided through four hospitals, five maternity hospitals, nineteen health centres, two health clinics, six environmental health centres, and eighteen child welfare. (Central Statistics Organisation, 1993). Moreover, there are also three private and one military hospital available.

These health care services are distributed through out the country for easy and equal access by the users.

The Directorate of Public Health plays a major role in the prevention and control of diseases in Bahrain. The main responsibility which lay within their directorates is to providing preventing programmes which include communicable and non-communicable diseases control, food hygiene, insects and rodents control, water sanitation, health education, and occupational health. Improvement had also been achieved in disposal of solid and liquid wastes. This activity is carried out by the Central Municipality Directorate.

### **3.6.2. Health status of the population:**

Bahrain, during the past 30 years, has witnessed a remarkable decrease in life threatening infectious and communicable diseases. This decrease is due to the fact that Ministry of Health has emphasised primary health care particularly in the areas of

maternity and child health care, and immunisation. Measles has been reduced from 1019 cases in the year 1985 to only 7 cases in 1991. This decrease resulted from adoption of a comprehensive immunisation programme which covered 88 % of children. Immunisation coverage for DTP and OPV was 96% in 1991 (Ministry of Health, 1991). The health of people living in Bahrain has improved during the last two decades. Infant and children mortality has declined rapidly in the last 35 years. According to the United Nations (1988) figures, the probability of children dying between birth and age of five declined from as high as 303 per 1000 in 1950-55 to as low as 38 per 1000 in 1980-85. Infant mortality rate dropped significantly from 175/1000 live births during 1950-1955 to 20.5/1000 live births in 1992. Although this figure is still high compared to developed countries which have witnessed extensive declines as far as infant and child mortality is concerned. However, Bahrain through providing advanced medical care to everybody, is targeting to achieve low levels of infant and child mortality which is equivalent to other developed countries. The crude birth rate in 1991 was 25.1/1000. Life expectancy at birth was increased significantly from 51.0 years during 1950-1955 to 71.9 in 1990s for both sexes, a gain of 20.9 years. (Bahrain Health Information Centre, 1992).

In Bahrain expenditure on health care and education have a high priority. In 1992, 7.5 percent of total governmental expenditure was spent on health and 14.4 percent on education. The total health expenditure in 1993 amounted to Bahraini Dinars (BD) 54,626,000 (8.5% of the public expenditure). The per capita health expenditure is BD 76.00. (Bahrain Health Information Centre, 1992). Where one BD is equivalent to 1.7 British Pounds.

Steep improvement in health status of Bahraini has been achieved with such significant expenditure. The effect is clearly indicated in the life expectancy for all persons in Bahrain and in infant mortality rate which were given above. Further improvement in the health of the inhabitants of Bahrain can and should be achieved. It won't be achieved through buying expensive medical care and technology only.

To achieve self-reliance in health care delivery, a department for training and development of manpower was established within the MoH. This section of the MoH carry the burden of training and developing human resources in various areas of health and at all levels. Training of health teams is achieved in local institutions and overseas. The main local training institution is The College of Health Sciences. This college has graduated 2051 graduates from different programmes in allied health and nursing since its establishment in 1976 until 1990 (Bahrain Health Information Centre, 1990).

The health problems in Bahrain are similar to those generally found in countries passing through the transitional stage of development. There is a noticeable decline in the occurrence of communicable diseases and an increase in the occurrence of chronic diseases such as circulatory, respiratory diseases and neoplasm (Bahrain Health Information Centre, 1992).

According to 1992 figures (Bahrain Health Information Centre, 1992), seventy seven percent of deaths in Bahrain are due to: 1. diseases of circulatory system, 2. causes of

prenatal mortality, 3. neoplasm, 4. diseases of respiratory system, 5. accidents, poisoning and violence and 6. others of unknown causes.

### **3.6.3. Food safety in the health system:**

Bahrain is a country in which food trading is very important. The majority of foods which are consumed in Bahrain are imported from outside. Most imported foods come by sea from all over the world. Foods of different contents and quality, pre-packaged and live. For example in 1992, a total of 306, 743 animals were slaughtered in Bahrain of which 99% were imported. 16,460,000 kilogram of poultry and 3,970,000 litre of fresh milk were imported during the year 1982-1992. In 1992, 52,605,000 eggs were imported to Bahrain (Central Statistics Organisation, 1993).

Despite the technological advances in food production and food technology, it is extremely difficult to control foods from being contaminated with micro-organisms. It is therefore extremely important to guarantee the safety of food supply. Bahrain is one of the most developed countries compared to its neighbours as far as food hygiene and food inspection is concerned. The Public Health Directorate (PHD) is in-charge of food hygiene and foodborne illnesses. It inspects foods, produces licenses to food shops, and provides medical examination to food workers and licenses them.

Food inspection is carried out by the Food Hygiene Section of the PHD. The inspection is done by the health inspectors who have completed two and a half years of college training in public health after their secondary school education. Some of these



inspectors have attended local and overseas training programmes in the sub-speciality of food hygiene. Many of the inspectors have been working in the food hygiene section for over thirty years. The responsibilities of food hygiene inspectors are to ensure the safety, soundness, wholesomeness, and high hygienic standards of food, whether imported or produced locally, to protect the consumer from foodborne illnesses and prevent food loss due to spoilage.

Food hygiene section consists of two sections, the port of entry section and the internal section.

- **The port of entry section:**

The majority of foods which are consumed inside Bahrain are imported from outside the country. Most of the foods are industrially packed and are generally safe.

There are five authorised ports of food entry in Bahrain. All foods which are imported to the country are inspected physically by the health inspectors. Inspection is mainly based on visual and personal judgement and laboratory tests which are taken randomly from different consignments. Upon inspection of the food consignment at the port of entry, the food inspector determines if it is necessary to take samples for laboratory analysis. The inspectors are fully authorised to reject any food which is not wholesome. Inspectors emphasise the main following points:

- Dates of production and expiry; emphasis is also laid on adulteration in the food label.
- The condition of the package i.e. rusty or bulged cans.
- Storage condition of perishable foods such as defrosted meat, poultry etc.
- Radioactive quality of food. this is a new service which was introduced after the Chernobyl accident.

The majority of the inspection is based on visual judgement by inspectors. Samples however are taken from one time to another depending on the country of origin of foods and on the condition of the foods themselves. Violating food will either be destroyed or sent back to the manufacturer. However, because the inspection is strict, many foods which are not allowed in Bahrain are returned to the country of origin or directed to the neighbouring countries where food control is less strict.

- **Internal section:**

This section of food hygiene is responsible for inspection of all food service establishments (restaurants, food shops, manufacturers, etc.) on the island. The inspectors make routine and surprise visits on the average of eight times a year to each establishment. The main concerns of the inspectors during the visits are the hygienic status of the establishments and the personal hygiene of the workers, refrigeration and storage of food. Temperature is recorded during the inspection but not as often as it should be and not by all inspectors. Moreover, the inspectors give a great value to the health certificates which have proved to be ineffective against food poisoning.

Food safety measures in Bahrain are far better than in neighbouring countries but still not efficient because the main factors which cause food borne illnesses are not addressed adequately during inspection (Ali, 1986). In addition, inspectors use the traditional type of inspection instead of the HACCP for which the inspector sees only a relatively short phase of food operation and not the actual preparation practices. Due to irrationality of the traditional approach of food inspection, Ali (1986), recommended HACCP as an alternative approach.

Future plans to include HACCP in food hygiene programmes is an aim which PHD are planning to incorporate in the future plans. Planning for intensive training programmes for inspectors is seriously considered by the MoH. In fact several inspectors have already been sent on local or overseas training programmes. There are some training programmes which are available for food handlers but I consider them to be inadequate.

Inspectors working in this section, however, are insufficient in number to inspect properly the growing numbers of food stores.

Bahrain is like developed countries where a safe water supply is readily available and standards of environmental sanitation and food hygiene are relatively high.

### **3.7. Food and culture:**

In Bahrain, three meals are taken every day which consist of a) A light breakfast, in which bread is taken with any of the following: cheese, eggs, honey, jam, boiled chick-peas, boiled broad beans. Many households consume more of these items at a meal. Also tea is taken with breakfast. b) Lunch, the main meal of the day, in which rice is either taken with fish, meat or chicken plus some leafy vegetables and salads, and c) Dinner. Usually bread and cheese, curry, chick-peas, broad beans, barbecued chicken or meat; sometimes pizza, or sandwiches are bought from restaurants.

#### **3.7.1. Food and environment:**

The hot and humid weather of Bahrain must contribute tremendously to growth of micro-organisms which cause food poisoning and food spoilage. The weather of Bahrain is hot and damp. High temperature may also alter flavour and colour; dampness will cause rust and may lead to perforation of cans (Hobbs & Roberts, 1993). However, the small size of the land area is advantageous because it decreases the time required for transportation of foods. In Bahrain many food items spoil so quickly or become unsafe for human's health because of heat and humidity. Despite this fact, foods are still displayed for public in extreme environment of sun, heat and humidity. Fish and meat are displayed by the sellers without refrigeration for quite a long time. Many people believe that if ice is used on fish or meat, such food is old so they avoid it, thus the sellers do not use ice on displayed fish or meat. However, extra

amount of fish are kept cool in ice-box and brought out for selling when the displayed stock is sold.

### **3.7.2. Food in relation to culture:**

There are certain cultural beliefs in Bahrain which affect consumption of food. Food can be classified as hot, cold, gas producing and some foods are associated with certain diseases. Thus some people tend to avoid such foods or do not eat them. Example of hot foods are mangoes, eggs, prawns, yellow melon. Cold foods are preferred in summer seasons e.g. water melon. Air forming foods which upset people and cause abdominal pain e.g. are legumes. Eggs or oily foods are avoided if someone has cough. Furthermore, mixing of certain foods and consuming them at the same meal also believed to cause certain diseases. There are certain meals that should not be mixed. For example, fish and milk products.

Increase of wealth and income per capita in Bahrain also affects food preparation, consumption and risk which might be associated with food. It is not any more mothers are responsible for preparation of family meals in Bahrain. Almost every family has a house-maid who is often responsible for house-work including cleaning and preparing of food. This is common to the majority of the families. Not only that but some house-maids decide the family meals and do the shopping. These house-maids, similar to food workers in restaurants, are from the Indian-Subcontinent. They come from the lower socio-economic levels, have communication problems, limited education and are from places with low standards of personal hygiene.

In Bahrain, as all over the world, eating habits have changed rapidly; people now eat more often in restaurants where foods are prepared in advance and in large quantities. Moreover, people buy foods in bulk for one week or longer. Undoubtedly, changes in foods and eating patterns have brought about an increase in food related illnesses. Types of foods have changed, methods of storage and cooking have also changed. Many foods are not as natural as they used to be; pesticides, fertilisers, antibiotics, preservatives and other additives are new to our foods. The use of these chemicals have affected the bacteriological quality of foods as well. The prophylactic use of antibiotics in foods of animals to control micro-organisms has resulted in the development of drug-resistant strains of salmonella (Hobbs & Roberts, 1993; Yew et al., 1993; Thornton et al., 1993). New microbes are introduced in some countries because of trade and importation of foods. In Bahrain new Salmonella species were introduced which were traced to countries from which foods are imported.

### **3.7.3. Food consumption in schools:**

In Bahrain, over 90% of boys and girls in primary schools bring their meal with them from home and over 95% of high school students buy their meal from schools' canteens; the remaining buy their food from small restaurants adjacent to schools.

Foods are prepared in small restaurants, by contractors and brought to schools in vans on a daily basis. Students in the majority of schools have two breaks, in some others have one but longer break in which they buy their meals from the canteens. One of the

selected schools had a cafeteria. Cafeteria differ from canteens because they have tables and chairs where students can sit and dine. However, canteens do not have these facilities. Students buy their meals and walk in the school playground and eat.

#### **3.7.4. Food safety in schools:**

Concept of food safety in schools is very important because huge amount of food is prepared and consumed by thousands of students on regular basis. Food taken at schools are supposed to compliment nutrition at homes. A committee has been formed which has members from the MoH and the MoE to help with foods which are to be sold to students in all Bahraini schools. Nutritional components were the main issue of concern. Many of nutritionally balanced foods were introduced into schools; however many other recommendations have never seen the light. Food safety in schools is mainly maintained by the MoH. Health inspectors make visits to schools but these inspections are not adequate and many times there are no visits. In very few schools, teachers, who are responsible for schools canteens, supervise canteens but they are not trained to do such work and they do not do it on a regular basis.

## CHAPTER FOUR

### Chapter 4

#### **4. Review of the literature:**

##### **Overview:**

A substantial amount of literature deals with food and foodborne illnesses specifically during the last few decades. In fact, the recognition of the new public health movement and emphasis on primary health care and health promotion has encouraged researchers to deal with health issues at the grass roots level. Recently more researchers have turned to linking status of health to foodborne illnesses, and a large number of research projects on various aspects of food safety have been carried out.

The importance of food safety on health and illnesses is well documented from many angles. It involves many disciplines and therefore requires different approaches. As far as the conceptual framework of this study is concerned, a long list of disciplines, approaches and themes may be included in the wide dimensions of the issues that this study is suppose to cover. The list may be suggested as follows: a) theoretical basis which is health promotion, health education and b) procedural issues such as epidemiology, HACCP and TLMs evaluation.

As expected with the recent shift from biomedical model towards including social and cultural elements in order to draw a comprehensive picture of health, there is a large



body of literature which deals with these multi-dimensional themes. Taking the importance of concern for environmental issues into account, we are faced with an ever increasing literature in these fields. Food, food safety, food poisoning and foodborne illnesses which are the core focus of this study is a central theme influenced by all above mentioned approaches. Examining data bases and following cross references from published papers, reports and books have shown that there is a shortage of literature dealing specifically with assessing awareness, attitudes and opinions of students, parents, teachers, and health professionals and examining these in relation to the environment and TLMs.

In order to provide a review of existing literature, this chapter will examine therefore the prime sources in relation to the main themes.

There have been many surveys and epidemiological studies in order to analyse outbreaks to identify causative agents, foods involved, factors contributing to the occurrence of the outbreaks. A relatively new model, HACCP, has been used to further study outbreaks, and identify critical points at which microbes are introduced, survived and multiplied in foods.

The most relevant literature only are reviewed in this chapter. They are divided according to the main themes and issues. The first section presents reporting of foodborne diseases. Then epidemiological findings of foodborne illnesses are highlighted. Literature related to foods incriminated in outbreaks, places of foodborne illnesses occurrence, factors that contribute to the outbreaks are discussed. In the

following section HACCP, the role of food workers in foodborne illnesses, and social and cultural research and TLMs are examined. Finally, limitations in the published literature and previous studies are explained; and contribution of the current research is highlighted.

#### **4.1. Reporting of foodborne disease:**

Research into analysis of patterns, trends and examining factors related to food poisoning became available from early 1900. While it is difficult to identify the early research in this field there are a diverse number of papers examining food poisoning in different parts of the world and trying to identify the exact causative agents as well as suggesting preventive measures. The example of causative agents can be found in Wieneke et al. (1993), Vindel et al. (1993), Hanninen et al. (1984), Skirrow et al. (1993), Hedberg et al. (1992a&b), and Cartwright & Evans (1988). Whereas suggested preventive measures can be found in West (1992), Cruickshank (1990), Burch & Sawyer (1991), Foster; Kaferstein (1985), WHO (1988a), WHO (1991e), Grist (1990) and Oosterom (1991).

There is a large literature on specific illnesses caused by contaminated food items; for example, Skirrow et al. (1993), Hanninen et al. (1984), Sockett (1991), Adams & Mead (1983), Hedberg et al. (1992b), Bone et al. (1989), Gilbert et al. (1993) and Brackett & Beuchat (1992).

Research in food safety is multidimensional. That is my focus and contribution which I did not find any literature matching my study. Therefore, I am going to examine prime sources with relation to causative agents, diseases caused, types of food involved, regional and national outbreaks, schools' canteen environment and findings of some papers related to the current study.

Todd (1990) reported that surveillance of foodborne disease began in the USA at the beginning of this century and the first data collection for milkborne outbreaks were in 1923. From 1938 onwards data collection improved and more data were collected for foodborne, and waterborne outbreaks (Todd, 1990). Moreover, the annual summaries of foodborne disease outbreaks were documented by the Centres for Disease Control (CDC) from 1966 to 1981 as individual publications and included in the Morbidity and Mortality Weekly Report from 1982 to 1987. In Canada, however, Todd (1990) stated that foodborne diseases were gathered in 1973 by the Foodborne Diseases Reporting Centre of the Health Protection Branch.

Reports on food borne diseases are often inadequate and outbreaks incidents are usually under-reported (WHO, 1988a; Bryan, 1988).

Researchers in all parts of the world report an increase in the incidence of foodborne illnesses (Todd, 1990; Hamilton, 1991; Morton, 1993; WHO, 1991e; WHO, 1988a).

In Bahrain, where this study is focused, several large outbreak have occurred lately and many people have suffered ill health (Akhbar Alkhaleege, 1994; Ali et al., 1986;

Ministry of Health, 1993a&b) and one death was documented (Akhbar Alkhaleege, 1994; Ministry of Health, 1993a).

Epidemiological data about the risk of food borne illnesses resulting from such foods in Bahrain are inadequate. Under these circumstances, Bryan (1992) suggested that information from developed countries can be used when the same foods are being considered.

#### **4.2. Epidemiological findings:**

WHO (1988a) stated that the whole body of literature in food hygiene falls into three categories. They are classified as: epidemiological research, HACCP studies and behavioural (sociocultural) research.

Epidemiological studies are established to: a) collect data on the incidence of foodborne illnesses, b) identify the main food items involved in the outbreaks of foodborne illnesses and c) identify the factors that contribute to the outbreaks of foodborne illnesses.

A considerable literature has examined the association between micro-organisms and foodborne illnesses, described characteristics of microbes, identified factors responsible for foodborne illnesses and determined the incriminated food items.

Researchers have studied the characteristics of microbes in foods with regard to survival requirements. For example, characteristics of *Salmonella* was studied in depth. It was found that *Salmonella* are aerobic and facultatively anaerobic, non-spore-forming, motile rods, have peritrichous flagella and are gram-negative (Bryan et al., 1980b). Bryan et al. (1979) reported the survival characteristics of this important organism. The authors stated that the optimal growth temperature is between 37° C and 43° C, but they are destroyed at above 54° C if the exposure time is long enough. The optimal pH for the growth of this organism ranges from 6.5 to 7.5. They multiply in an environment of high moisture and relatively low sugar and salt concentration. Genigeorgis & Riemann (1979) reported that *Salmonella* remain viable in frozen foods for several months. Freezing, however, is effective in preventing their growth, but once they have returned to their favourable temperature, they will resume their multiplication. Blaser & Newman (1982) and Bryan (1975) described the infective dose of *Salmonella*. Similarly, other micro-organisms which cause foodborne illnesses were described by the same and/or other authors. Examples, are shown in Farber et al. (1992), Cook & Ruple (1992), Humphrey et al. (1990), Hanninen et al. (1984), Adams & Mead (1983), Hurst & Hughes (1983), and Mansfield & Farkas (1983).

#### **4.3. Foods incriminated in outbreaks:**

In most instances, it is difficult to identify the exact food item responsible for the foodborne illnesses because more than one food was usually found to be contaminated. Moreover, by the time authorities are informed, incriminated foods would already have

been disposed off. However, there are many studies that have reported incriminated foods.

Researchers (Bryan, 1975; 1981a; Bryan et al., 1979; Cohen & Blake, 1977; Hobbs & Roberts, 1993) have shown that foods of animal origin such as meat, poultry, milk, eggs and their products are often contaminated with pathogenic micro-organisms and have frequently been identified as vehicles in outbreaks of foodborne illnesses in developed countries. These foods may become contaminated while the animals are in the farms. For example, *Salmonella* can reach food from contaminated feed and feed ingredients, contact with other infected animals or their droppings and from contaminated water (Bryan, 1975; Bryan, 1981a; Cohen & Blake, 1977; Jones et al., 1982). Bryan (1975) stated that further contamination occur as animals or birds are transported to slaughter houses and kept in pens. Bryan (1978; 1980a), and Rigby et al. (1982) reported that the infection rate increases at the processing plants during handling. It was reported that Salmonellosis is the leading cause of foodborne illnesses in many countries (Vugia et al., 1993; Altekruuse et al., 1993; Polydorou, 1992; Harris et al., 1990). Foods which are most frequently incriminated as vehicles of Salmonellosis are food of animal origin mainly ham, beef, turkey, eggs and their products (Bryan, 1975; Bryan, 1980a; Bryan, 1980c; Bryan, 1981a; Bryan, 1983; CDC, 1981; Vugia et al., 1993; Hayes et al., 1991; Perales & Audicana, 1989; Stevans et al., 1989) Many other foods were also reported as vehicles (Bryan, 1975; Bryan, 1981a; Cohen & Blake, 1977). These food items might differ from one country to another. For example, in the USA, turkey, beef, and home-made ice-cream were the most frequently reported vehicles of Salmonellosis during 1968-77. In Canada, turkey

was the most frequently reported vehicle during 1973-75. (Bryan, 1981a). In UK, chicken, turkey, poultry, beef, ham and other meat products, eggs, and milk were incriminated in Salmonellosis outbreaks (WHO, 1992; Stevens et al., 1989; Ahmed et al., 1992; Sockett, 1991; Synnott et al., 1993).

From 359 outbreaks and sporadic cases of staphylococcal food poisoning in the UK during 1969-1990, Wieneke et al. (1993) reported that meat and meat products, particularly ham, was the most common vehicle (53 % of the incidents), poultry and poultry products accounted for 22 % of the outbreaks, whereas fish and shellfish, milk and milk products and eggs accounted for 7.8 and 3.5 % of the incidents respectively. Contaminated pate was responsible for considerable increase in foodborne listeriosis (Gilbert et al., 1993).

Thornton et al. (1993) found that ham which was undercooked was responsible for an outbreak of *Salmonella typhimurium* in North West England and North Wales in April and May 1991 which affected 39 people.

Ashley (1990) reported that hazardous foods, in the developing countries, are created because of two reasons. Firstly, the majority of food procedures, manufacturers and food services are outside regulatory control and there is lack of cash in most of these countries. Secondly, health education programmes are not usually addressed to these groups. Furthermore, small food producers do not comply with food production and processing standards and such standards can not be enforced. Moreover, governmental control and supervision are inadequate for meeting needs.

#### **4.4. Places where foodborne illnesses occur:**

Epidemiological investigations have reported the places where foodborne illnesses occur. Generally, it has been found that geographical distribution of foodborne illnesses is not associated with a particular locality. They may occur in homes (WHO, 1992), restaurants (Hedberg et al., 1991; Vugia et al., 1993; WHO, 1992), schools (Belongia et al., 1991; Charles, 1983; Hobbs & Roberts, 1993; Kobayashi et al., 1991; Richards et al., 1993; Usera et al., 1993), universities, hospitals (Charles, 1983), nursing homes (Levine et al., 1991), on aircraft (Hedberg et al., 1992a), and in hotels (Ali et al., 1986). Outbreaks of foodborne illnesses in other locations have been well documented (Sockett 1991; Wood et al, 1992).

Wieneke et al. (1993) examined the outbreaks of staphylococcal food poisoning according to the places of their occurrence. It is reported that out of 359 outbreaks examined, about one third occurred at homes, 26 incidents were associated with shops and 58 outbreaks were associated with restaurants and at reception and parties (table 4.1.).



Table 4.1 Staphylococcal food poisoning 1969-90: places of incidents.

Places	Number of incidents
Private houses	106
Restaurants	31
Shops	26
Schools	23
Hospitals	19
Wedding receptions	18
Canteens	11
Outings (packed lunches)	11
Institutions	10
Parties	9
Other centres	13
Manufacturer	4
Other	22
Not known	56
Total	359

Source: Wieneke et al. (1993).

More example of places where food was contaminated or consumed in the European countries are explained in WHO report (1992). Based on this document, most of the European countries reported that the outbreaks had their origin either in restaurants or in private homes. Some European countries reported that homes are becoming more and more important as a source of outbreaks.

Sockett (1991) attributed the wide geographical spread of foodborne illness outbreaks to automation and technology in food manufacture. Automation and technology increased food production and replaced many traditional forms of food production and processing. Hazards associated with such a shift in food production and processing were inevitable (Sockett, 1991; Hobbs & Roberts, 1993).

In Bahrain, several large outbreaks have occurred at hotels, and during parties where substantial amount of foods are prepared (Ali et al., 1986; Ministry of Health, 1993 a; Ministry of Health, 1993 b).

#### **4.5. Factors that contribute to the outbreaks:**

Researchers (Bryan, 1972; Bryan, 1978; Bryan, 1988; West, 1992; WHO, 1992) reported the factors that contribute to the occurrence of foodborne illnesses. There is agreement in the literature on these common factors but the weight of these factors differs from one country to another. For example, Bryan (1978) conducted research in America to examine the factors that contribute to outbreaks of foodborne illnesses. He concluded that most foodborne diseases occur as a result of improper cooling of food, inadequate cooking or thermal processing, eating contaminated raw food products and cross contamination.

Another study by Bryan (1988) revealed the factors that contributed to outbreaks of food borne illnesses which were reported in the US from 1977-1982. The findings were slightly different from the previous findings. Inadequate cooling, which included leaving food at room temperature, or storing them in deep containers while being refrigerated contributed to the most of the outbreaks. The author found that the factors change slightly with microbes implicated in the outbreaks and also with the place where the outbreaks have occurred. According to Bryan, the three most important factors that contribute to outbreaks of Salmonellosis were improper cooling, contaminated raw products, and inadequate heating; to staphylococcal food poisoning

were colonised food workers handling cooked foods, lapse of 12 or more hours between preparing and consuming, and improper cooling; to *Clostridium perfringens* enteritis were improper cooling, lapse of 12 or more hours between preparing and eating and inadequate re-heating which is followed by improper hot holding; to typhoid fever were colonised food workers handling implicated foods, lapse of 12 or more hours between preparing and eating and time-temperature exposure of foods; to shigellosis were colonised food workers handling responsible food, improper cooling and lapse of 12 or more hours between preparing and eating; to *Bacillus cereus* gastro-enteritis were improper cooking, lapse of 12 or more hours between preparing and eating. Bryan (1988) also reported the most frequently identified factors that contributed to outbreaks at different food preparation locations. For example, in food service establishments these were improper cooling, lapse of 12 or more hours between preparing and consuming of food, colonised food workers handling implicated foods, inadequate re-heating and improper hot holding. In homes, these were contaminated raw foods, inadequate cooking, unsafe source, improper cooling, and lapse of 12 or more hours between preparing and eating. In food processing plants were inadequate heat processing, contaminated raw ingredients, improper cooling, colonised food workers handling implicated foods, improper cleaning of equipment and improper fermentation.

In considering factors that contribute to outbreaks of foodborne illnesses, West (1992) listed slightly different factors which cause risk in food outlets, they are:

temperature, staff awareness of hygiene, cross contamination, hand washing facilities, and management awareness of hygiene.

Similarly, Roberts (1982) reported the factors which contributed to the outbreaks of foodborne illnesses in England and Wales. Similar factors were reported, with slight difference in the importance of each factor.

The most reported contributing factors from the European countries are: improper cooling, improper storage, inadequate heat treatment, inadequate hygiene of personnel, cross contamination, use of ingredients from unsafe sources. Detailed information on contributing factors in the European countries are reported in WHO (1992).

Yet another body of research looked at the factors from different points of view. For example, Dabbagh et al. (1992) who studied diarrhoea in Egypt, put rather interesting contributing factors. They are various cultural and environmental factors, political commitment and medical policies. The authors believe that all these may be implicated as contributing factors to occurrence of diarrhoea.

However, Manning & Snider (1993) revealed that deficiencies in attitudes, knowledge and practices as frequently contributing factors of food borne disease outbreaks.

Foodborne diseases were also examined in relation to causative agents. Foster & Kaferstein (1985) and WHO (1991e) confirmed that micro-organisms are the primary causative agents of foodborne illnesses all over the world despite the increase in the use of chemical agents in the food industry. Kaferstein et al. (1990), Cross (1992), and

WHO (1991e) also reported that microbial contamination is the number one risk to the safety of food supply and to the consumers.

Vugia et al. (1993), Altekrose et al. (1993), Polydorou (1992) and Harris et al. (1990) reported that Salmonella is the leading cause of foodborne illnesses.

#### **4.6. Hazard analysis critical control point (HACCP):**

Community safety is the main concern of the health authorities. Consumer acceptance, regulatory compliance and aesthetical appearance must be of secondary importance. Foods become a threat to human health only when they are contaminated by pathogenic microbes, their toxin or poisonous chemicals. These contaminants must be present in high enough quantities to overcome body resistance and cause ill-health. Raw foods are often contaminated by organisms at the source of production, however such contaminants might not pose risk unless there are faulty practices along the food chain. Faulty operations, locations or food items which pose risk to the consumers are called critical control points (CCPs). These CCPs might permit contamination of sterile foods, survival and multiplication of pathogens or producing of toxin by these pathogens. CCPs can be identified, controlled and monitored by the HACCP model.

HACCP is defined in section 2.5. It was first described in 1971 at a conference on food protection (US department of Health Education and Welfare, 1972). Has been used in control of microbiological contamination of foods in different food outlets and foods stores by several authors (Bobeng & David, 1977; Bryan, 1981b; Bryan, 1981c;

Bryan & Bartleson, 1985; Bryan & Lyon, 1984; Bryan & McKinley, 1979; Bryan et al., 1981; Bryan et al., 1992a; Bryan, 1992b; Bryan, 1992c; Bryan, 1992d; Goff, 1988; Ito, 1974).

HACCP research has greatly contributed to the body of knowledge and research.

Hazard analysis and epidemiological studies revealed that foods prepared in advance and kept at room temperatures for a long time (6 hours or more) showed massive increase in bacterial counts reaching to a critical level. Hence, these foods are considered as high risk (Bryan, 1978; 1988, 1992; Hobbs & Roberts, 1993),.

#### **4.7. Food handlers:**

Among many issues argued by researchers is whether food handlers are a prime source of microbes or are they victims of foodborne illnesses. There is also an argument related to clinical examination of food workers. This area of research has been investigated by several authors. There is a disagreement between researchers; even the same researchers have given conflicting information at various occasions. For example, in a large outbreak of gastro-enteritis which occurred simultaneously among school children and teachers at nine elementary school in Japan, Kobayashi et al. (1991), stated that food workers were the most probable source of the outbreak. Hedberg et al. (1991) who studied an outbreak of *Salmonella enteritidis* also reported that food workers are the source of transmission. Charles (1983), however, believes that food workers are responsible for only a very small proportion of outbreaks of food

poisoning. Hobbs & Roberts (1993) and Cruickshank (1990) reported that handlers could be themselves victims of the foods they touch and taste and thus become sources of contamination. Hobbs & Roberts (1993 p. 161), mentioned that food workers do not play a major role in food poisoning except in *Staphylococcus aureus* poisoning. They also noted that only small number of occasions, food workers may have been responsible for outbreaks of Salmonella. Cruickshank (1990) also reported that food workers who have symptoms of a foodborne illness may pose a real hazard and should be excluded from work. With all micro-organisms except with *Salmonella typhi* and *Salmonella paratyphi*, food workers can work when they do not have symptoms and microbiological follow up is not required. With *S. typhi* and *S. paratyphi*, there has been clear evidence that excretors without symptoms have been responsible for outbreaks (Cruickshank, 1990). Bryan (1988) reported that colonised food workers handling foods have contributed to the occurrence of shigellosis, typhoid fever, and staphylococcal food poisoning.

Charles (1983) stated that routine medical examination is not recommended and that carriers should be allowed to work unless dealing with a high risk food items, e.g. salads, or any other foods which will not receive further heat treatment.

Chest x-ray for tuberculosis and test for HIV infection and sexually transmitted diseases may benefit the food worker but are irrelevant as hazards to food consumers (Cruickshank, 1990). Bryan et al. (1979) and Judson et al. (1983) did not recommend tuberculin skin test and chest x-ray, as *Mycobacterium tuberculosis* is not transmissible

by food (except un-pasteurised milk and that it is unlikely to be spread by air during a very short period of exposure within a restaurant.

However, Cruickshank (1990) justified testing in special circumstances, for example when recruiting staff from a known epidemic area.

Hobbs & Roberts (1993 p. 170) recommended physical examination at the beginning of employment to secure freedom from tuberculosis, infection, intestinal pathogens and skin infection. However, they discourage periodic examination of healthy workers. But also suggested stool examination of those who travel to the Middle East and Far Eastern countries. Bryan et al. (1979) suggested that food workers should be certified on the basis of what they know about protecting the health of the consumer and not on the basis of medical or clinical examination.

#### **4.8. Social and cultural research:**

In spite of a large body of literature, the relationship between health knowledge and foodborne illnesses, in the larger community, has not appeared in major data bases. Most importantly no literature could be traced on food safety and foodborne illnesses within the school settings, particularly school canteens, though this issue was recommended by WHO and other researchers for further assessment and examination.

Very few published papers which measured knowledge, beliefs and practices were found, and they were only among food workers and food managers. A study to assess food service operators knowledge and attitudes was conducted by Cunningham (1993)



in the Hamilton Wentworth Region, Ontario, Canada in 1989. The author found that the operators were informed on correct food handling procedures, however they knew nothing about HACCP. Burch & Sawyer (1991) surveyed managers and employees of convenience stores in the Great Lansing area of Michigan, USA to estimate their actual knowledge of food service sanitation. The obtained information from this study were correlated to sanitary conditions of food preparation. Manning & Snider (1993) conducted a study to assess food safety knowledge, attitudes and practices of workers in temporary public eating places. The authors found deficiencies in knowledge, attitudes and practices in areas of cooling, re-heating, temperature control and cross-contamination. In a survey which is conducted to assess UK hotel workers' knowledge and understanding, Griffith and Coleman (1993), found that knowledge and understanding of the Food Legislation Act 1990 was generally poor, especially among the managers of small hotels involved in the survey. The findings of these papers suggest significant lack in knowledge and poor practices in food hygiene.

Wyatt (1978) surveyed 219 managers and owners of retail food markets to determine their knowledge, opinions and experiences in food service sanitation and food safety. The results of this research confirmed a distinct lack of fundamental knowledge in the basics of food sanitation and safety.

WHO (1992) reported that tradition and beliefs contribute to the occurrence of food poisoning both in industrialised and in developing countries.

West (1992) stated that a great deal of change had occurred in food catering, however, people's awareness to food hygiene and quality has not kept pace with the new development.

#### **4.9. Teaching and learning materials (TLMs):**

According to Farrell-Miller & Gentry (1989) and Ali (1991), written materials are the backbone of training programmes for any population group.

Mcleod (1991) said that TLMs for students may serve one of the following activities: Primary learning, revision of learned materials, and for reference purposes only.

There is a tremendous shortage of TLMs in the developing countries, according to Mneimne (1994).

Because of shortage in TLMs, Dowling & Ritson (1985) believe that there is a need to encourage developing countries to produce their own materials to meet the specific requirements of their own health personnel.

Dowling & Ritson (1985), referring to materials for health workers, stated that where teaching materials do exist, they are often of poor quality, out of date, not relevant to local needs, and are translated from foreign texts. Ali (1991) and Estey et al. (1993) believe that materials of such quality might be difficult to understand, confusing, threatening and could be socially and culturally unacceptable, or not addressing the

needs of that country. Evaluation of TLMs before using them is vital for achieving the objectives of any education.

Discenza (1993) stated that evaluating TLMs must involve evaluation of content, the instructional design, the technical production of the instructional textbooks and the packaging. In his paper, Dicensa has suggested a detail about the criteria of evaluation of TLMs. Other researchers such as Valaitis & Shea (1993), Bernier & Yasko (1991), Charlton (1986), and Mcleod (1991) followed some similar approaches to evaluate TLMs.

When evaluating the content, the following questions should be taken into consideration: Is the material pertinent to the need of the society and the country?, Is the information provided by the material current? is it accurate and scientific?. Regarding appropriateness, Is it at the level of the intended audience?.

Emphasising readability, Estey et al. (1993) said that there are many materials available but mentioned that TLMs serve no useful learning purpose if the target group are unable to understand and make full use of them. Materials should be written within the reading level of the population. Researchers Mcleod (1991), Estey (1993), Charlton (1986), Lohr et al. (1989) and McCabe et al. (1989) mentioned that writing materials beyond the reading level of the target group will not guarantee comprehension also lowering the reading level of the printed materials may not guarantee comprehension. For TLMs written in English, researchers showed that there are several tests that can

be used for assessment of reading levels of the materials (Jastak & Wilkinson, 1984; Taylor, 1953; Fry, 1968; McLaughlin, 1969).

Ewles & Simnett (1992) have given clear criteria for choosing and using health promotion materials. The authors have discussed the advantages and limitations of a range of materials. According to Weinrich & Boyd (1992), adequate learning will not take place unless proper teaching tools are used.

Despite their importance in empowerment, no assessment of TLMs in food safety was traced in the published literature.

#### **4.10. Limitations of the published literature:**

The last few years have witnessed an upsurge of interest in community development. Health promotion to empower people to have control over their health was the centre for achieving this goal. In spite of good amount of work in the field of health promotion, food safety, I found certain weaknesses in these studies. Most importantly is that the majority of research have suggested health promotion/education as a control measure for foodborne illnesses, but all failed to study such problems, from the consumer point of view, to examine weaknesses and identify target groups for which health education should be addressed..

Foster & Kaferstein (1985) mentioned that food safety has not been properly defined.

The authors felt that in the developed countries it was seen largely in terms of

legislation and inspection. In the developing worlds, however, relatively little has been done.

According to Foster & Kaferstein (1985), it is only in recent years that the relationship between food safety and malnutrition among children is being recognised. Much malnutrition, particularly among children is due to the inability of the body to fully utilise the food because of repeated diarrhoeal episodes. WHO (1981) acknowledge the importance of nutrition and balanced diets, but also showed its concerns about inability of the body to fully utilise the ingested nutrients due to repeated diarrhoeal episodes.

Foster & Kaferstein (1985) reported that many research projects have been done in nutrition, but there is no behavioural research that deals with the critical points in the food chain. There are only some studies on infant formulas and bottle feeding. Returning to Foster and Kaferstein, they added that much information is available on the type of foods which are produced, their nutritional values, the social practices that affect distribution of foods within the family or the community and the solution to illnesses associated to malnutrition. The authors stated "Yet in the developing world very little is known about how food becomes unsafe and what changes in environmental conditions and beliefs and behaviour must be accomplished in order to reduce food hazards". Kaferstein et al. (1990) valued the importance of nutrition to man but mentioned that nutrition itself does not secure good health, especially if the food is contaminated with health-threatening microbes or their poisons.

In spite of the substantial amount of published literature in food hygiene, Kaferstein et al. (1990) expressed their concern that food, which is one of the most important needs to human survival, has largely been overlooked. The authors believe that many efforts have been taken to improve the environment and reduce environmental hazards. Efforts which included decreasing air pollution, providing safe water, ensuring basic sanitation and so forth. The authors emphasised the need for safe food to eat and suggested that particular emphasis should be laid on the microbiological contamination of food which cause, according to Kaferstein et al., a large number of victims, especially amongst young children.

Kaferstein et al. (1990) stated that the factors that contribute to outbreaks of foodborne illnesses are general and independent of geographical and climatic conditions. However, because of social and cultural settings and also variation in economic resources, educational intervention should be culture-specific. The authors suggested that health education in food hygiene must address the needs of a particular culture as it is impossible to adopt a universally-applicable education programmes because of sociocultural differences.

WHO (1988a) recommended research similar to the present investigation as it is extremely important.

The need for quantitative data for developing an effective food safety education and the feasibility of gathering such data through school-based survey encouraged the researcher to establish a method through which data could be develop for food safety

survey. The researcher is particularly interested in those factors which affect the safety of food. Those which promote food safety and others which threaten it. Previous epidemiological, HACCP, and socio-cultural studies should be complemented by the current research. The findings from these studies should enable health authorities, providers and consumers to provide effective control measures and protect the health of the community at large.

#### **4.11. Previous studies:**

Previous studies have examined the association between food poisoning and practices and the hygienic status of the food services establishments. Unlike this study, the previous ones have not studied the knowledge, beliefs and attitudes of a wider community in food hygiene. Only limited information is available in health promotion and food safety. Moreover, little is known on whether or not there are other empowering elements such as supportive canteen environment or relevant resources such as TLMs which enhance food safety.

Previous studies have recommended health education as a control measure, but none has extensively studied the consumer's perception of food hygiene and food poisoning and facilities available to him, particularly TLMs, to make healthy decisions.

Ashley (1990) believes that there are many faulty operations and behaviours that will lead to have hazardous foods in developing countries. However, these conditions were not adequately studied.

Restaurants, food vending operations, food services establishments and other food stores have been investigated using HACCP or by other epidemiological approaches. However, no published research could be approached which studied school canteens and food preparation sites for schools. It is also the first time Awareness, HACCP and TLMs to be linked together aiming at developing culturally-specific programmes and future empowerment of the community.

The present study is different from previous studies in five ways. First, previous research studied knowledge, attitude, and beliefs among food workers and food managers, however, the current study was addressed to students, parents, teachers, and health promoters. Secondly the target groups contributed to the design of the study and were fully involved throughout the research. Thirdly, the study linked knowledge, attitudes, beliefs and practices, canteens' environment and TLMs. Fourthly, CHAID analysis was used for the first time in a food safety study. The idea behind this kind of analysis was to narrow down the variables so that to focus the attention on specific part of the problem or segment of the population where intervention can be most effective thus avoiding extra expenses in terms of time, money and efforts. Finally, food poisoning knowledge, beliefs and opinion is described for the first time in such detail.

With regard to analysis, Burch & Sawyer (1991) used the frequency distribution, simple linear correlation and analysis of variance to assess the impact of personnel knowledge level of food service sanitation of managers and employees working in food



stores on facility sanitation. Other researchers such as Cunningham (1993) used chi-square analysis way to determine if age, sex, previous education and years of operation of food workers had a direct effect on the responses to food handling. Moreover, Manning & Snider (1993) used frequency distribution, mean and standard deviation to assess knowledge, attitudes and practices of workers in temporary public eating places.

## CHAPTER FIVE

### Chapter 5

#### **5. Methodology:**

##### **Overview:**

This chapter highlights procedures that have been employed to collect and generate data and information. It covers target populations and sampling, the design of the study, setting of the survey, data collection and analysis, criteria for inclusion of the subjects, research instruments, assessment of school textbooks and health education materials, assessment of school canteens and food preparations sites, procedure for conducting the surveys and interviews, description of questionnaires, clarifying variables, and examination of validity, reliability and pilot study.

In order to identify the knowledge, beliefs and opinions of students, parents, teachers and head teachers and health promoters, data were collected by four different methods.

Firstly, a sample of senior students in the final year and from different sections of Bahraini schools, their parents, teachers, head teachers and health promoters were interviewed about food hygiene and health promotion using a separate questionnaire which was developed for each group by the investigator. Secondly, semi-structured interviews were carried out with teachers, students and health inspectors. Thirdly, data on the practices within school canteens and on the hygiene status of the school

canteen was collected by using HACCP and a check list which was developed specifically by the investigator for this purpose. Some foods were traced to the source and assessment of food preparation areas were also carried out. Fourthly, health education materials developed by health education section and the science teaching and learning materials (TLMs) used in the primary, intermediate and the secondary schools were assessed by the investigator to determine whether or not they contain information on food hygiene. Such information was assessed for its appropriateness.

The questionnaire was discussed in detail with the supervisor, field tested through pilot studies and modified accordingly.

The instrument was prepared by the researcher and consisted of six sections:

1. Background information: data on socio-demography.
2. Factors responsible for contamination of foods, survival, and growth of microbes.
3. Attitudes: asked respondents to report on their reaction to certain practices, and foods. Subjects were presented statements and they indicated the degree of their agreement or disagreement on a series of Likert- type scales (Likert, 1932).
4. Open-ended questions were used to elicit responses on needs, barriers and general comments.

The PRECEDE model was the basis for developing the questionnaire and the personal assessment of the environment. However, additional models were needed to develop

the components of this investigation such as Self- Empowerment, Health- Belief Model and HACCP.

### **5.1. Target population and sample selection:**

In this section, a description of the population and the method of sample selection will be given. The sample consisted of students, their parents, teachers and health promoters. The target population and sample selection in this study are as follows:

#### **5.1.1. Students:**

##### **A. Importance of students to health promotion:**

In Bahrain, twenty-one percent of the population were students in 1992 (Central Statistics Organisation, 1993).

Involving school children in health issues is fundamental for the following reasons according to Dhillon & Philip (1992): (a) school children represent the largest segment of population in all developing countries. (b) school children are readily accessible and (c) they are receptive to learning. They also stated that school setting serves as great opportunity for giving health knowledge, developing appropriate values and attitudes and encouraging a health behaviour.

Dhillon & Philip (1992) estimated that the number of school-age children is over a thousand million in the world. It was found that in developing countries about 80% of children are enrolled in primary or elementary schools, and that 60% complete at least four years of school education. Children in schools or outside schools have to receive some information on health topics so that they become informed and are able to protect their own and their family's lives.

### **B. Process of sampling:**

Because the majority of the population (85%) reside in two main islands, only those two islands were considered in sampling. Students who were selected were in their final year of their high school study. There were a total of 3600 boys and 3800 girls students in the final year of public high schools which is year 12 of the education system and 514 in the private schools. There are 24 public secondary schools and 7 private high schools. Public secondary schools were stratified by sex from which 12 (50%) were selected. The sample consisted of 5 boys schools and 7 girls schools. Also 5 (71.4%) private high schools were selected. Simple random method was used during sampling. Next, students in public and private schools were stratified according to sections. From public schools over 10% sample was drawn. Because the number of students in the non-governmental schools was small, the sample for this group was doubled and 20% were selected to recruit more subjects.

Out of these total number, 400 were selected for this study. In this sample, there were 195 males and 205 females. The average age of this group is 17 years. These students

were selected from all major speciality areas of science, literary, commerce and industrial.

The reason for selecting students who are in the final year of their education is that those students are expected to have attained a comprehensive level of knowledge.

### **5.1.2. Parents:**

#### **A. Importance of parents to health promotion:**

Parents were included in the study because they are the family decision makers who determine the family affairs thus are very significant to this study. Parents involvement in health education activities is even more significant according to Coombs & Craft (1987). They gave four reasons for involving parents in health education activities. Firstly, it encourages consistency of approach for the health education in general and for particular programmes; making parents better prepared for to deal with questions, anxieties or misunderstandings. Secondly, consulting with parents in health education will validate the process and increase confidence in the programme. Thirdly, school might use parents in a facilitating role to provide information about particular health issue such as genetic counselling and information of school medical services. Finally, involvement of parents in health education has important implications for the whole work of the school.

In PRECEDE model, Green et al. (1980) recommended students, parents, teachers and health professionals by stating that for school health education planning, social and epidemiological diagnosis will be more effective and useful if it includes both the general and the school community. Teachers, administrators and students represent the school community whereas parents and health educators represent the general community. Green et al. (1980) also said that to plan school health education, the committee should at least consist of students, parents, teachers, administrators and community health professionals (p. 146). This kind of planning according to Green et al. (1980) will make the effort more responsive to the needs and concerns of the community that supports the school. In other words, if the community is concerned and represented in the planning of school health education, the interest and the support of the community in programme implementation will be increased.

#### **B. Process of sampling:**

Parents of the same students selected in sampling were also surveyed in order to gain further understanding of family settings and background into the knowledge and beliefs related to food and food poisoning. A total of 400 parents corresponding to students were selected. It is important to mention that as a norm of the society, all students live with their parents until marriage and sometimes even after marriage. Questionnaires were sent to parents through their children. The rate of response was slightly lower as it was assumed that the questionnaires were not delivered initially to the parents. To increase the response rate, an announcement was made in one of the two main daily news papers in Bahrain (Al-Ayam).

### **5.1.3. Teachers:**

#### **A. Teachers and health promotion:**

The reason for selection of this group was because of their influence on the students and because they are the prime source of information to future generations. Kaferstein et al. (1990) suggested that teachers must be targeted in any health education programmes because of their influence on children and consequently upon their parents.

#### **B. Process of sampling:**

Teachers, school social workers and headmasters/ headmistress were selected to be included in this study. This group was stratified according to sex, speciality and level of teaching (primary, intermediate and secondary). The sample was selected from the 17 secondary schools from which students were selected, and from 18 primary and intermediate schools throughout the country. Primary and intermediate schools were selected by simple method of sampling. There were a total of 3022 males and 2956 females teachers in all levels of Bahraini schools. Out of which 340 were selected for this study. Out of this total, there were 183 males and 157 females.



#### **5.1.4. Health promoters:**

##### **A. Description and sampling:**

Health promoters are the inspectors working in the MoH. They are responsible for environmental health which includes food safety, insects and rodents control, communicable diseases, occupational health and health education. There were a total of 72 health promoters present during the implementation of this study. All of them were included. Inclusion of such a target group in planning health education is crucial.

All health educators who were present on duty during that period were included in the study and given the questionnaire.

#### **5.1.5. Focus group:**

##### **A. Importance of focus group to the study:**

The focus group interviews were conducted to gain an understanding of knowledge, attitudes, beliefs and opinions. Moreover, to determine what the target group would like to be done to improve food safety. Understanding the willingness and unwillingness of the community to participate in health matters is critical to the development and implementation of health promotion programmes and policies.

Focus group interview is a valuable method for obtaining information about knowledge and attitude of people towards a specific health subject. Basch (1987) outlined the advantages of focus group interviews. The advantages include the following: group interviews enable more interaction between participants; group pressure may inhibit participants from giving misleading information; and the cost of focus group interviews is lower than individual interviews. Ramirez & Shepperd (1988), however, added that focus interview is more flexible than survey method and often stimulates new ideas and insights among participants and may provide information that the researcher might not have thought of. Stevenson & Lennie (1992) provided the limitations of focus group interview as having poor generalizability, the need for caution in evaluation, and influence from the facilitator and other participants. However, when used in combination with other methods, Stevenson and Lennie said that more meaningful results can be obtained than from using a single method.

#### **B. Process of sampling:**

Focus groups were selected by a systematic method of sampling. They consisted of six groups of students in public schools, 3 groups of students in private schools, 5 groups of teachers and 3 groups of health promoters.

## **5.2. The design of the study:**

### **5.2.1. Setting of the research:**

Data collection was carried out in Bahrain as follows:

A. Statistical records were studied to identify major foodborne hazards, their causes and contributing factors in Bahrain. Ministry of Health Annual Report, Health Statistical Abstract, issued by Bahrain Health Information Centre were the main sources of information, published and unpublished epidemiological reports were also used as sources of information for this data.

B. Data for students were collected from 12 governmental and 5 private schools. For parents, data were collected from the parents of the same students, for teachers, data were collected from 35 schools (primary, intermediate, and secondary) and for health educators, data were gathered in the Public Health Directorate (PHD) and in the health inspector's and health educator's offices.

C. Semi-structured interviews with students, teachers and health promoters were conducted in schools, PHD and health inspectors and health educators offices respectively. The parents were not interviewed as they were difficult to reach.

D. Sixteen school canteens and 6 food preparation sites were inspected using HACCP approach and a simple check list which basically measured the presence and use of

cooling, heating, and hot holding facilities, and general hygiene of the cafeteria (Appendix 6).

E. Seventy-two health education materials, which were available at the time this research was carried out, were evaluated for information on food hygiene. The Country's Senior Health Educator was also interviewed regarding health education programmes in food hygiene nation-wide and historical background and present practices.

F. Sixty five school textbooks (mainly Science textbooks) were evaluated to find if information related to food hygiene exist and such information were assessed in terms of accuracy, adequacy, and relevancy.

The general sections of the questionnaires dealt with knowledge, beliefs, and attitudes towards food borne illnesses, food hygiene and health promotion. The questionnaire examined awareness of a cross-sectional segment of the community focusing on what they know, believe and what they want to know.

## 5.2.2. Data collection:

### A. The questionnaires:

The questionnaire for students, teachers and health promoters were handed out personally. Students were asked to complete the questionnaire on the spot, whereas parents, teachers and health promoters were asked to bring them next day.

In all schools a list of names was available, systematic method of sampling was used to draw the samples. For teachers, the list was obtained from the MoE.

In most cases, students were called by microphone and gathered in a lecture hall and questionnaires were distributed to them personally. For parents, the questionnaires were given to the same students who were asked to take them home, and return them next day. Students were instructed not to help their parents with the answers. The questionnaires were packaged with an explanatory cover letter which had clear address and work and residence telephone numbers for calling in case of any inquiries. Number of questionnaires distributed and the ones which were completed are shown in table 5.1.

Table 5.1: Number of Questionnaire distributed and completed.

The subjects	Questionnaires distributed	Questionnaires completed	% completed
Students	400	390	97.5
Parents	400	259	64.8
Teachers	340	329	96.8
Health Promoters	72	69	95.8
Total	1212	1047	86.4

The total sample size of the present investigation was 1047 subjects, out of which 31.4% were teachers, 37.3% students, 24.7% parents, and 6.6% were health promoters who completed and returned the questionnaire.

### **B. Focus group:**

Focus group interviews were carried out by the investigator. A structured framework for discussion was prepared but modified during the interview (Appendix 5). Focus group pre-tests were conducted. This interview excluded the parents as they were difficult to reach. Responses from the interviews were directly recorded on papers. After the interviews, feedback was given to the participants. The interviews were conducted in a quiet area within the schools setting and in the PHD so that the interviews could be conducted in an informal way without any distraction.

During the interviews, the subjects lead the discussion with minimal interference by the researcher. The researcher acted as a moderator. The groups were seriously involved and were pleased to discuss food safety and health. They insisted in being involved in future plans of health promotion.

The time required to finish an interview was approximately one hour.

### 5.2.3. Criteria for inclusion of the subjects:

The criteria for inclusion of subjects in the study was as follows:

1. A random sample of students in the final year of governmental and non-governmental schools were selected provided they consented to participate.
2. Parents of the same students were included in the study. The criteria for inclusion in the study was that they could read and write.
3. A random sample of school educators (teachers, social workers and administrators) from primary, intermediate and secondary levels in both governmental and non-governmental schools were included in the sample
4. Focus groups were selected from the same groups of teachers, students and health educators who were handed the questionnaires.
5. Mainly science textbooks were selected for evaluation for the presence of information related to food hygiene. Science textbooks were selected for two reasons: first, the number of the textbooks which are used by the students exceed a thousand which makes them impossible to evaluate with the tight time schedule. Second, curriculum designers were interviewed regarding the contents of the textbooks and they were sure that non-science textbooks do not contain any information on food hygiene and they suggested that I evaluate science textbooks.

Some students asked for assistance with some questions. Assistance was provided by the investigator in all occasions. Only two of the parents telephoned requesting assistance in answering. All students except two expressed interest in participation, all health educators expressed willingness to participate but two failed to return the questionnaires and one returned an unanswered copy. Eight teachers refused to participate because of their commitments and tight schedules. They were replaced by others from the list and three returned an in-completed questionnaires. Nine incomplete questionnaires were returned by parents.

Students' and health promoters' questionnaires were directly collected by the investigator; whereas teachers' and parents' questionnaires were collected by the investigator or sent to the school health education section in the MoE.

#### **5.2.4. Data entry:**

Data entry was conducted by the investigator. A computer specialist designed a database file in D-base III programme in the investigator's personal lap-top IBM compatible computer. Data were double checked for non-sampling errors by the investigator initially and by a senior computer scientist from the University of Oxford. Computer validation check revealed four mistakes which were found and corrected.



Data were then copied into IBM compatible computers in School of Postgraduate Medical Education, University of Warwick, UK. Re-coding and data cleaning was done.

#### **5.2.5. Data analysis:**

For the present study, the statistical software used to carry out the analysis of the questionnaire was SPSS version 6.0. Variety of statistical tests were used including frequencies, cross-tabulation, and CHAID. Using CHAID, version 6.0, SPSS Inc., Chicago, Ill. , a probability of P-value equal or less than .05 was used as a test of significance in all analysis.

#### **5.3. Research instruments:**

The general sections of the questionnaire were as follows:

- reasons for occurrence of food poisoning.
- attitudes towards contributing factors related to food poisoning.
- susceptibility towards food poisoning, contamination and survival of microbes and certain benefits of control measures
- sources of microbes
- control measures
- community participation for effective intervention
- felt needs as expressed by respondents

- perceived barriers to health promotion
- comments of the subjects

Questionnaires for each category of the community were similar. Questionnaires were translated into Arabic. In translating the questionnaire into Arabic and the responses into English the investigator was extremely careful to adhere to the exact or most close meanings. Private schools, which use English as a medium of instruction, were handed the English version of the questionnaires. The respondents were asked to tick or circle the applicable statements. Likert scale and open ended questions were used in each set of questionnaire. The open-ended questions were used to elicit spontaneous responses and to identify beliefs and attitudes of the subjects.

Each questionnaire carried a serial number for follow up purposes. Each possible answer was assigned a numerical code to facilitate computerised statistical analysis.

Questionnaires for each group were in different colours for easy identification.

Assistance in completion was provided by the researcher in person for all groups except for parents assistance was given by students or via telephone when requested.

#### **5.4. Assessment of schools' canteens:**

To assess microbiological hazards associated with foods consumed in Bahrain's schools, hazard analysis was conducted in school canteens and the sites of food preparation. Initially the aim was (a) to determine possible sources of food

contamination, modes of contamination, survival and multiplication of microbes and (b) assess the performance that affect contamination, survival and multiplication of microbes within school canteens, (c) identify critical control points and (d) suggest appropriate preventive measures. However, having found that foods are prepared outside by private contractors, the investigation was expanded to assess foods at the source of preparation. The study emphasised both the operation within each canteen and food preparation sites and the physical structure of the canteens that might interfere with the safety of foods, with greater emphasis on operation and handling.

Schools were stratified by sex and level of education. Sixteen schools were selected randomly from the lists by systematic method of sampling. HACCP were conducted in sixteen school canteens and six food preparation sites which supply foods to the schools. School canteens and places for food preparation were evaluated in details through observation and a checklist prepared in advance particularly for this purpose. Cooking temperatures were measured in one shop only. Cooking temperatures in other sites were not measured because foods were prepared in a similar manner. It is not a practice to eat raw foods or half cooked foods of animal origin in Bahrain thus deep frying and cooking of foods are used. Holding temperatures were measured of all foods in all canteens and food preparation sites at different intervals (2, 4, 6, and 8 hours after cooking). Air temperatures were also recorded using a digital thermometer with 2 separate probes sensors, one for the food and the other for air. The thermometer measures temperatures ranges from  $-30$  to  $+750^{\circ}\text{C}$ . with an accuracy of  $\pm 0.3$  to  $\pm 1.0^{\circ}\text{C}$ . During temperature recording of foods, the probe was placed in the centre of the sandwiches and covered entirely. Students and faculty were interviewed

regarding the quality of foods. Food workers were asked if they had had any training in food hygiene.

Food samples were not collected for the following reasons: cost, time, facilities for storage, transportation at the time of the study.

### **5.5. Assessment of textbooks and health education materials:**

Content analysis of the textbooks was conducted by the researcher. Evaluation was performed depending on personal judgement criteria set by the researcher's opinion. As the number of textbooks exceeded a thousand, mainly science and home economics textbooks were involved in the assessment. The purpose was to determine if the textbook contained health information related to food hygiene that will ultimately increase the awareness of the students and eventually will empower them.

Assessment of the Textbooks was determined by review of the content. Pictures and illustrations were also assessed for clarity, accuracy of information, and whether or not they are current. Accuracy was determined by the investigator for both the written and the illustration parts.

Since reading level is fundamental for students to comprehend the topics, and whether or not a reading level formula is used during writing processes of the TLMs. This was determined by personal communication with the curriculum specialists in the Directorate of Curriculum.

Readability levels of the materials were subjectively evaluated based on the researcher's judgement. Easiness, difficult vocabularies, long sentences, and technical terminology were focused. Other factors that affect readability were assessed. These factors were: the type of print or font used, the amount of white spaces and the layout of the textbook. These are important issues that affect readability. Lohr et al. (1989) and Mcleod (1991).

Document analysis was conducted to evaluate school and health education teaching and learning materials.

The section of Health Education in the Ministry of Health, Bahrain was approached and asked to provide all the health education materials that are produced locally or those which are purchased from international sources. Ministry of Education was also approached and all the science and home economics textbooks which are taught in Bahraini schools were taken.

Assessment of school textbooks and health education materials were determined by review of the content. Assessment depended on judgement criteria set by professional opinion. The investigator was mainly concerned with the presence of information related to food hygiene and the appropriateness of such information. The reason for evaluating textbooks is because these documents are used in all schools and reach all students.

## **5.6. Procedures for conducting the study:**

### **5.6.1. Gaining access:**

1. A formal letter was forwarded to the director of secondary education, Ministry of Education asking for permission to carry out the study in the schools and to provide with school textbooks. Letters were also forwarded to the directors of intermediate and primary sections asking permission to interview school educators and to assess the canteens. Response were immediate. All directors sent letters to schools informing them about the study and to facilitate and help with completion of the questionnaire. Data collection was done officially with all the supports from the MoE.

2. A letter was forwarded to the Acting Director of Public Health Directorate requesting his permission to carry out the study among health inspectors and health educators. Permission was granted after the research committee in the MoH studied the questionnaire and the aim and ethical issues.

3. The acting head of health education section was approached to permit access to health education materials. All the materials were made available to the researcher.

### **5.6.2. Ethical consideration:**

Information gathered from individual participants was known to the investigator only. Confidentiality and anonymity were assured to the subjects through a cover letter and

personally by the investigator. Data was stored in a personal lap-top computer and back up copies were stored on 3.5 Floppy Diskettes which were kept with the investigator and will be destroyed after completion of the study.

## **5.7. Description of the questionnaire:**

### **5.7.1. Independent variables:**

The first items of the questionnaire addressed the independent variables. The independent variables differed with each group of the respondents. They are demographic characteristics such as age, gender, nationality, type of schools, section in the schools, and occupation. The influence of demographic variables on health promotive behaviour warrants studying (Palank, 1991). The aim was to identify the target group who are in most need for health education and empowerment. Also to determine if there is any significant differences between these groups with respect to their awareness so that they will be targeted in any health promotion activities. It is extremely important that we focus all our attention and energy on the high risk population to ensure we are placing our resources where the greatest need may be.

### **5.7.2. Dependent variables:**

The first section of the dependent variables dealt with causes or why food poisoning occur. This section consisted of ten closed-ended statements and one open ended-statement. The respondents were asked to circle the scale of measurement which

ranged from strongly agree to strongly disagree. The statements covered some facts, beliefs and practices. Item one in this section was a factual statement that food poisoning is caused because of microbes or their toxins. It aimed at assessing the respondents knowledge about the causal agent of food poisoning.

Item two addressed a deep rooted belief that food poisoning occurs because of mixing certain foods in a single meal. This statement assessed the belief about causes of food poisoning. WHO (1988b) highlighted the importance of this information in designing health promotion activities. The belief that certain food stuff must not be mixed arose from the fear of interaction between these food items. This belief is common in the Middle East and the Indian Subcontinent.

The third statement was about supervision. Although supervision of food services establishments is important. However, Bryan (1992) and Ali(1986) suggested that supervision is of no value if the primary cause (critical control points) of foodborne illnesses are not addressed. Supervision alone is a handicapped. It has to be accomplished through HACCP which places more emphasis on the critical points. When proper inspection which is based on scientific basis is done, then it will bear fruit. Irwin et al. (1989) have found association between outbreaks and inspection scores of restaurants. Inspection has to be supported by laws, education, supportive environment and relevant resources.

The fourth item was to identify the opinions of the respondents towards training and whether it affects food poisoning occurrence. Training is crucial to health promotion.



Training of food handlers has shown to be a very important method of foodborne disease control (Hobbs & Roberts, 1993; WHO, 1988b; Bryan, 1992; West, 1992; Woolaway et al., 1986). Training has changed knowledge, which consequently affected the behaviour in food hygiene. Hobbs & Roberts (1993), education reduce incidence of food poisoning.

The fifth and the sixth items in this section were to identify the beliefs of the respondents towards periodic examination and health certification of food handlers. Bryan (1992), Charles (1983), and Hobbs & Roberts (1993) indicated that examination of food handlers are expensive and should not be used as means of controlling foodborne illnesses. Health certificate and medical examination are highly valued by health inspectors. It was aimed to find if respondents associate these two statements with food poisoning.

The seventh item in this question identified knowledge of the community towards insects and their role in contaminating food. Findings suggest that insects such as cockroaches and flies are capable of acquiring and infecting each other and foods, therefore, implicating them as potential risk factors to food (Charles, 1983; Rivault et al., 1993; Kopanic et al., 1994). In Bahrain, cockroaches are a problem. Many people complain of cockroaches. American cockroach is a particular problem during summer, however, German cockroaches are seen all the time around the seasons. Lizards are also common in residential areas of Bahrain. They are more seen during summer and particularly outside the residences, but may find their way inside. Lizards were

reported to be frequent carriers of salmonella because they feed on insects which might carry the microbes on or in their bodies. (Haddock & Nocon, 1993).

The eighth item is about a belief which came from one health inspector in food hygiene section. He believes that food handlers put a cap on their head so that hair do not fall into food. He believes that hair reach the intestine and twist the intestine which may result into blockage of the intestine. This question was included to find if it is a common belief or just an opinion of a single person. Hair which may fall into food during preparation or serving may not constitute an immediate danger, but indicate that the personal hygiene of the workers are poor.

The ninth and tenth question were on external powers. God and other external powers. The purpose is to determine beliefs in this field. Studies reported the effects of some of these powers on people behaviour hence it is essential to identify these factors for health education interventions.

This section was concluded by an open-ended question to assess respondents belief in other causes of food poisoning.

The second section of the questionnaire dealt with cooking, re-heating, cool storage, cross contamination, and storage of foods in deep pans. These are the most important factors related to foodborne hazards in almost all European countries, US, and Canada (Bryan, 1988; Hobbs & Roberts, 1993; West, 1992). These factors could differ

slightly from one country to another. For example one factor might be more important in one country but the second important in another country.

WHO (1988b) and Bryan (1992) argued that we should rely on similar data from other countries when data in our own country is unavailable. Bryan (1992) noted that in many developing countries, information is not available, and when available, such information may be scanty and unreliable.

The scale of measurement in this section differed from the rest. The respondent were asked to circle a four-point scale of measurement. It consisted of good practice, neutral, bad practice, and do not know.

The third section was designed to assess respondents knowledge, beliefs and opinions towards poisoning, contamination and survival of microbes.

Items one and two are based on the principles of the Health Belief Model (HBM) (Becker, 1974; Becker & Maiman, 1975). Items one is designed to identify the respondents perceived opinions towards the susceptible age group. The second item is to identify their perceived opinions towards reducing such hazard. Both items are important parts of health promotion according to the HBM.

Items three, four, five, and six dealt with contamination. The rationale behind these was to assess respondents' knowledge of sources of contamination and risky foods. Studies have shown that raw foods of animal origin are often contaminated at the

source (Hobbs & Roberts, 1993), (Bryan, 1981a) and (Adams & Mead, 1983). More contamination occur during processing and handling (Hobbs & Roberts, 1993; Bryan, 1981a, Adams & Mead, 1983; Rigby et al., 1982). Research also have shown many outbreaks as a result of contaminated eggs which are consumed without adequate cooking. Raw milk also pose risk to our health. There are beliefs that raw eggs and raw milk make you stronger and healthier.

The fourth section of the questionnaire dealt with the sources of the microbes. The purpose of this section was to identify the knowledge, and beliefs of the respondents in the major sources of microbes which contaminate foods. Studies reported that food handlers (Kobayashi et al., 1991), raw foods (Hopkins & Scott, 1983; Brackett & Beuchat, 1992; Wood et al., 1992), cooked foods, and the environment (Dawkins et al., 1984) are sources of food pathogens. An open-ended question was given at the end of this part to generate responses on possible sources of microbes as seen by the respondents.

The fifth section was designed to gather information on the beliefs of respondents towards certain control measures. Item one assessed respondents belief towards importance of surprise inspection of food stores, item two measured respondents belief towards enforcement of laws and regulation in food hygiene. Item three and four dealt with punishing of food handlers and closing down of premises. the aim was to determine the subject's belief. Luby et al. (1993) showed that penalising restaurants was not successful in preventing outbreaks. Items five and sixth addressed education of food handlers and the community. Education were found to be the most effective

approach of changing behaviour if it is supported by other supportive policies and resources. This section was ended by an open-ended question to elicit respondents beliefs towards control measures.

The sixth section of the dependent variables was on community participation in food safety. Human and institutional questions were included. Community participation in food safety is an essential element in prevention of foodborne diseases (WHO, 1991e; Ewles & Simnett, 1992). Returning to WHO (1991e), community involvement in the promotion of food safety help the community learn the most important causes and factors contributing to food poisoning; also help people act individually or collectively to insure safe foods. Moreover, WHO (1991e) presented more reasons for community involvement. Firstly, participation itself contributes to the learning experiences of the subjects. Secondly, the more people participate in a programme the more likely to be motivated and influenced by it. Thirdly, participation increases the likelihood that the programme is relevant to the needs of the community, i.e. reflecting important perception, beliefs, habits, customs, policies, and quality control. Fourthly, involvement leads to mobilising of relevant covered resources and contributes to sustained efforts.

The purpose was to determine which group of the respondents will be more happy with. The community must decide for themselves and should participate in selecting the groups whom they feel more comfortable with.

The open-ended questions concluded the questionnaire. The first one was to elicit respondent's felt needs of health subjects to include in future health education programmes. Ewles & Simnett (1992) highlighted the importance of identifying felt needs when designing a health promotion programme.

The second open-ended question intended to identify the perceived barriers which might interfere with health promotion activities if implemented in schools.

The last open-ended question was a general question for the respondents asking them for their suggestions. It is an essential element of empowerment to listen to the target community and involve them in any step of health promotion programmes.

The rationale behind selection of these dependent variables was based on many research outcomes reporting the importance of community participation their belief, attitudes and knowledge. It is extremely essential to involve the community in all the process of health promotion so as to secure their participation afterwards and to motivate them and give the feeling that it is their programme which came from them. Questionnaire for all groups are shown in (Appendices 1, 2, 3, and 4).

#### **5.8. Pilot, validity, and reliability of the study:**

All questionnaires were pre-tested to uncover any flaws, confusions or any other problems. The first pilot study revealed that the questionnaire was too long - nine pages- require long time to finish which might negatively influence the response rate.

and the language in some questions was difficult because of the presence of some technical terms hence difficult vocabularies were omitted and substituted by simpler words. A second pilot study was conducted. The questionnaire consisted of six pages. As a result of this test, three questions were reworded, one question's format was changed and transitions were removed.

In writing the questionnaire, and the canteen evaluation form, the findings of epidemiological studies were incorporated into the research instruments. Moreover, the content validation of questionnaire and canteen evaluation form carried out through feedback provided by the supervisor. The validity of the questionnaire was secured through pilot studies and consultation of the target groups and experts in the field. Target groups were asked to give comments on all the questions and help in modification of the questionnaire to make it clear, measure what it is intended to measure. The pilot studies also included discussion of the questionnaire with the target group and with the curriculum designers and textbooks writers in Bahrain. Their feedback were incorporated into the questionnaire. several questions were modified, some questions were difficult thus simpler words were used and clarification were given to some other questions. Furthermore, few questions were omitted and also the scale was modified by omitting 'Not Applicable' because it was confusing. The questionnaire was also reviewed by top level academic research professionals in the University of Warwick and University of Liverpool.

Because this study will measure knowledge, and beliefs, there is a need to ensure that the tools are reliable. To secure reliability, the participants were requested to check

the true responses. This was stressed with every participant. Moreover, to avoid any error which might occur because of different observation from several raters and observers, only the investigator was involved in data gathering, rating and data entry thus securing constant rating and coding all the way through out the study.

#### **5.9. Further contacts with schools:**

Following the study, many schools showed interest in food safety and requested feedback and information on food poisoning through presentations and lectures. Two schools were given short presentations. This was done after all the data gathering was completed. One school was given a series of slides on food poisoning. Feedback and information were also given to the focus groups after completion of the interviews.

#### **5.10. Limitations and difficulties:**

Although there are common problems which face investigators when conducting surveys particularly when dealing with very young, adolescents and elderly. Kann et al. (1989) however, reported several problems which can cause difficulties in conducting a survey research. They are: cost of the survey, determining appropriate sampling frames, obtaining administrative and subjects consent and developing items for the survey.

With the current investigation, the only encountered problem was identifying items for the survey. The author has examined several questionnaires which were previously used by Manning & Snider (1993), Burch & Sawyer (1991) and also suggestions given



by Jolly (1989). None of the questionnaire and the items were found to be relevant. This part of the research was a challenge to the investigator. The researcher had to develop his own instrument after consulting epidemiological and HACCP findings, and personal experience. Assistance were given by the target groups themselves, supervisor, and subject experts.

The investigator did not encounter any difficulties during data gathering. All administrative and the subjects were extremely helpful, and sincere in both the MoH and the MoE. This has helped in increasing the response rate.

The results of this study could slightly be limited because the sample included only those who could write and read. However, because the majority of the population are literate (over 70%), sampling was not a serious limiting factors.

## CHAPTER SIX

### Chapter 6

## 6. Analysis:

### Overview:

This chapter highlights results of the questionnaires, focus groups, canteens and practices within canteens, and TLMs. The findings were interpreted in light of the PRECEDE, Health Empowerment, and Health Belief (HBM) models.

### 6.1. Results of the questionnaires:

#### 6.1.1. Description of the respondents:

The response rate was extremely high. 96.8% of teachers, 97.5% of students, 64.75% of parents and 95.8% of health promoters. The overall response rate (86.4%) was well above the expectation and provide a strong ground for statistical analysis. Frequency for responses of all the groups are presented in table 6.1. As shown in this table, 329 of the subjects whom completed the questionnaires were teachers, 390 were students, 259 were parents and 69 were health promoters.

Table 6.1. Subjects whom completed the questionnaires.

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Teachers	1	329	31.4	31.4	31.4
Students	2	390	37.2	37.2	68.7
Parents	3	259	24.7	24.7	93.4
Health Promoters	4	69	6.6	6.6	100.0
		-----	-----	-----	
	Total	1047	100.0	100.0	

Tables 6.2 to 6.8 described frequencies for teachers. They included: nationality, sex, age, level of education or degree possessed, type of schools (public or private), occupation, and sections they teach in. Note, Table 6.2 showed that the majority of the teachers were Bahraini (74.5%).

Table 6.2. Nationality of teachers.

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Bahraini	1	245	74.5	74.5	74.5
Non-Bah	2	84	25.5	25.5	100.0
		-----	-----	-----	
	Total	329	100.0	100.0	

Table 6.3 showed the sex distribution of the teachers. Note that males were (53.2%) and females were (46.8%).

Table 6.3. Sex distribution of the teachers.

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Male	1	175	53.2	53.2	53.2
Female	2	154	46.8	46.8	100.0
		-----	-----	-----	
	Total	329	100.0	100.0	

Table 6.4 showed the age distribution for teachers. The majority of the ages ranged from 30 to 40 years (48.9%).

Table 6.4. Age distribution for teachers.

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
< 30	1	71	21.6	21.6	21.6
30 to 40	2	161	48.9	49.1	70.7
41 to 50	3	86	26.1	26.2	97.0
> 50	4	10	3.0	3.0	100.0
	9	1	.3	Missing	
		-----	-----	-----	
	Total	329	100.0	100.0	

Table 6.5 reported the level of education of teachers. It was found that the majority of the subjects were bachelor degree and diploma holders (62.3% and 23.4% respectively).

Table 6.5. Level of education of the teachers.

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Diploma	1	77	23.4	24.3	24.3
Bachelor	2	205	62.3	64.7	89.0
Masters	3	15	4.6	4.7	93.7
Others	5	20	6.1	6.3	100.0
	9	12	3.6	Missing	
		-----	-----	-----	
	Total	329	100.0	100.0	

Table 6.6 indicated that the majority of the subjects were from public schools (93.0%).

Table 6.6. Type of schools the teachers work in.

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Government	1	306	93.0	93.0	93.0
Private	2	23	7.0	7.0	100.0
		-----	-----	-----	
	Total	329	100.0	100.0	

Table 6.7 reported the occupation of the teachers. Teachers, social workers and head masters/mistress were represented in the study. The majority, of course, were teachers (84.2%).

Table 6.7. Occupation of the teachers.

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Teacher	1	277	84.2	85.2	85.2
Social worker	2	13	4.0	4.0	89.2
Headmaster/Mistress	3	35	10.6	10.8	100.0
	9	4	1.2	Missing	
		-----	-----	-----	
	Total	329	100.0	100.0	

Table 6.8 showed that the majority of the subjects were from literary, science and industrial sections (27.7%, 18.8% and 14.6% respectively).

**Table 6.8. The sections at which teachers teach in.**

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Science	1	62	18.8	24.0	24.0
Literary	2	91	27.7	35.3	59.3
Religious	3	5	1.5	1.9	61.2
Commercial	4	22	6.7	8.5	69.8
Industrial	5	48	14.6	18.6	88.4
Others	6	30	9.1	11.6	100.0
	9	71	21.6	Missing	
<b>Total</b>		<b>329</b>	<b>100.0</b>	<b>100.0</b>	

Tables 6.9 to 6.11 showed the frequencies for students. As shown in Table 6.9, females were more than males in the sample (51.8%).

**Table 6.9. Sex distribution of students.**

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Male	1	188	48.2	48.2	48.2
Female	2	202	51.8	51.8	100.0
<b>Total</b>		<b>390</b>	<b>100.0</b>	<b>100.0</b>	

Table 6.10 reported that the vast majority of the subjects were from governmental schools (85.1%).

**Table 6.10. Type of schools students learn in.**

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Government	1	332	85.1	85.1	85.1
Private	2	58	14.9	14.9	100.0
<b>Total</b>		<b>390</b>	<b>100.0</b>	<b>100.0</b>	

Table 6.11 showed that the majority of the students are from science section followed by literary (44.1% and 33.1% respectively).

**Table 6.11. The sections at which students learn.**

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Science	1	172	44.1	44.2	44.2
Literary	2	129	33.1	33.2	77.4
Religious	3	1	.3	.3	77.6
Commercial	4	54	13.8	13.9	91.5
Industrial	5	16	4.1	4.1	95.6
Others	6	17	4.4	4.4	100.0
	9	1	.3	Missing	
<b>Total</b>		<b>390</b>	<b>100.0</b>	<b>100.0</b>	

Tables 6.12 to 6.14 reported frequencies for the parents. As indicated in Table 6.12, the majority of the parents were Bahraini (78.8%).

**Table 6.12. Nationality of parents.**

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Bahraini	1	204	78.8	79.7	79.7
Non-Bah	2	52	20.1	20.3	100.0
	9	3	1.2	Missing	
<b>Total</b>		<b>259</b>	<b>100.0</b>	<b>100.0</b>	

Note that Table 6.13 reported that the majority of the parents were diploma holders (31.3%), followed by primary intermediate level (21.6%), and university degree (13.9%).

Table 6.13. Level of parents education.

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Intermediate	1	56	21.6	23.4	23.4
Secondary	2	30	11.6	12.6	36.0
Diploma	3	81	31.3	33.9	69.9
University	4	36	13.9	15.1	84.9
Others	5	36	13.9	15.1	100.0
	9	20	7.7	Missing	
		-----	-----	-----	
	<b>Total</b>	<b>259</b>	<b>100.0</b>	<b>100.0</b>	

Table 6.14 reported the parent who answered the questionnaires. As shown, most of those who filled the questionnaires were fathers (56.0%).

Table 6.14. Parents response to the question on who completed the questionnaire.

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Father	1	145	56.0	56.9	56.9
Mother	2	61	23.6	23.9	80.8
Both	3	49	18.9	19.2	100.0
	9	4	1.5	Missing	
		-----	-----	-----	
	<b>Total</b>	<b>259</b>	<b>100.0</b>	<b>100.0</b>	

Tables 6.15 to 6.18 are frequencies for the health Promoters. Table 6.15 showed sex distribution. 79.7% of health promoters were males and 15.9% were females.

Table 6.15. Sex of health promoters.

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Male	1	55	79.7	83.3	83.3
Female	2	11	15.9	16.7	100.0
	9	3	4.3	Missing	
		-----	-----	-----	
	<b>Total</b>	<b>69</b>	<b>100.0</b>	<b>100.0</b>	

Note that Table 6.16 showed age distribution of health promoters. The majority of them were between the ages of 30 to 40 years (63.8%).

Table 6.16. Age of health promoters.

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
< 30	1	10	14.5	16.1	16.1
30 to 40	2	44	63.8	71.0	87.1
41 to 50	3	5	7.2	8.1	95.2
> 50	4	3	4.3	4.8	100.0
	9	7	10.1	Missing	
<b>Total</b>		<b>69</b>	<b>100.0</b>	<b>100.0</b>	

Table 6.17 showed that 88.4% of the health promoters were inspectors and 11.6% were supervisors.

Table 6.17. Occupation of health promoters.

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
H. Inspector	1	61	88.4	88.4	88.4
Supervisor	2	8	11.6	11.6	100.0
<b>Total</b>		<b>69</b>	<b>100.0</b>	<b>100.0</b>	

Table 6.18 showed the sections at which health promoters work in. The majority were from environmental health section, food hygiene, and health education (39.1%, 17.4% and 7.2% respectively).

Table 6.18. The sections at which health promoters work in.

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
Comm. Diseases	1	1	1.4	2.2	2.2
Food Hygiene	2	12	17.4	26.1	28.3
Env. Health	3	27	39.1	58.7	87.0
Port Health	4	1	1.4	2.2	89.1
H. education	5	5	7.2	10.9	100.0
	9	23	33.3	Missing	
<b>Total</b>		<b>69</b>	<b>100.0</b>	<b>100.0</b>	



### 6.1.2. How CHAID works:

Figure 6.1. is a CHAID tree diagram which is based on analysis of the responses to a question. Each branch (node) on the tree diagram represents a group. The first branch (root node or parent node) of the tree represent the total sample response. The second node contains the summary statistic of responses. When responses among the groups are statistically different, CHAID makes a new branch (depth 1). This branch may consist of several groups depending on the sample and the type of response (Magidson, 1993). For example, in Figure 6.1., There are two groups in depth 1. CHAID has merged all those who responded in a similar way (statistically indistinguishable) in one group and those who responded differently from the rest (heterogeneous) were placed in another group. The first group node (the one on the left) contains the first characters of the value labels (T=teachers, P=parents, H=health promoters) at the top. Response rates are put at the box below the characters. The box on the right is suppose to contain the response rates for the students (Figure 6.1).

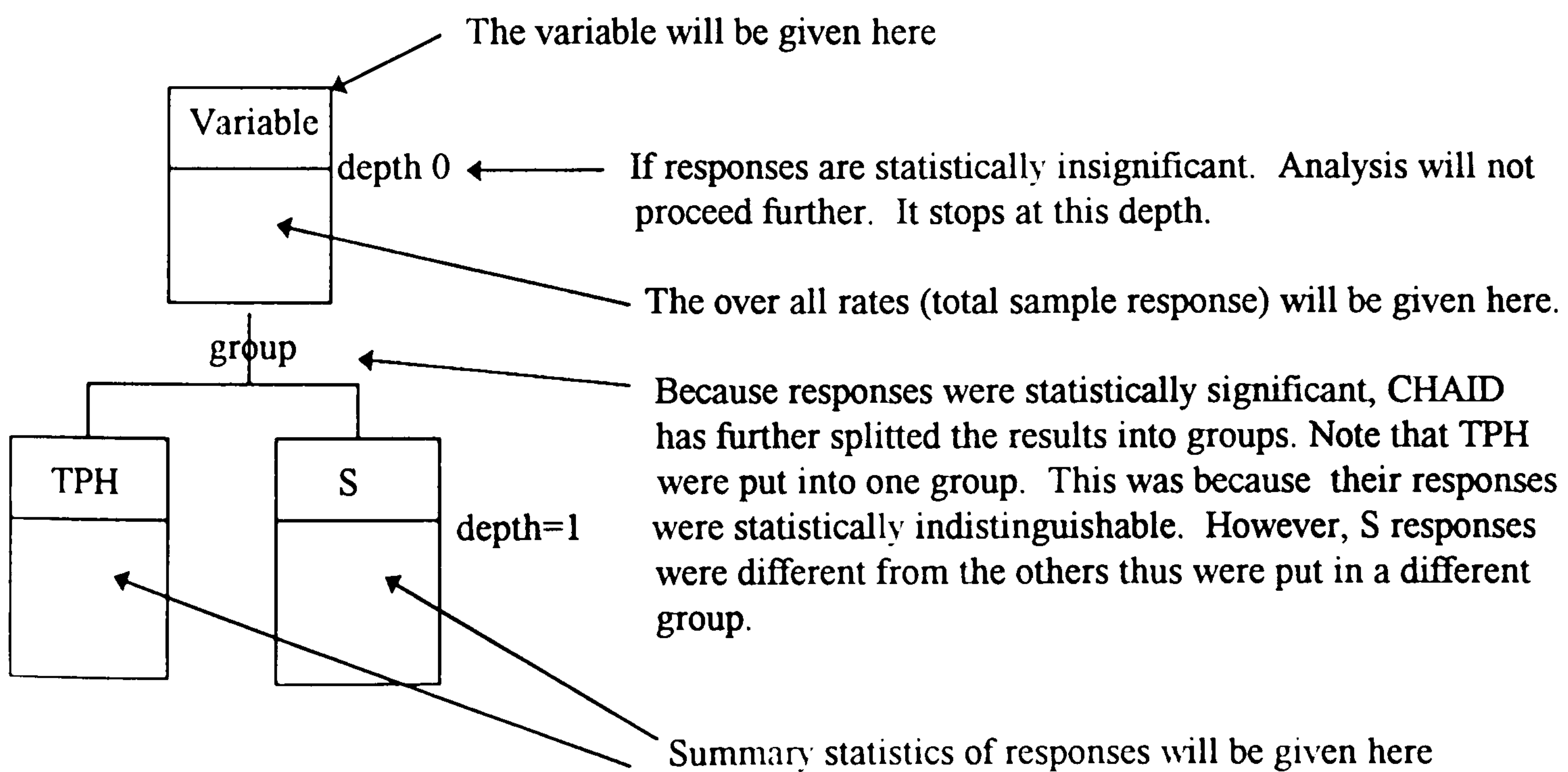


Figure 6.1. Description of CHAIDS analysis.

### 6.1.3. Analysis between the groups:

This section reports the results of CHAID analysis of responses between the groups. To make the findings clear, Questions will be stated at the top followed by tree diagrams, figures and statistics which reflect the answers. The following abbreviations will be used in the figures: T=teachers, S=students, P=parents and H=health promoters

#### A. Causes of foodborne illnesses:

##### Microbes or their toxins are responsible for foodborne illnesses.

CHAID has stopped at depth 0 because there was no statistically significant differences in the responses between the subjects. Figures 6.2 A&B reported that the subjects were informed (91.23% agreed) about what causes foodborne hazards.

Microb
1: 91.23%
2: 3.56%
3: 5.20%
n=1038

depth=0

Figure 6.2 A: Food poisoning occurs because of the presence of microbes or their toxins

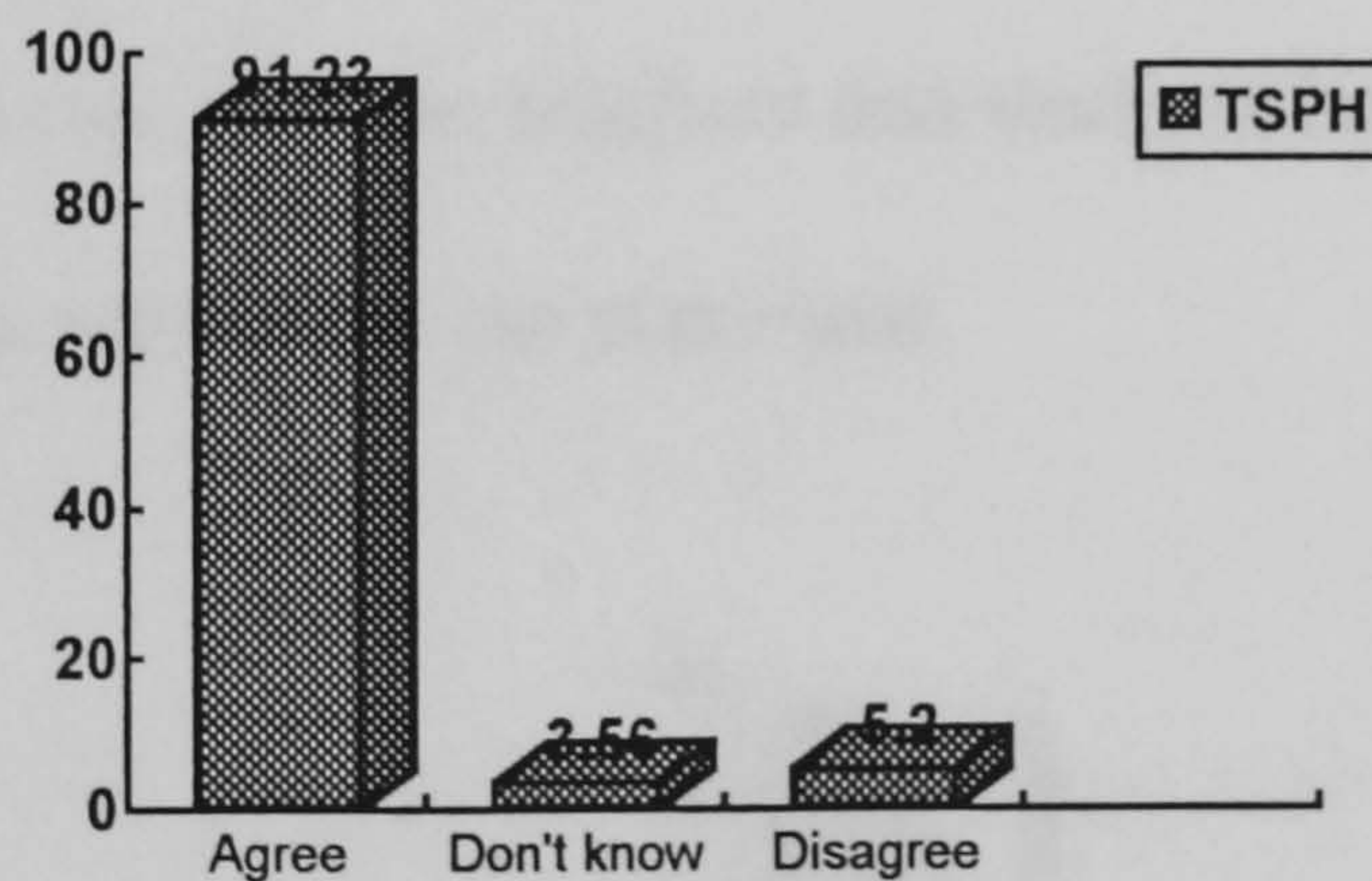


Figure 6.2 B: Food poisoning occurs because of the presence of microbes or their toxins

##### Mixing certain foods at a meal is responsible for foodborne illnesses.

As shown in figures 6.3 A&B, CHAID has split the responses into two depth because there was statistical differences in response between the groups. Note that T and S

responses were statistically indistinguishable whereas P and H each responded differently. H were more likely to disagree (78.79%) compared to P and T and S.

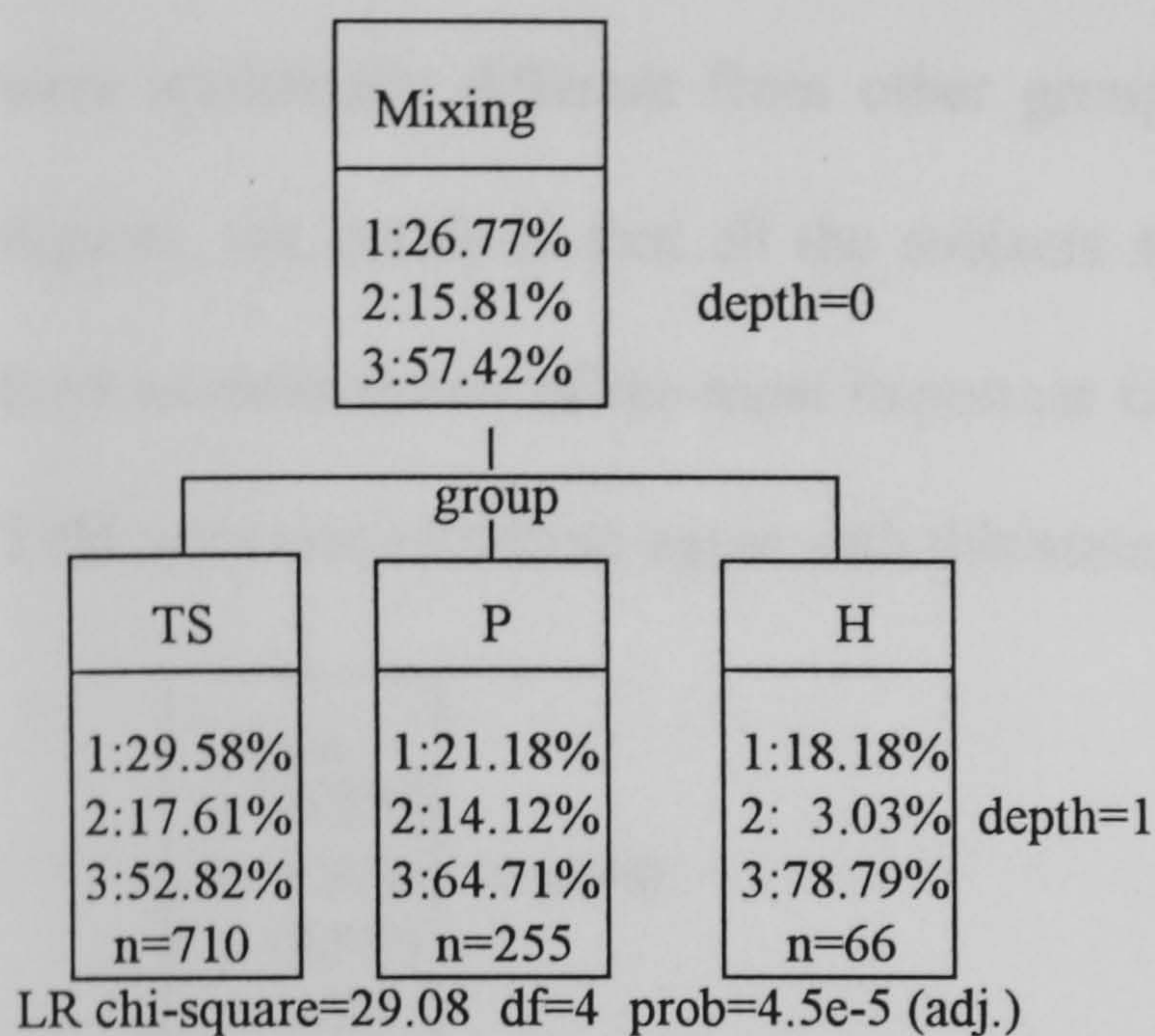


Figure 6.3 A: Mixing certain foods at a meal is responsible for food poisoning

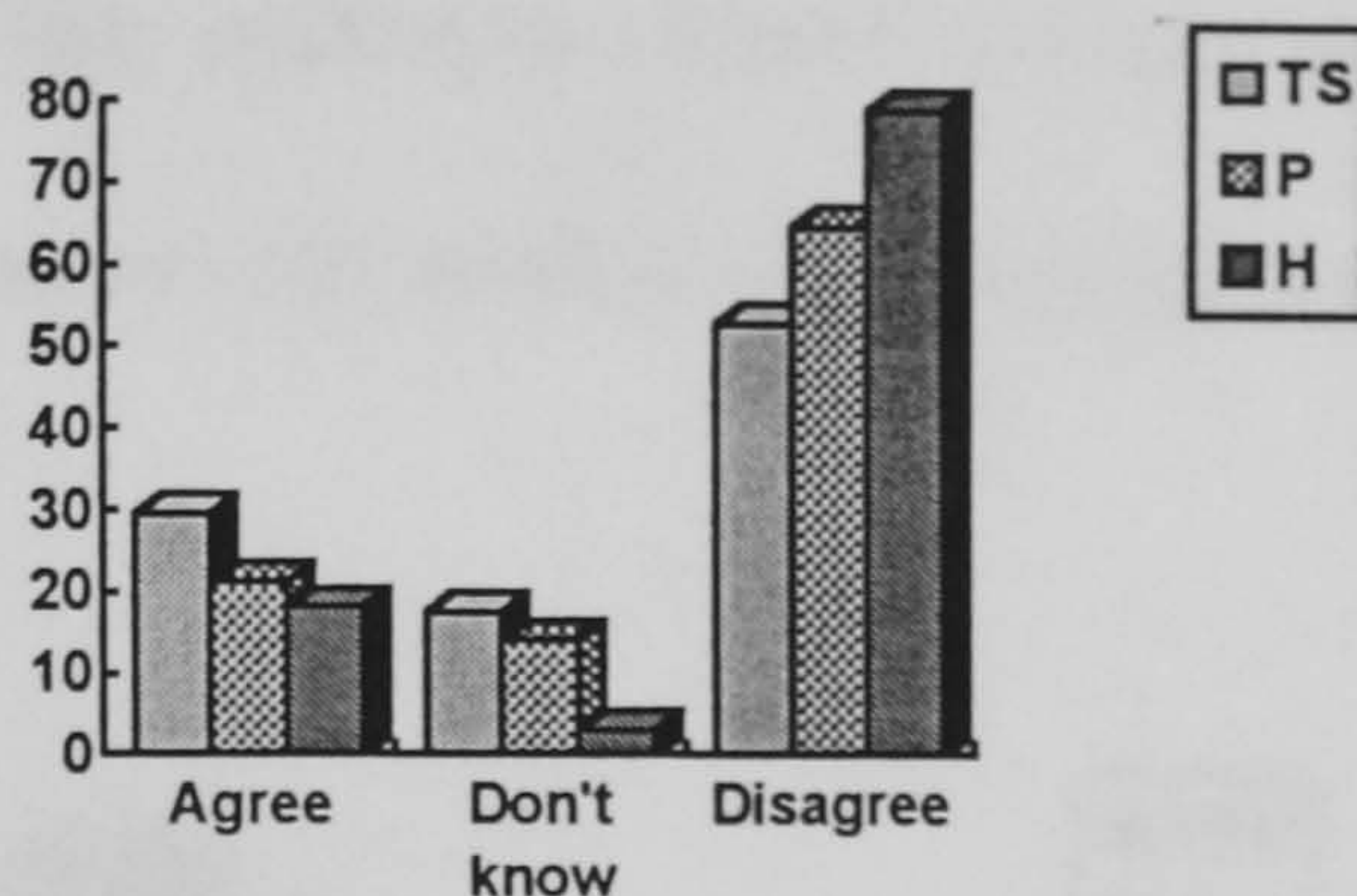


Figure 6.3 B: Mixing certain foods at a meal is responsible for food poisoning.

**Food poisoning occurs because of improper supervision of canteens.**

Figures 6.4 A&B reported statistically significant differences between the subjects. P and H responded at about the same rate whereas teachers and students both responded differently. T were more inclined to agree with the statement.

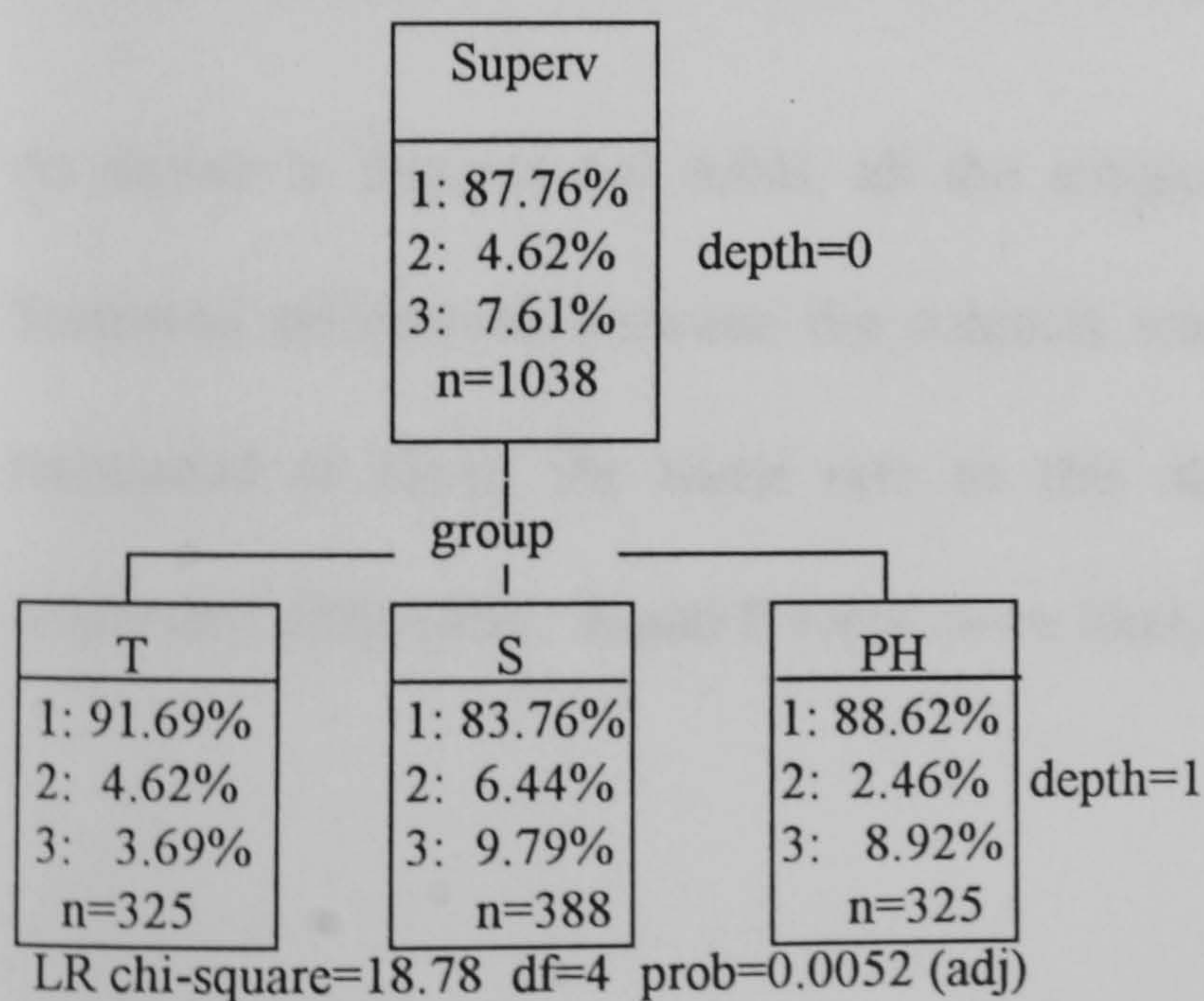


Figure 6.4.A: Food poisoning occurs because of improper supervision of canteens.

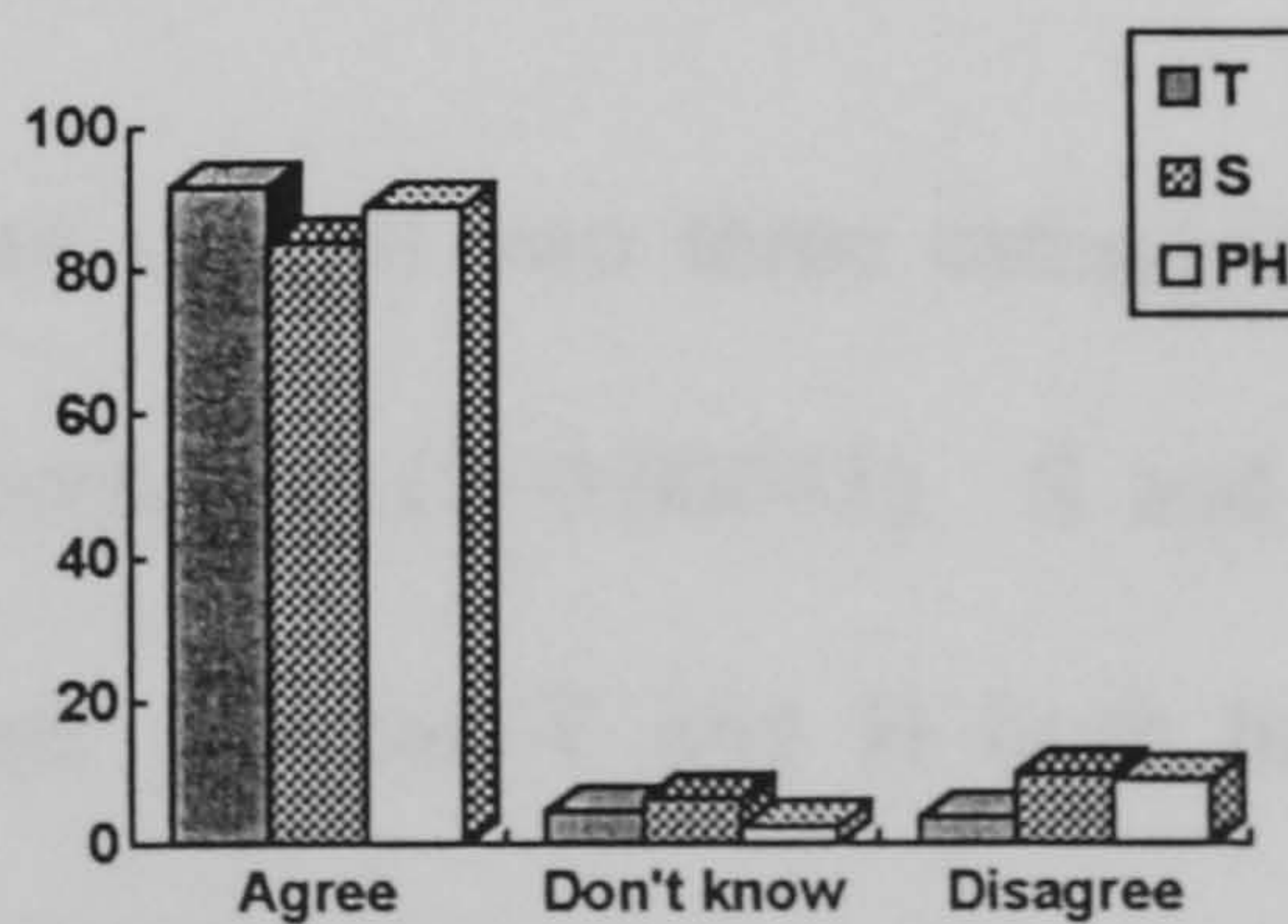


Figure 6.4.B: Food poisoning occurs because of improper supervision of canteens.

**Food poisoning occurs because of inadequate health training of food workers.**

Note that T, P and H had statistically indistinguishable responses whereas S responses were statistically different from other groups (Figures 6.5 A&B). Looking at the Figures, we conclude that all the subjects agreed that inadequate health training of food workers is one of the most important factors associated with food poisoning but TPH were more likely to agree with this statement.

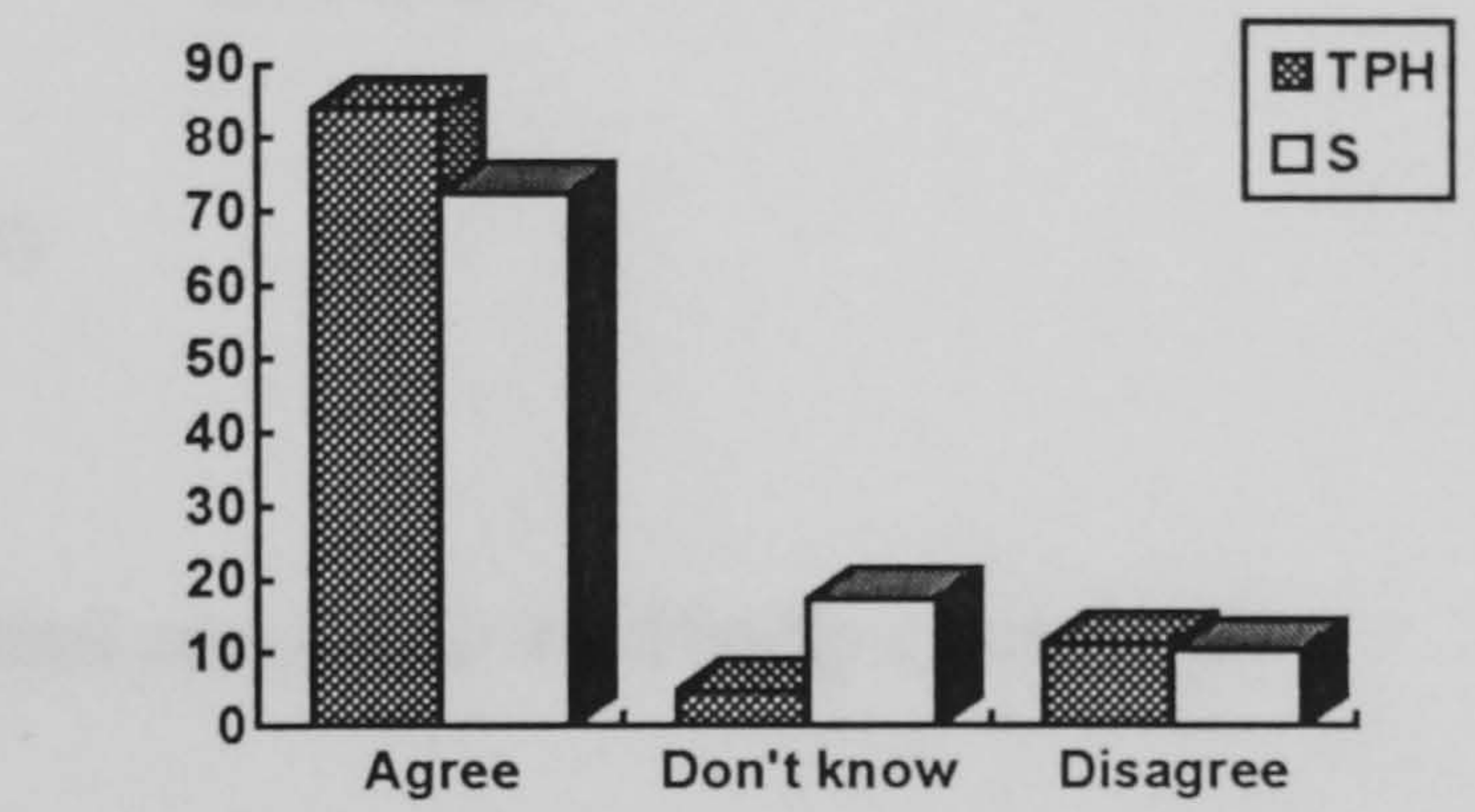
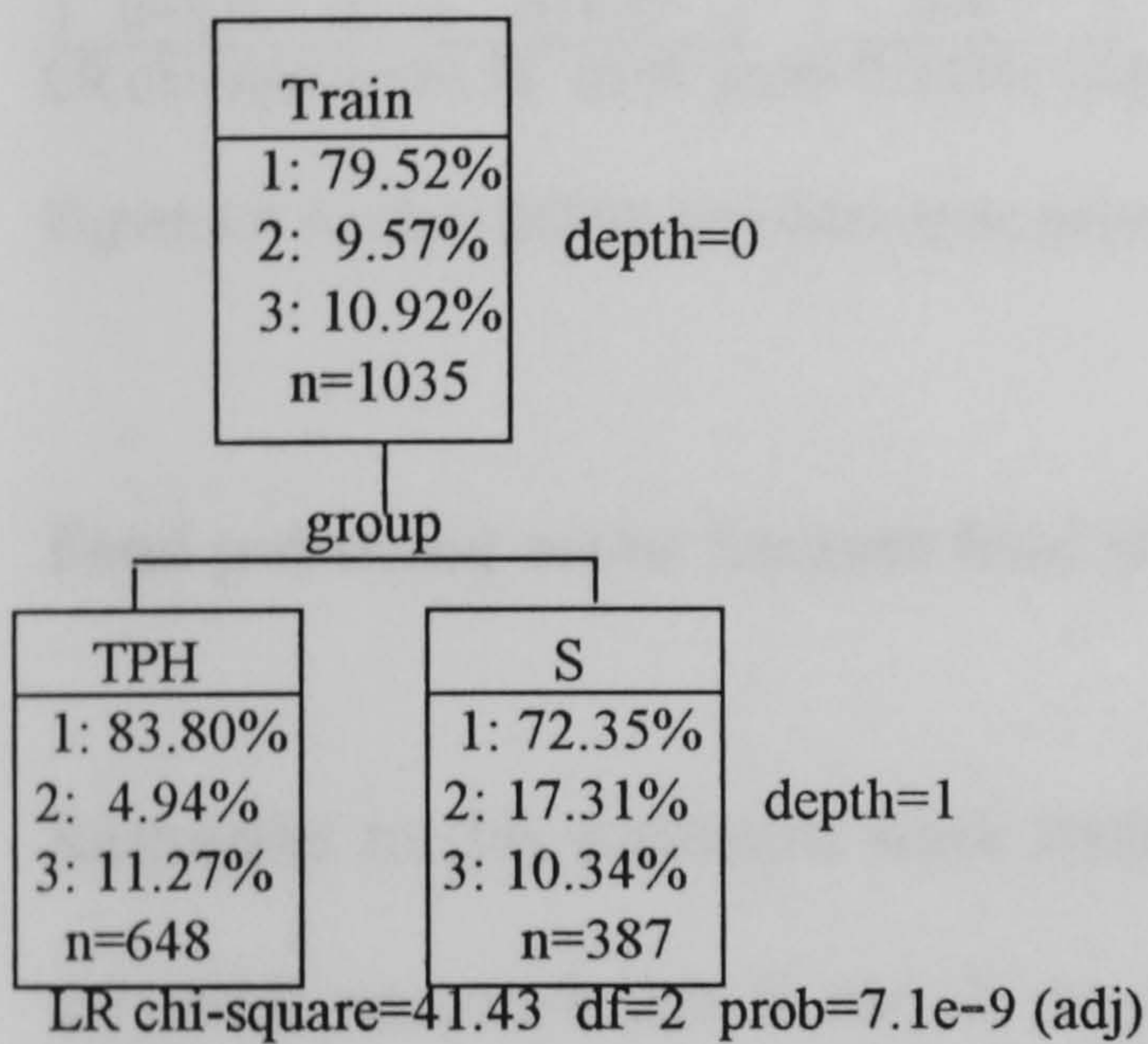


Figure 6. 5 B: Response to inadequate training of food workers

Figure 6.5. A: Response to inadequate training of food workers

**Food poisoning occurs because of hair falling into food.**

As shown in Figures 6.6 A&B, all the subjects were merged into three categories. Statistical differences between the subjects were reported at (P=0.00041). S and P responded at about the same rate to this statement whereas T and H both had responded differently. S and P were more likely agreed with the statement.

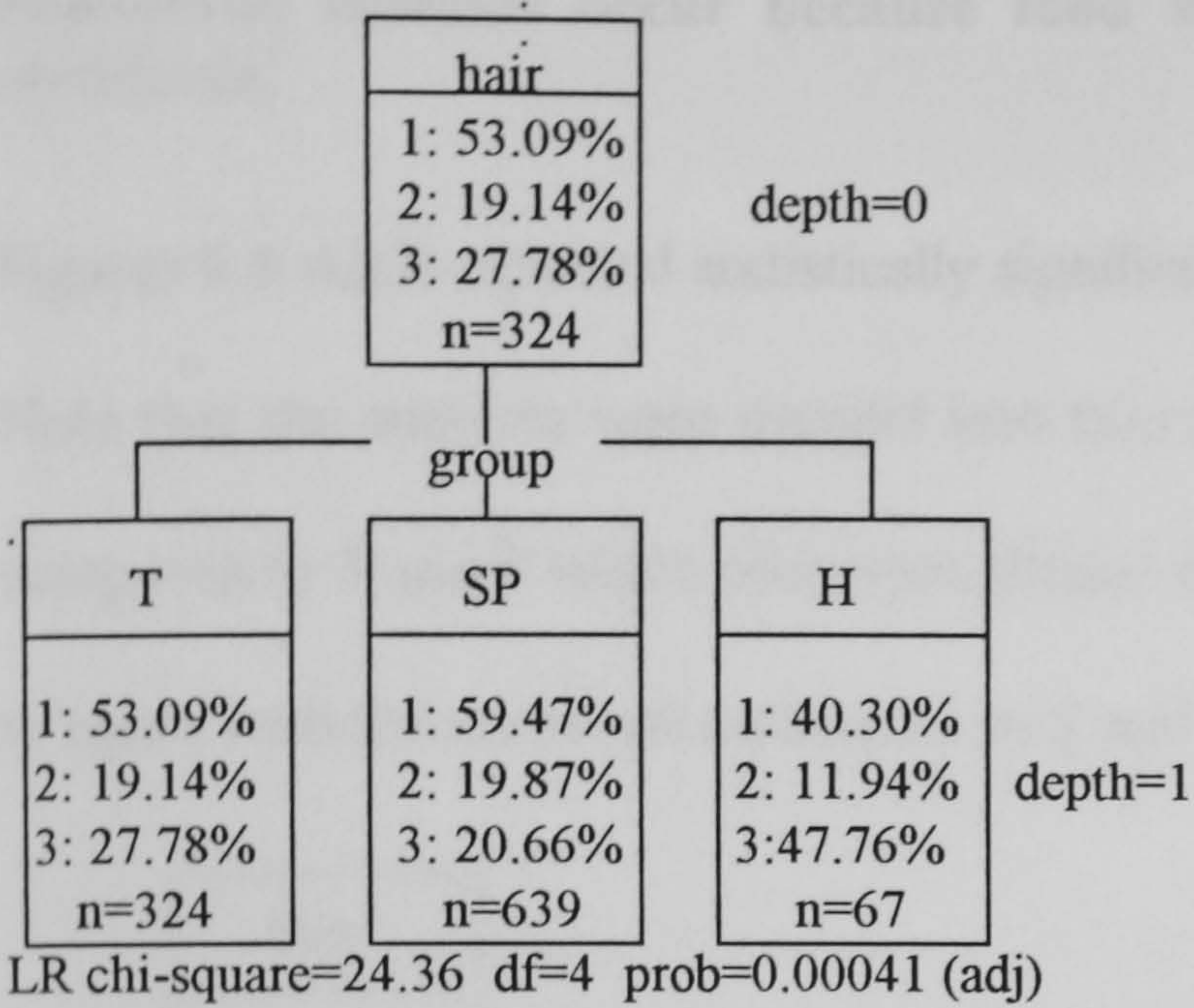


Figure 6.6 A: Hair falling into food cause poisoning.

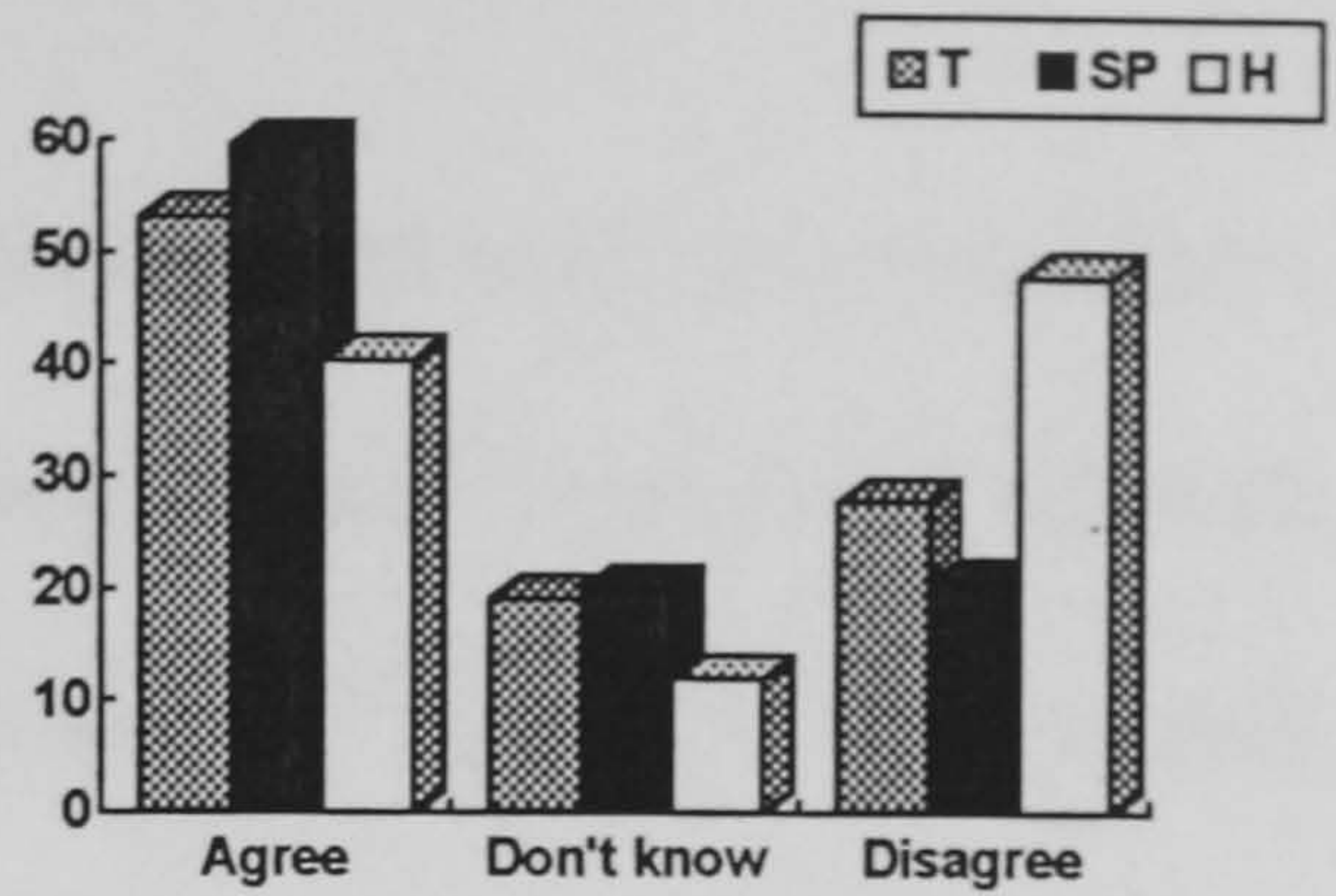


Figure 6.6 B: Hair falling into food cause poisoning.

**Food poisoning occur because food workers are not periodically examined.**

Responses to this statement were statistically different between the groups. Figures 6.7 A&B reported that S and P responded similarly whereas T and H were both different. All the subjects agreed but H were more inclined to agree with the statement.

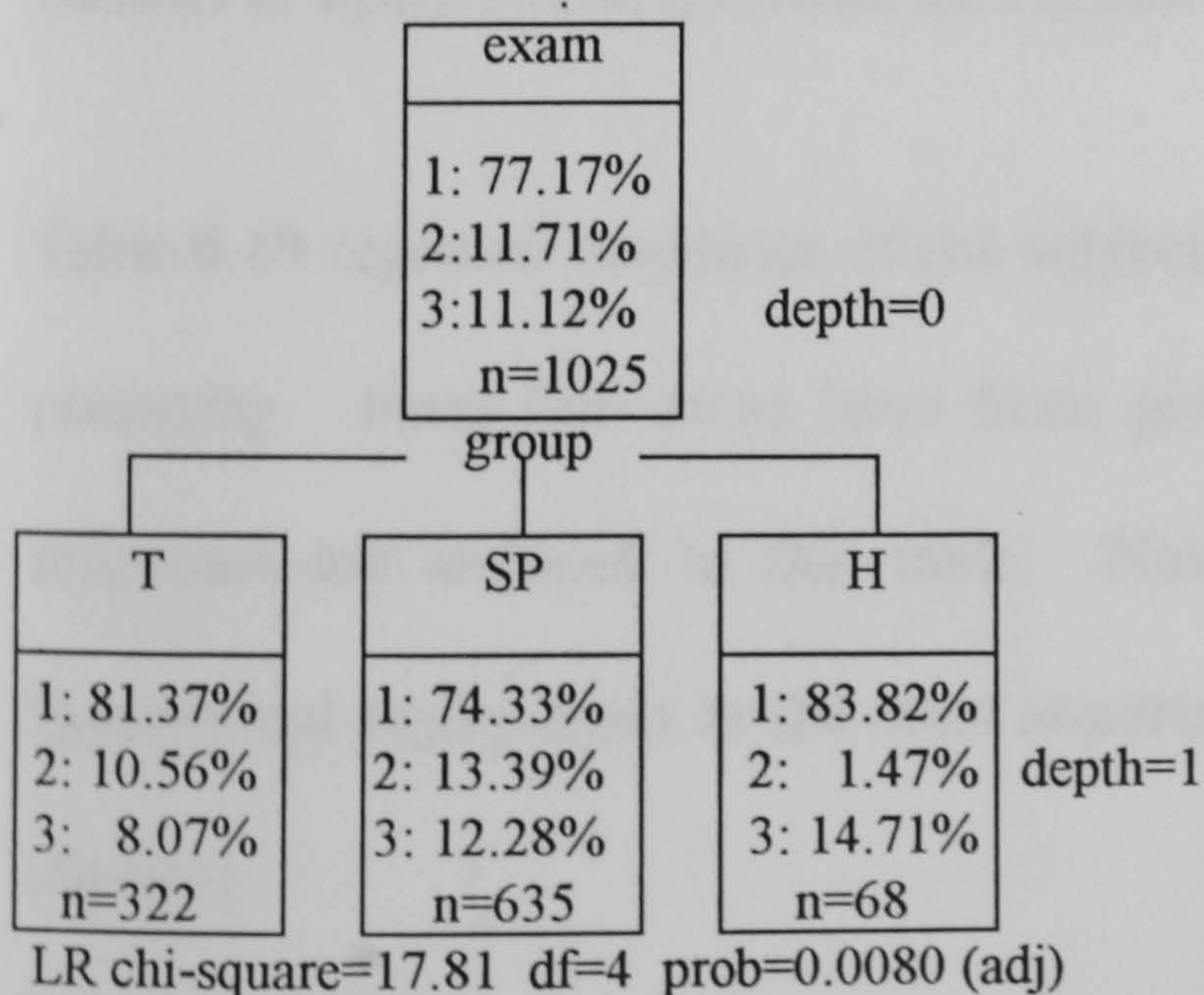


Figure 6.7 A: Food workers are not periodically examined.

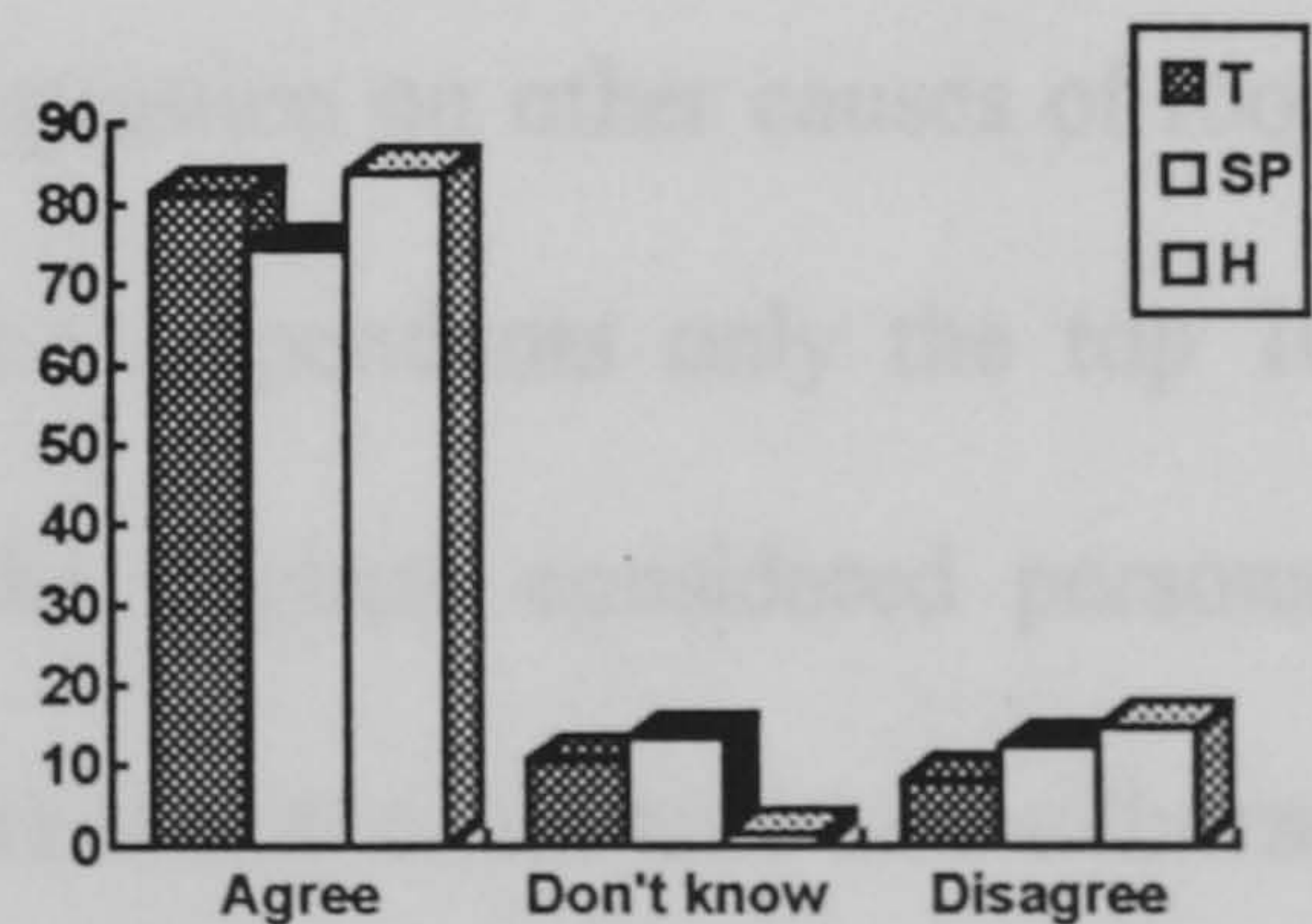


Figure 6.7 B: Food workers are not periodically examined.

**Foodborne illnesses occur because food workers do not have a valid health certificate.**

Figures 6.8 A&B reported statistically significant differences between the respondents.

Note that the subjects were merged into two categories T and H responded similarly compared to S and P whom also were similar to each other. T and H were more likely to agree with the statement compared to S and P.

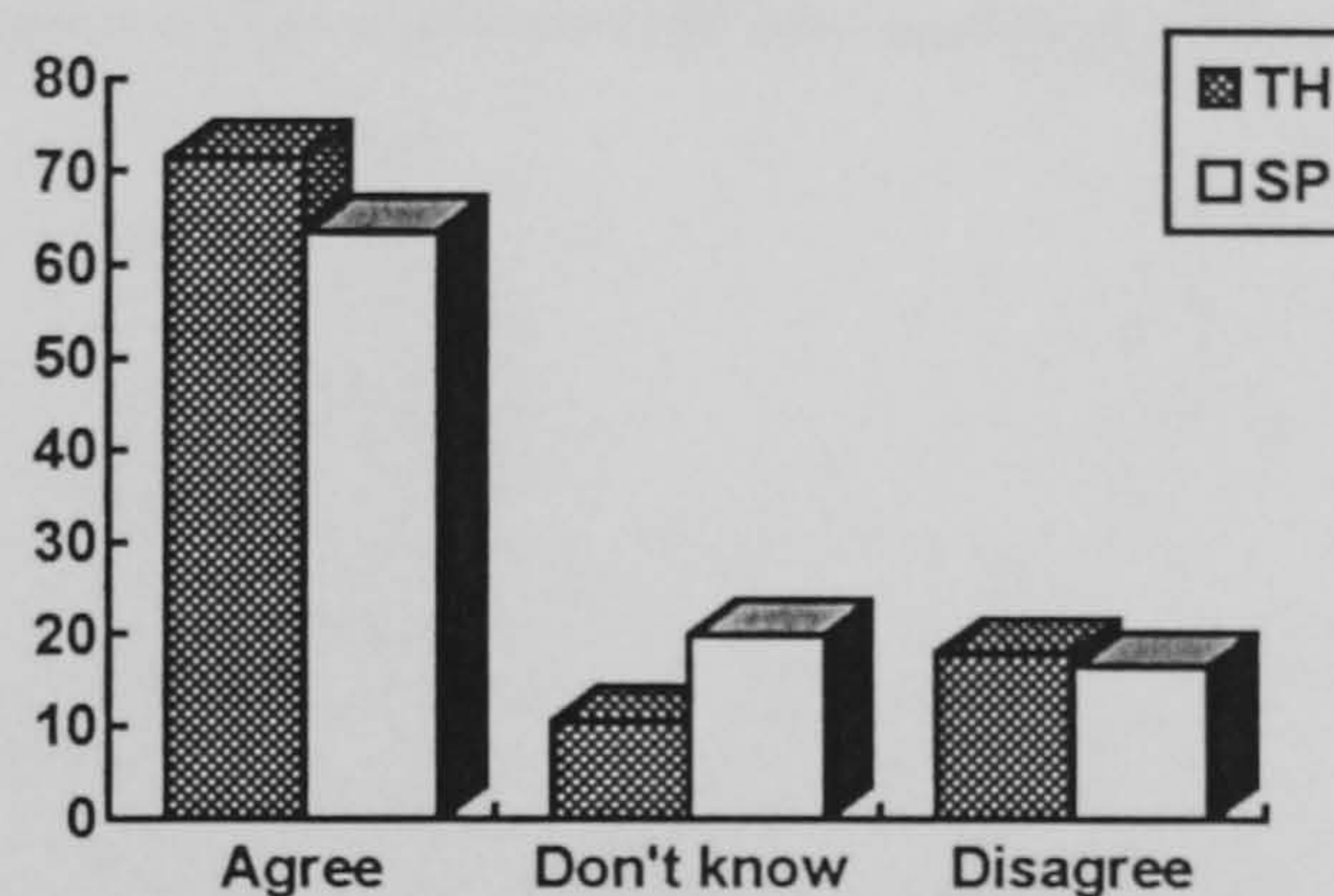
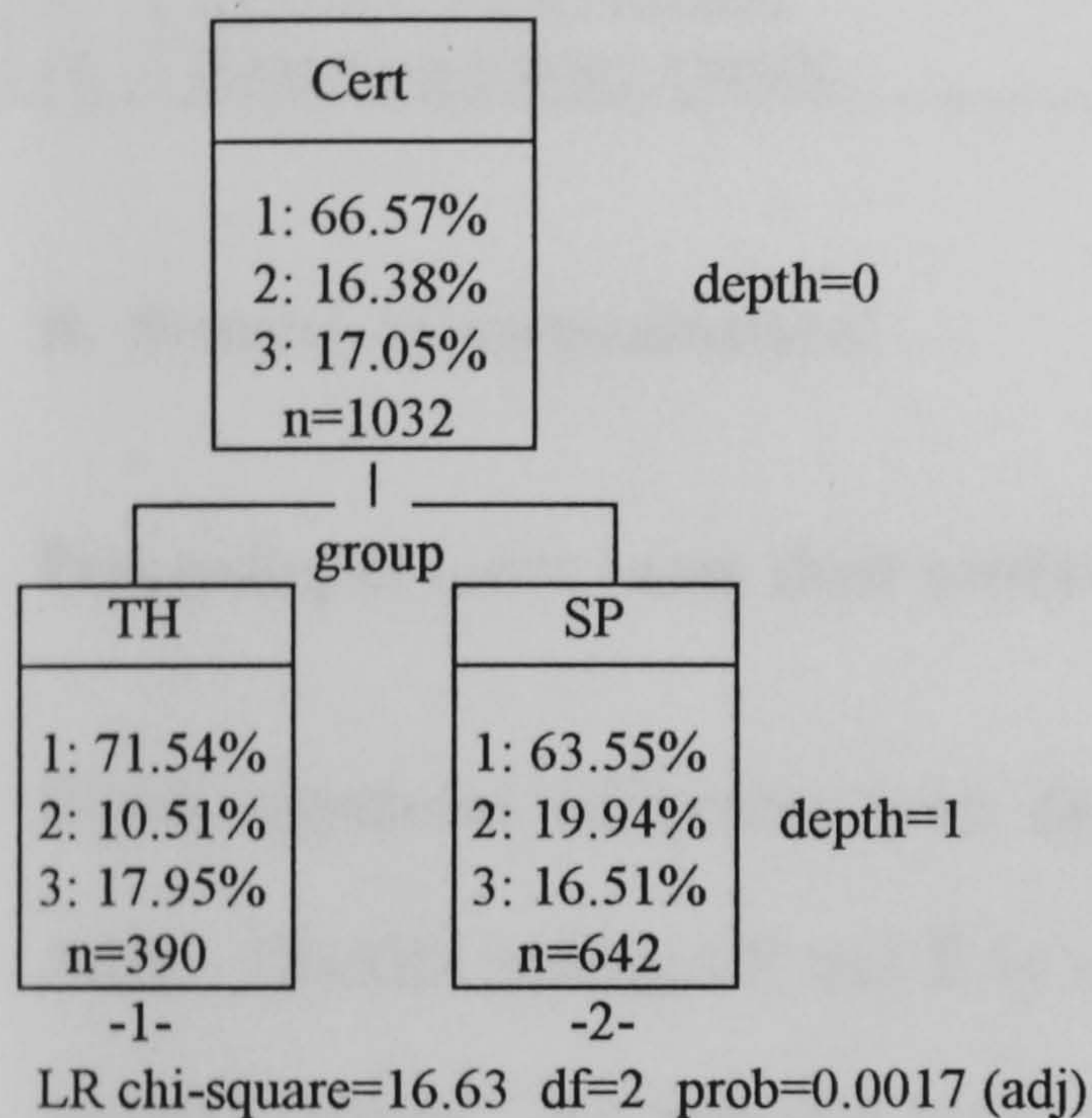


Figure 6.8 B: Food poisoning occurs because food workers do not carry a valid health certificate.

Figure 6.8 A: Food poisoning occurs because food workers do not carry a valid health certificate.

**Results of open-ended question on causes:**

Table 6.19 reported responses of the subjects to the question on other causes of food poisoning. Forty-five items have been given by the respondents only the top 10 responses are included in this table. Note that the subjects considered personal hygiene and expiry dates as the most important factors which could lead to foodborne illnesses.

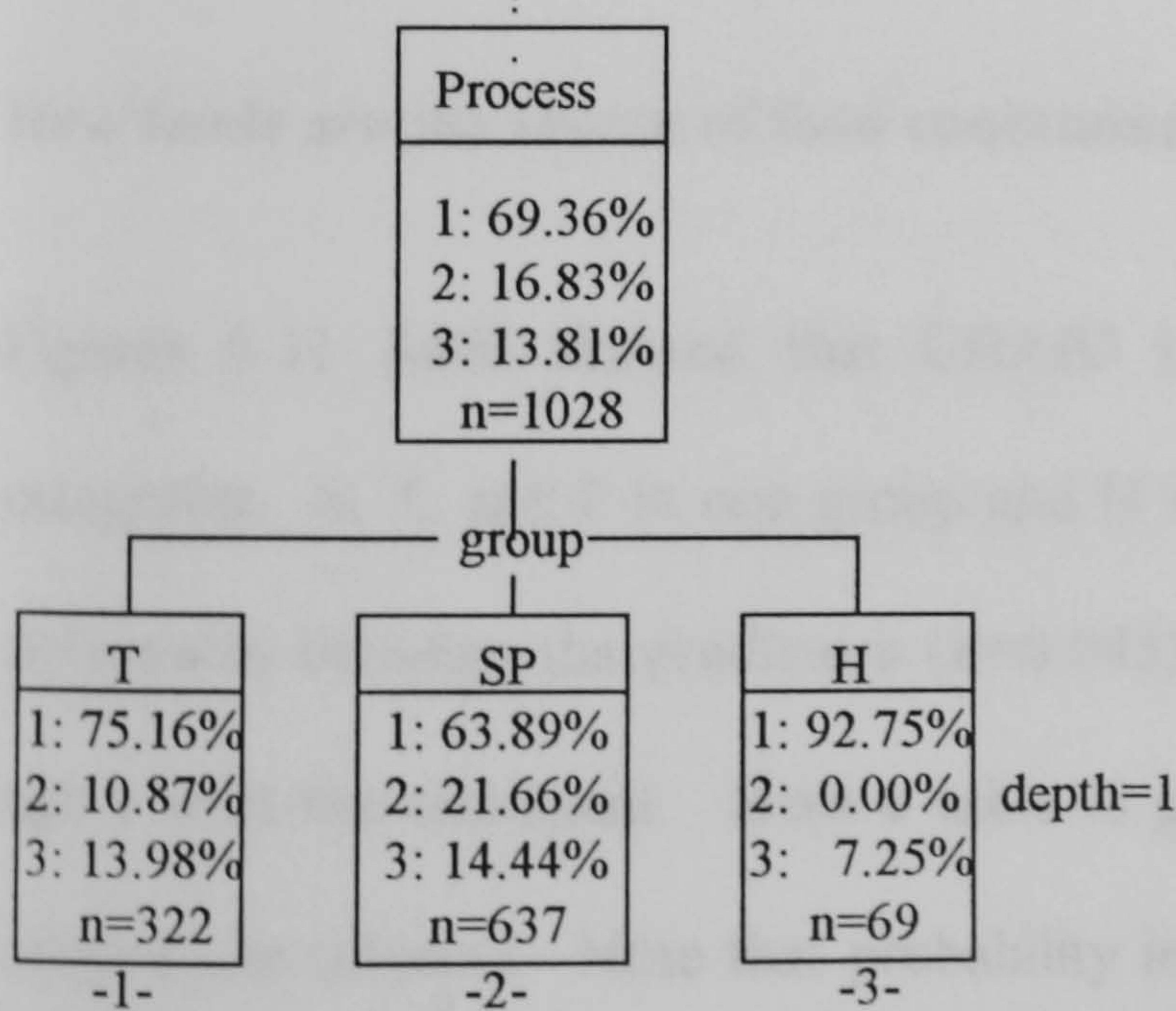
Table 6.19. Responses to the open-ended question on causes of food poisoning.

No.	Responses	Counts	Pct of Responses	Pct of Cases
1.	Personal hygiene	95	25.0	36.3
2.	Foods being expired	40	10.5	15.3
3.	Improper storage of foods for long time	38	10.0	14.5
4.	Carelessness & improper supervision of canteens by food workers	22	5.8	8.4
5.	Un-healthy habits of food workers from the Indian Subcontinent	20	5.3	7.6
6.	Keeping foods uncovered	19	5.0	7.3
7.	Foods being old	16	4.2	6.1
8.	Exposure of food for long time to outer environment	14	3.7	5.3
9.	Ignorance of food workers	13	3.4	5.0
10.	Using contaminated utensils	11	2.9	4.2

**B. Sources of contamination:**

**Processing of foods cause their contamination.**

Highly significant differences were detected ( $P=1.2e-9$ ), as shown in Figures 6.9 A&B. CHAID arranged S and P in one group whereas T and H were put in two separate groups. As expected health promoters were more aware of the cause of contamination whereas teachers were the second.



LR chi-square=51.16 df=4 prob=1.2e-9 (adj)

Figure 6.9 A: Processing of foods cause their contamination.

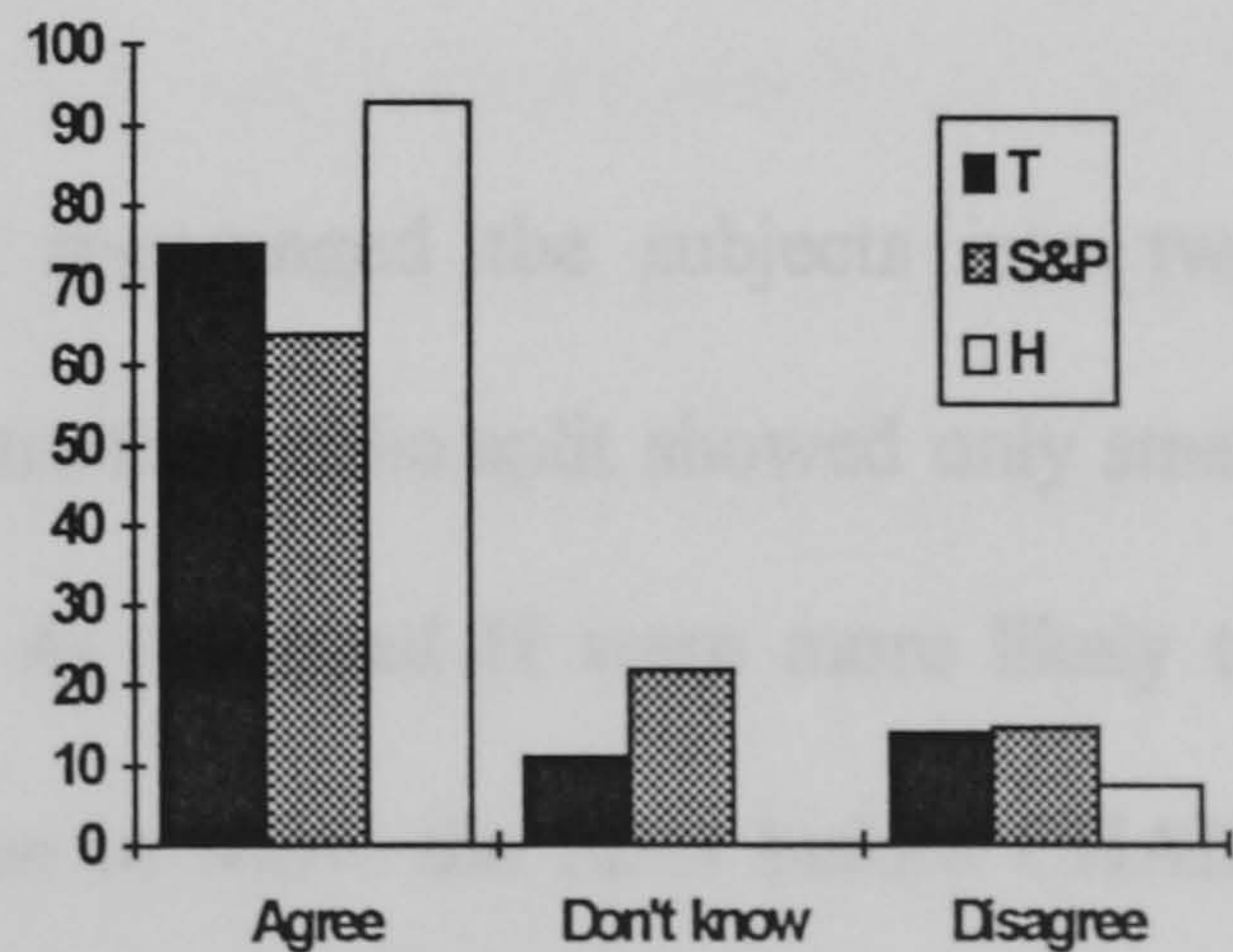


Figure 6.9 B: Processing of foods cause their contamination.

**Food workers are the source of contamination.**

CHAID has merged T and P because their responses were statistically indistinguishable compared to S and H who both had statistically different responses, as shown in figures 6.10 A&B. All agreed with the statement but H were more likely to agree and S were the least.

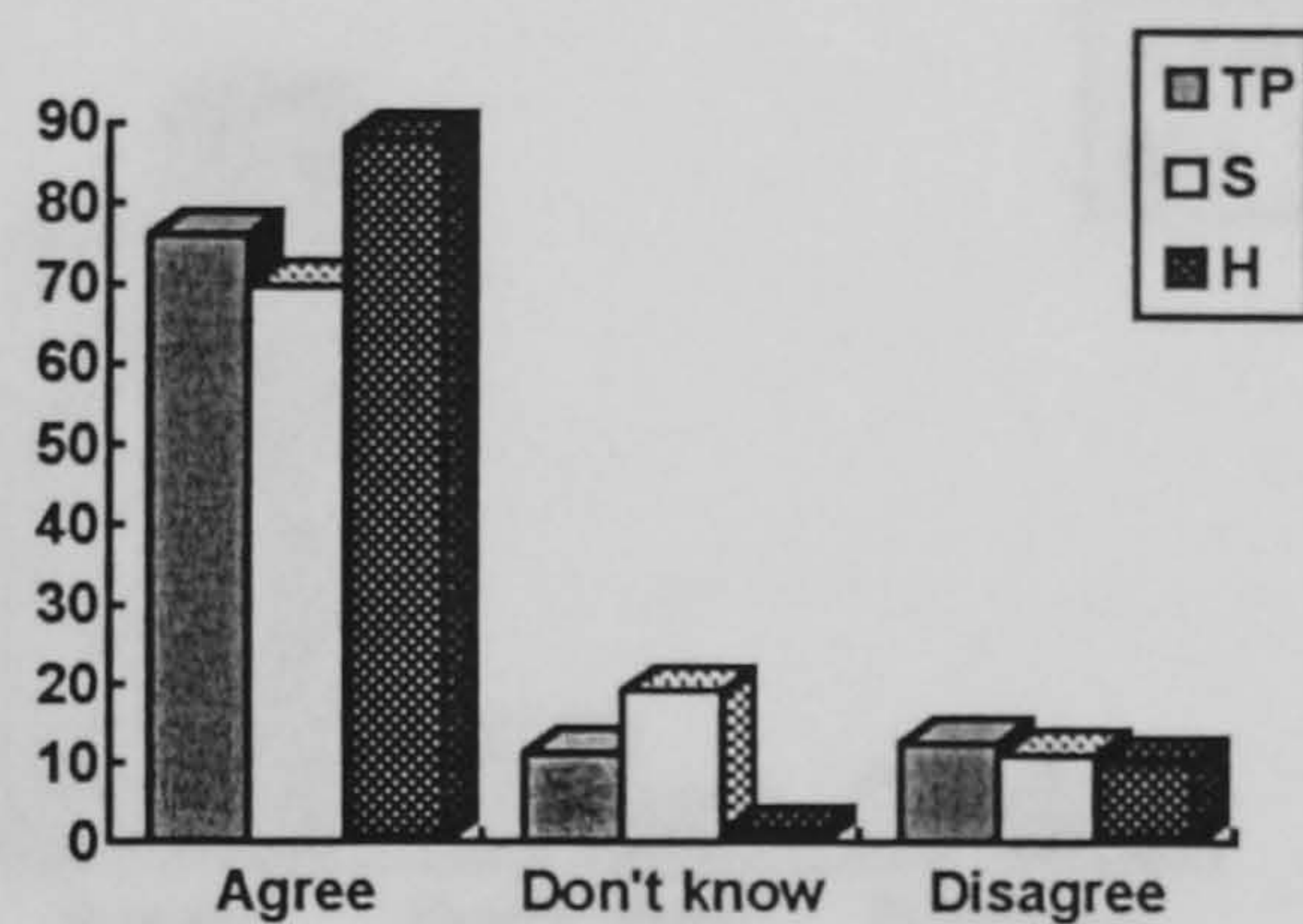
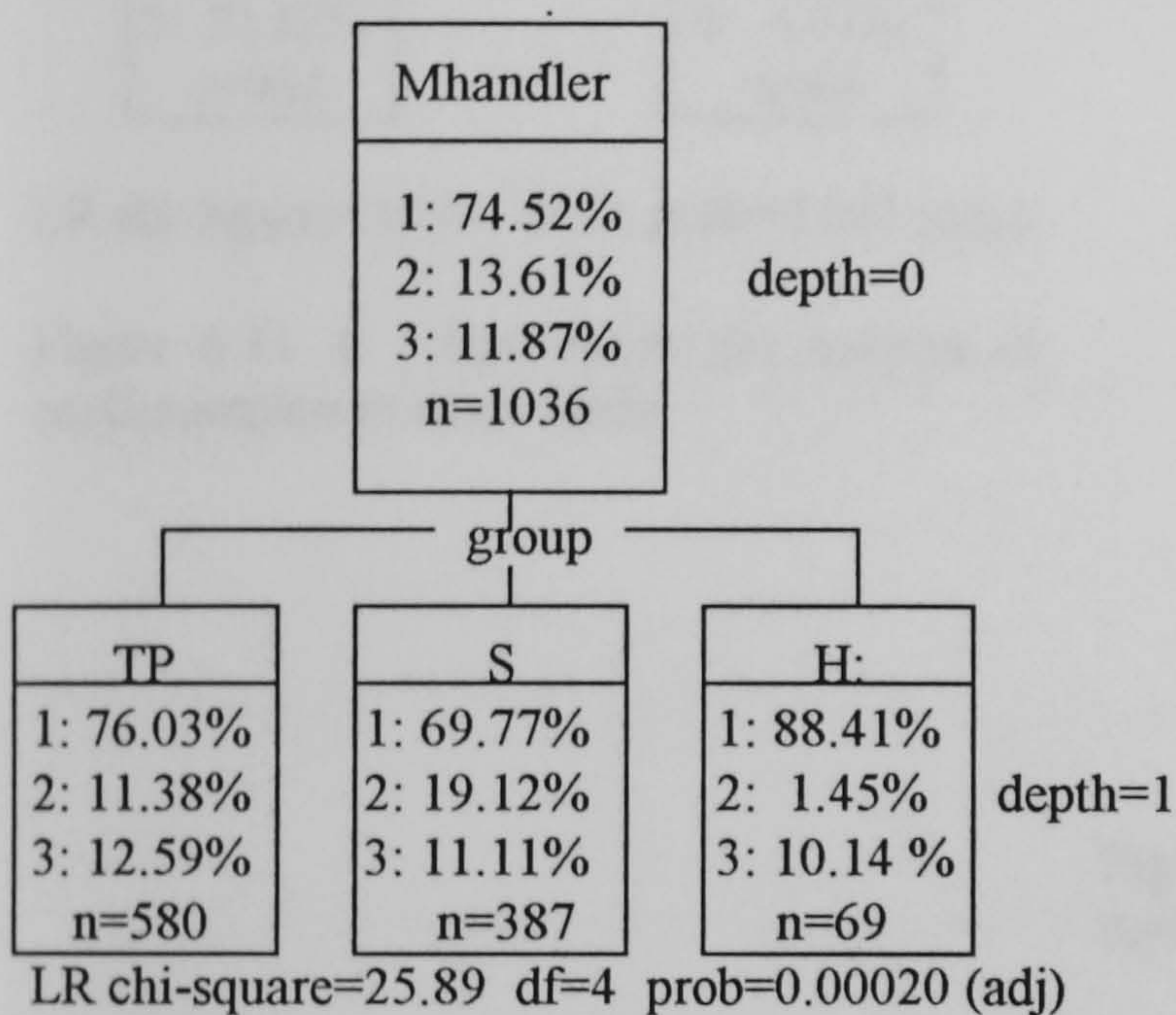


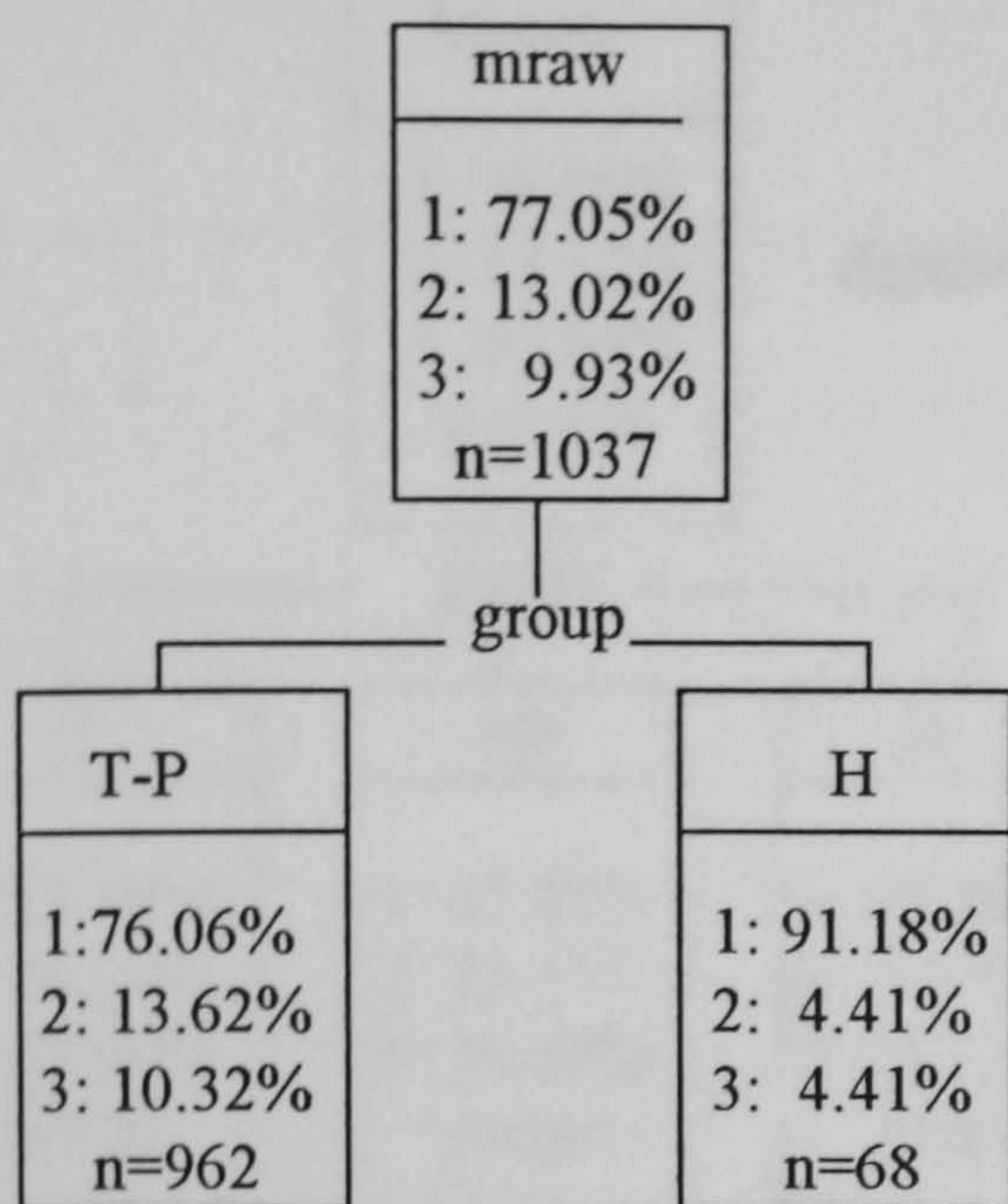
Figure 6.10 B: Food workers are the source of food contamination.

Figure 6.10 A: Food workers are the source of food contamination.

**Raw foods are the source of food contamination.**

Figures 6.11 A&B showed that CHAID has re-arranged the subjects into two categories. S, T, and P in one group and H in another. The split showed only small differences between the predictors (P=0.045). As expected H were more likely to agree with the statement. Here a table is given to show the rates before CHAID merged the subjects. Note that probability in the Table is slightly different from the one in the Figure. The one in the Figure was adjusted by CHAID after merging the subjects.





LR chi-square=10.05 df=2 prob=0.045 (adj.)

Figure 6.11 A : Raw foods are sources of contamination to other foods.

group (before)	Agree	Do not know	Disagree	Total
Teachers	73.37	14.86	11.76	323
Students	76.61	13.62	9.77	389
Parents	78.60	12.06	9.34	257
Health Promoter	91.18	4.41	4.41	68
Total	77.05	13.02	9.93	1037

LR chi-square=12.41 df=6 prob=0.053

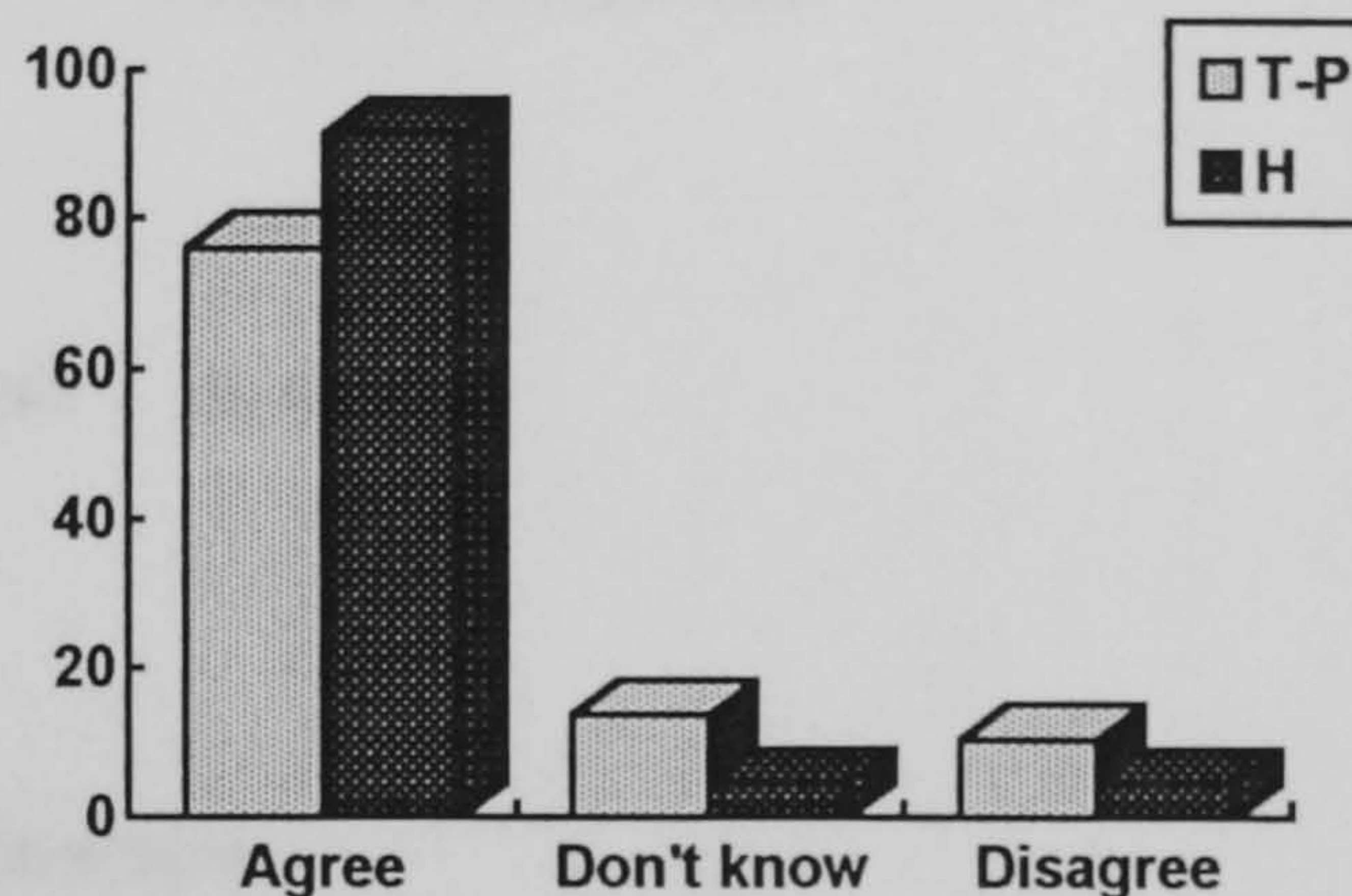


Figure 6.11 B : Raw foods are sources of contamination to other foods.

### Cooked foods are the source of contamination.

As shown in Figures 6.12 A&B, the predictors were re-arranged into three splits. S and P responded at about the same rate, thus put into one group whereas both T and H responded differently thus were put into two separate responses. H were more inclined to agree with the statement compared to S and P whom were less likely to agree.

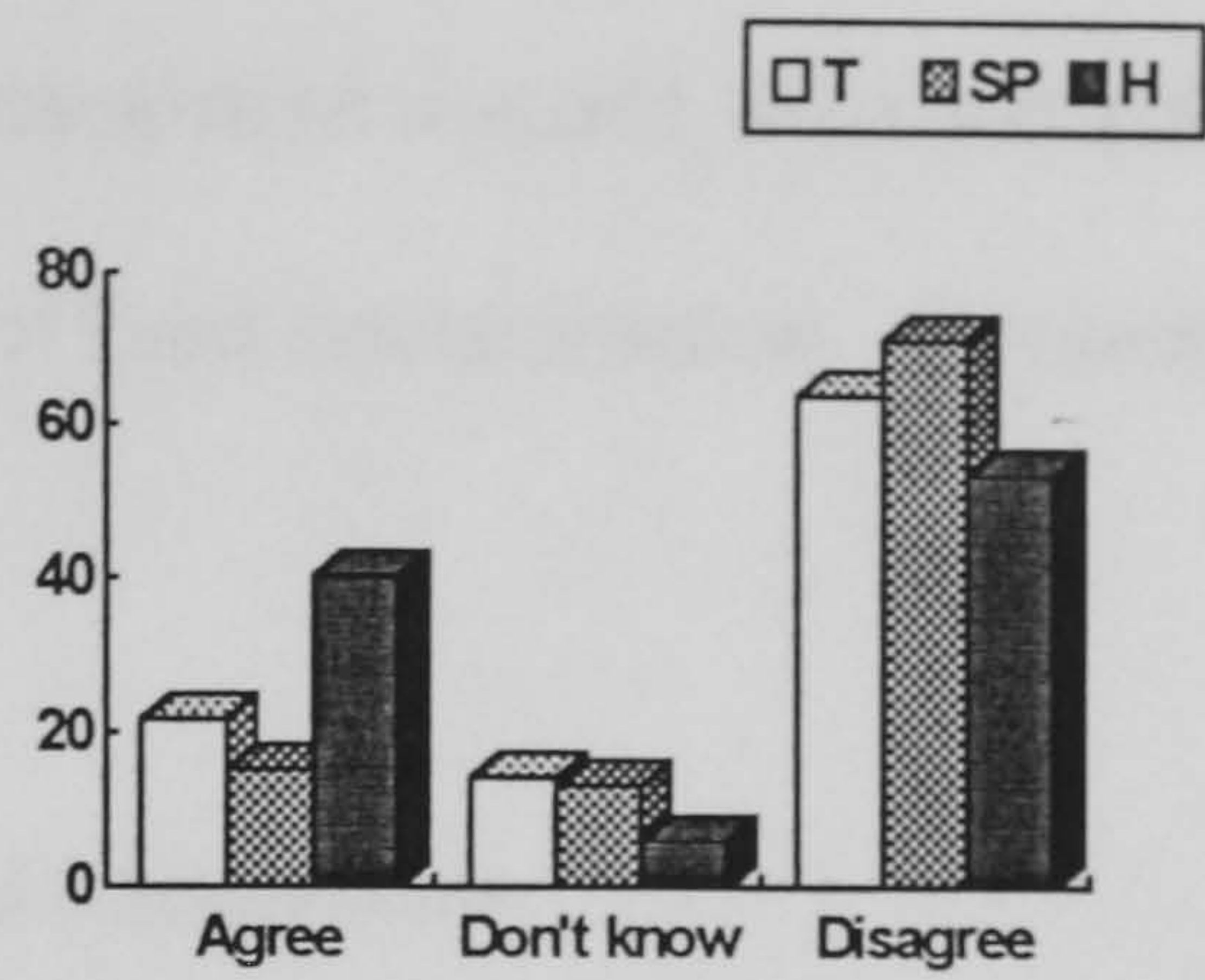
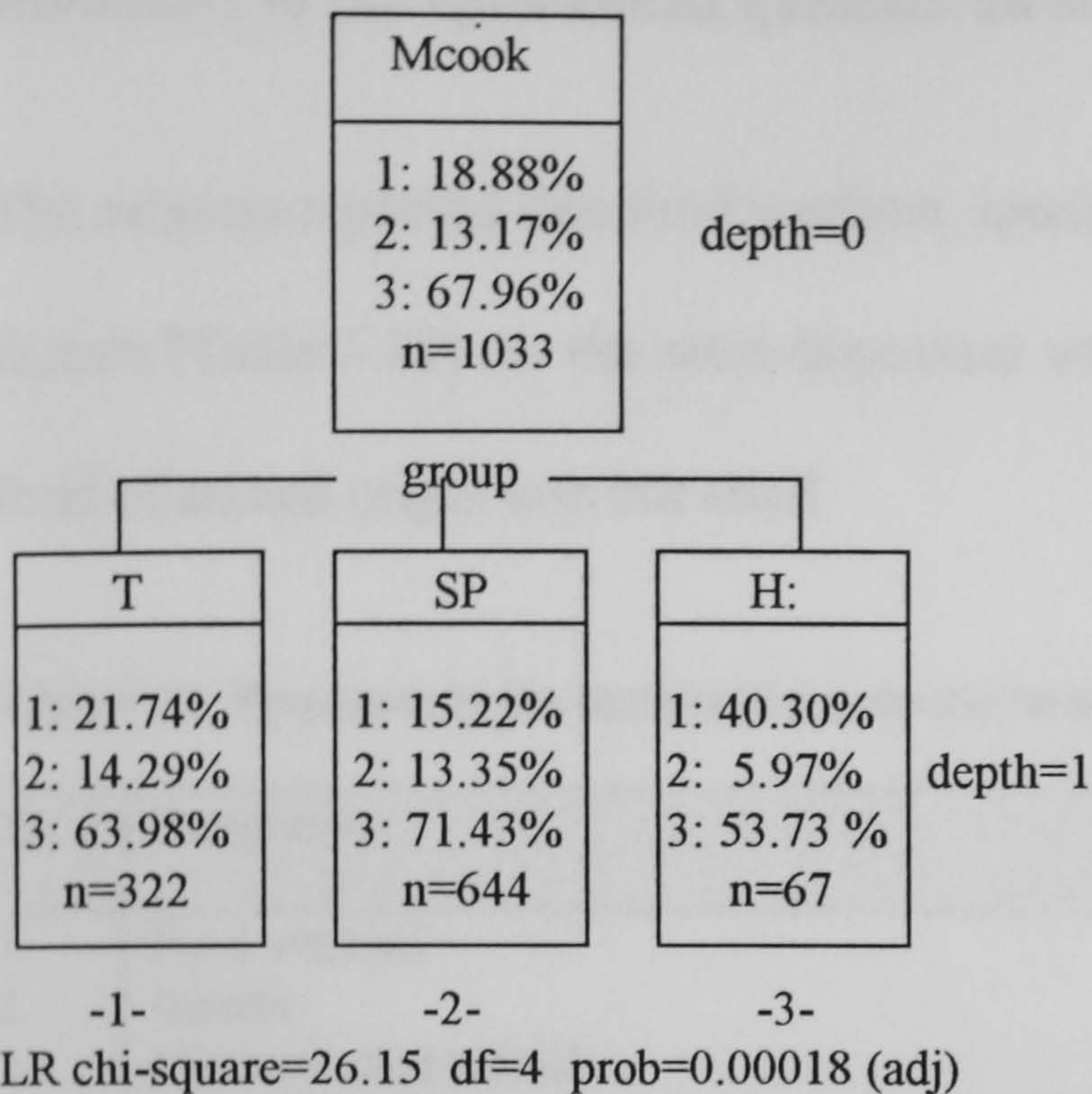


Figure 6.12 B: Cooked foods are the source of food contamination.

Figure 6.12 A: Cooked foods are the source of food contamination.

**Environment is the source of food contamination.**

No statistically significant differences were noticed (Figures 6.13 A&B). CHAID did not proceed further with grouping the predictors. As shown in Figure 6.13 A, the split stopped at depth 0. This indicates that all the subjects responded at about the same rate. This is a useful split as it tells us that all the subjects agreed with the statement.

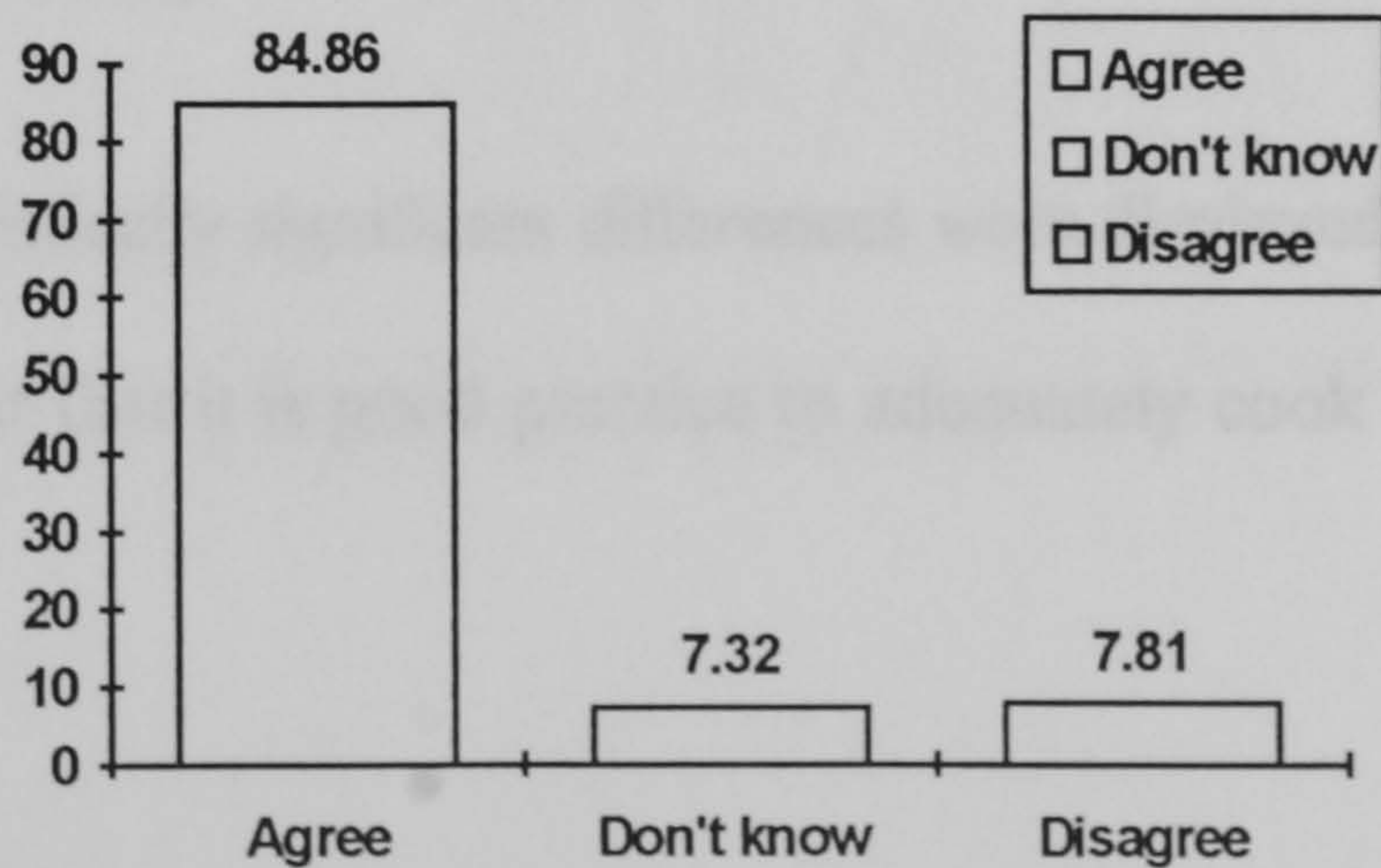
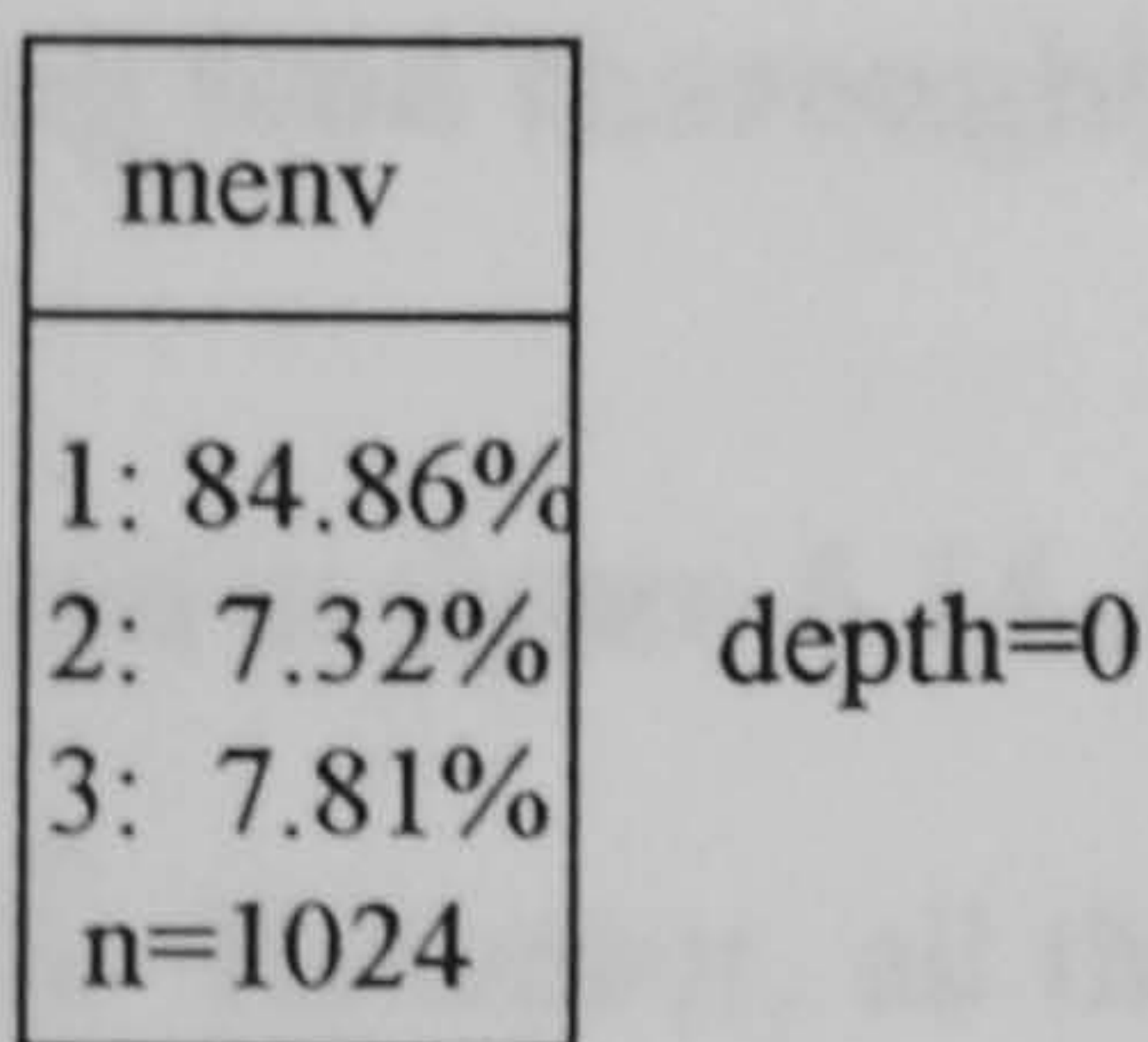


Figure 6.13 A: Environment is the source of food contamination

Figure 6.13 B :Environment is the source of food contamination

### Responses to the open-ended question on other sources of contamination.

The subjects reported that food workers, insects, contaminated utensils, time and other factors (Table 6.20) as the most important sources of food contamination. However, food of animal origin was not cited.

Table 6.20. Responses to the open-ended question on sources of contamination.

No.	Responses	Count	Pct of Responses	Pct of Cases
1.	Food workers	55	22.5	29.1
2.	Insects	39	16.0	20.6
3.	Contaminated utensils	27	11.1	14.3
4.	Contamination	21	8.6	11.1
5.	Foods which are kept outside for long time	17	7.0	9.0
6.	Storage places and methods	17	7.0	9.0
7.	Expired foods	11	4.5	5.8
8.	Polluted water	9	3.7	4.8
9.	Old foods (rotten foods)	7	2.9	3.7
10.	Canned foods	5	2.0	2.6

### C. Factors contributing to outbreaks:

The following part is different in which the subjects were asked to indicate whether the statements were: good practice, neutral, bad practice or they do not know.

#### Cooking food thoroughly (until well done).

As shown in figure 6.14 A&B, no statistically significant differences were displayed by CHAID. However, all the subjects felt that it is good practice to adequately cook the food.

cook
1: 83.73%
2: 13.47%
3: 1.73%
4: 1.06%
n=1039

Figure 6.14 A: Opinions to thorough cooking of foods.

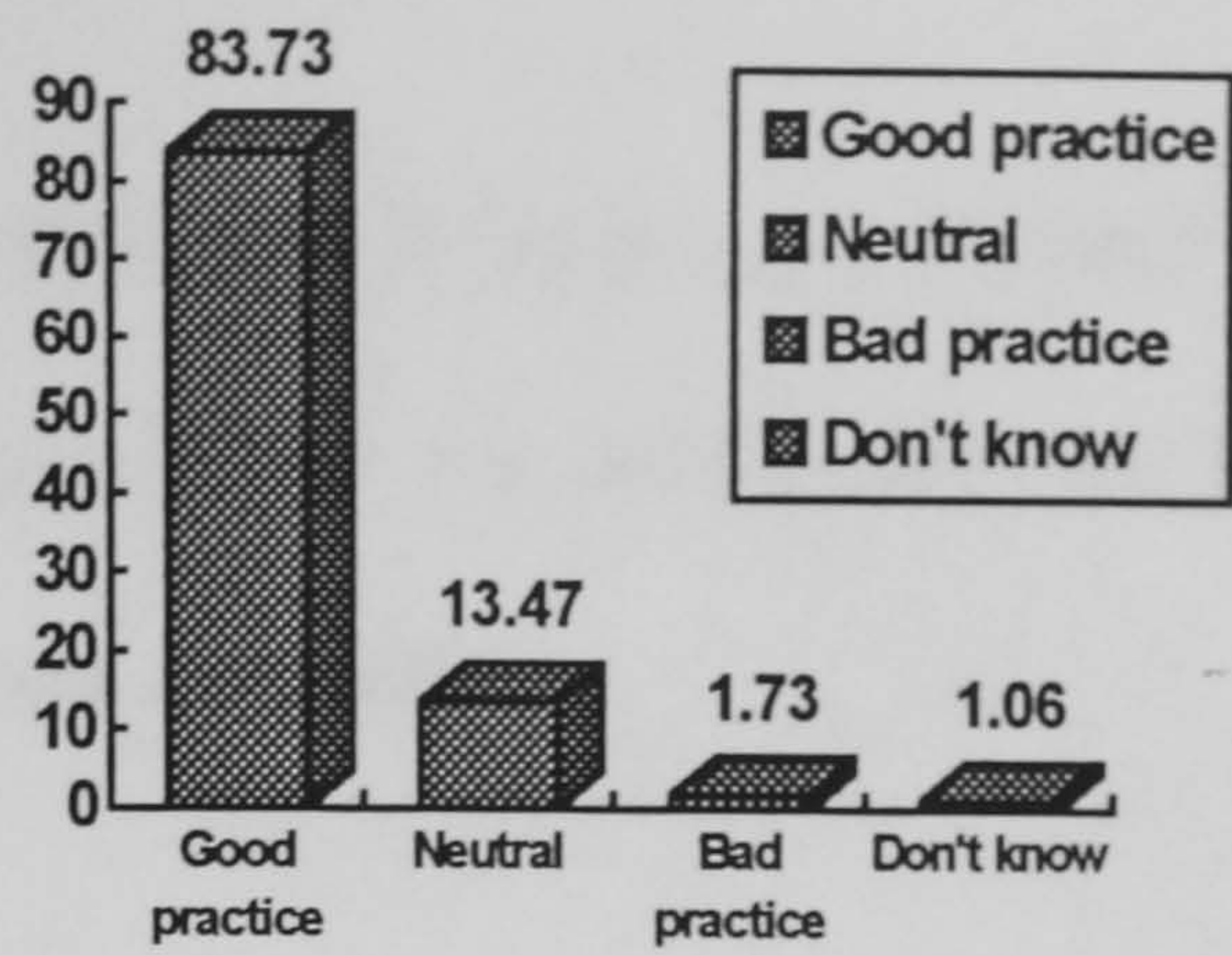


Figure 6.14 B: Opinions to thorough cooking of foods.

**Eating foods immediately while hot and not waiting long to become cold.**

CHAID has merged T, P and H in one group, as they responded at about the same rate. All the subjects felt that the statement is neutral. S were more likely to select this response. Higher rates of T, P and H felt that it is good practice to eat food while hot compared to S (Figures 6.15 A&B).

eat
1: 20.44%
2: 47.35%
3: 26.52%
4: 5.69%
n=1037

group

TPH
1: 26.19%
2: 45.15%
3: 24.19%
4: 4.47%
n=649

S
1: 10.82%
2: 51.03%
3: 30.41%
4: 7.73%
n=388

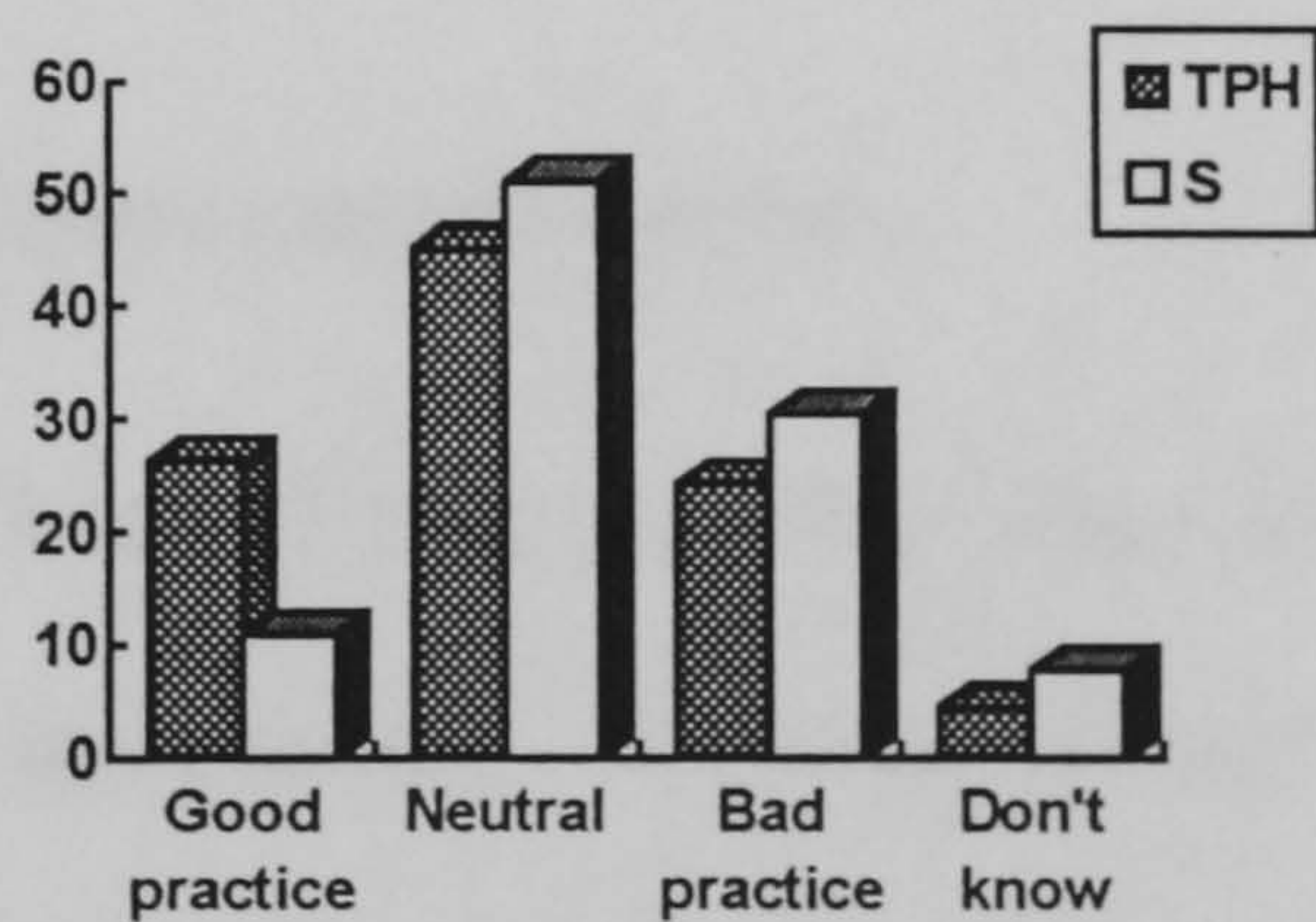


Figure 6.15 B: Eating food as it is hot and not keeping it long to become cold.

LR chi-square=40.50 df=3 prob=5.8e-8 (adj.)

Figure 6.15 A: Eating food as it is hot and not keeping it long to become cold.

## Re-heating of pre-cooked foods.

As expected, H felt it is good practice to reheat pre-cooked foods. Also T and P were more likely to choose good practice but the response rate was smaller than that for H. S were more likely to select neutral option (Figures 6.16 A&B).

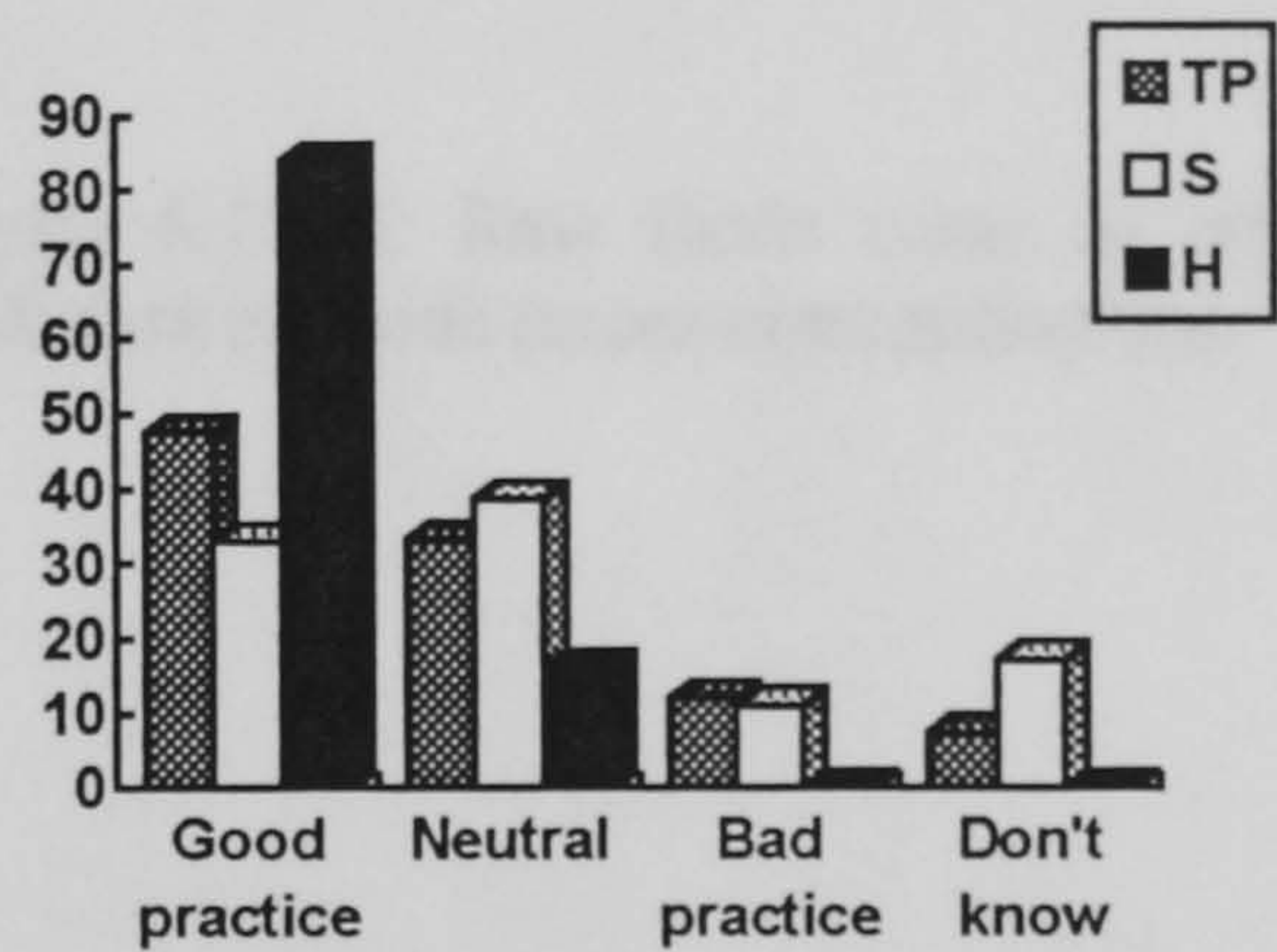
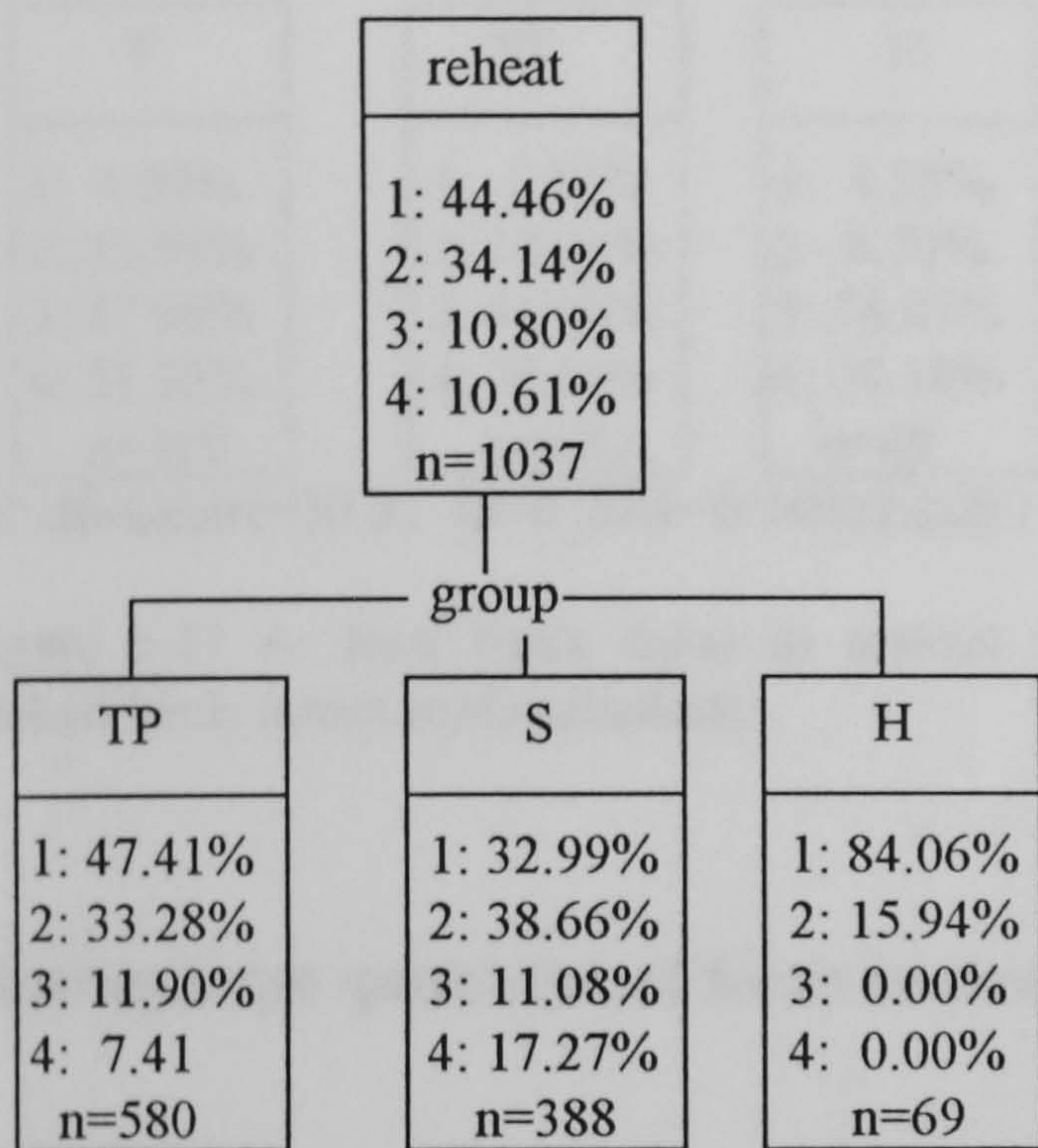


Figure 6.16 B: Re-heat pre-cooked food until it is hot before eating.

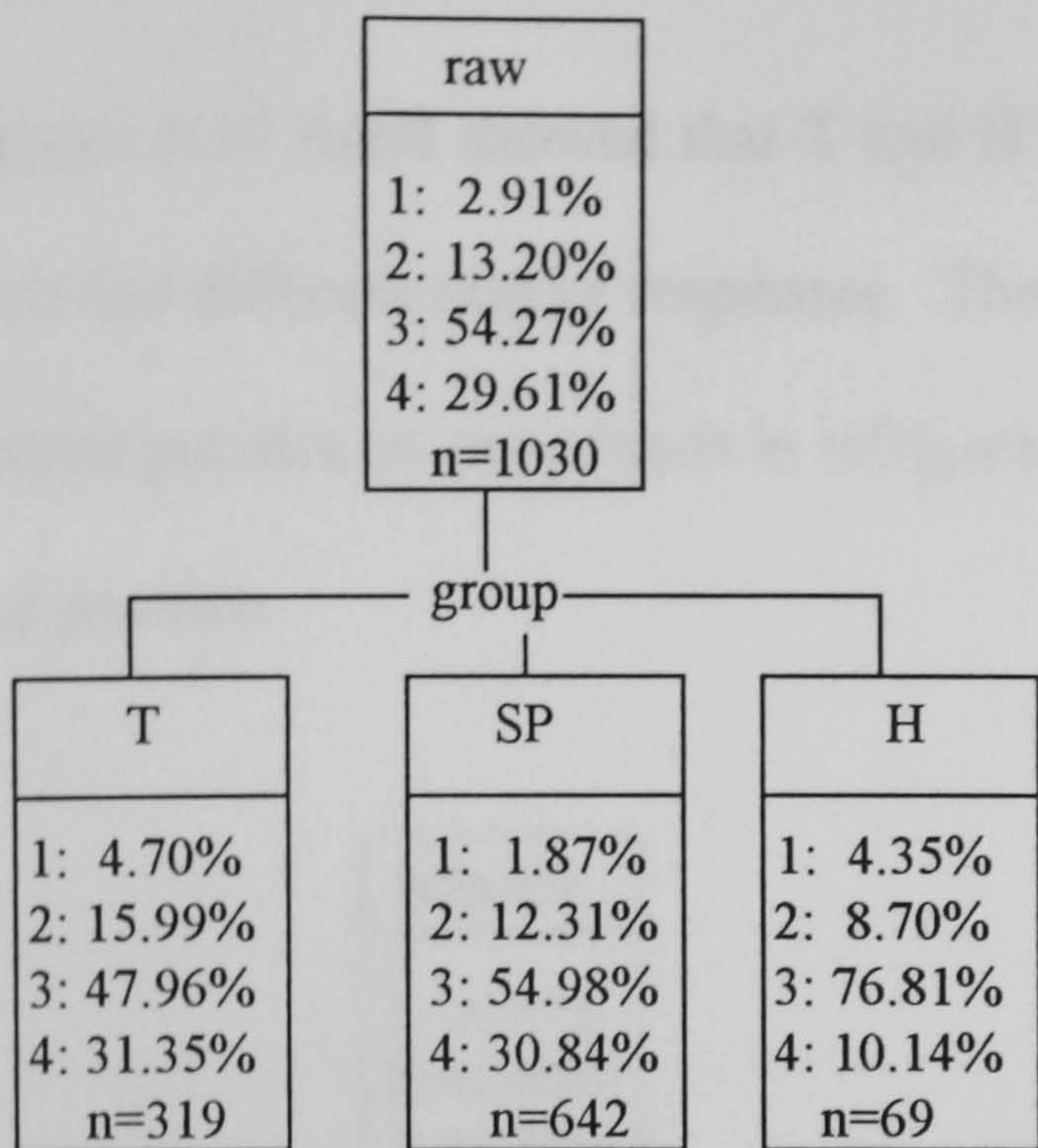
LR chi-square=93.73 df=6 prob=3.0e-17 (adj.)

Figure 6.16 A: Re-heat pre-cooked food until it is hot before eating.

## Raw foods come in contact with cooked foods (cross-contamination).

Note that S and P responded similarly whereas T and H both responded differently.

All the subjects felt that cross-contamination is a bad practice. The response rate for H, as expected, was higher, as shown in Figures 6.17 A&B.



LR chi-square=30.21 df=6 prob=0.00022 (adj.)

Figure 6.17 A: Raw foods come in contact with cooked foods (cross contamination).

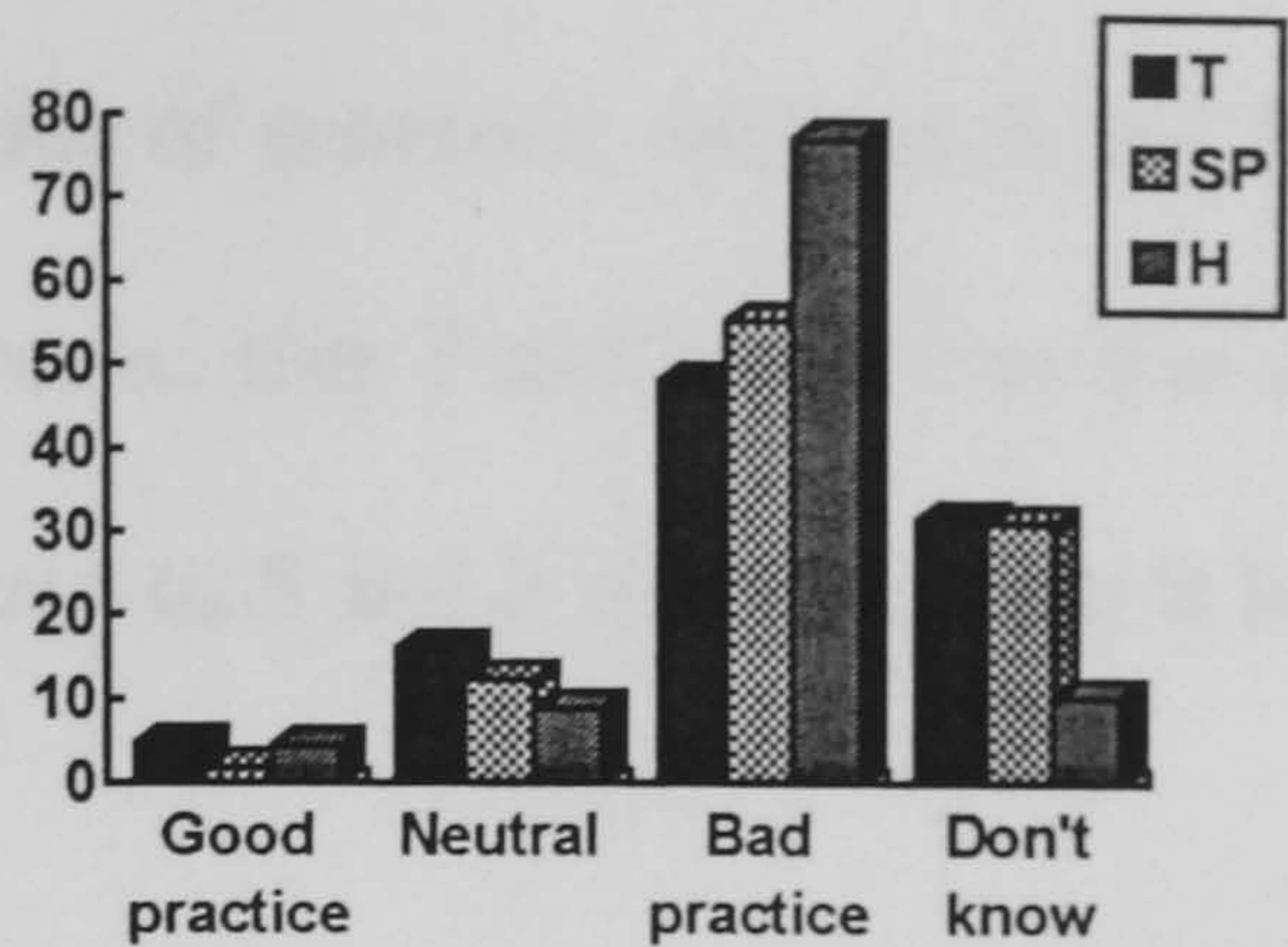
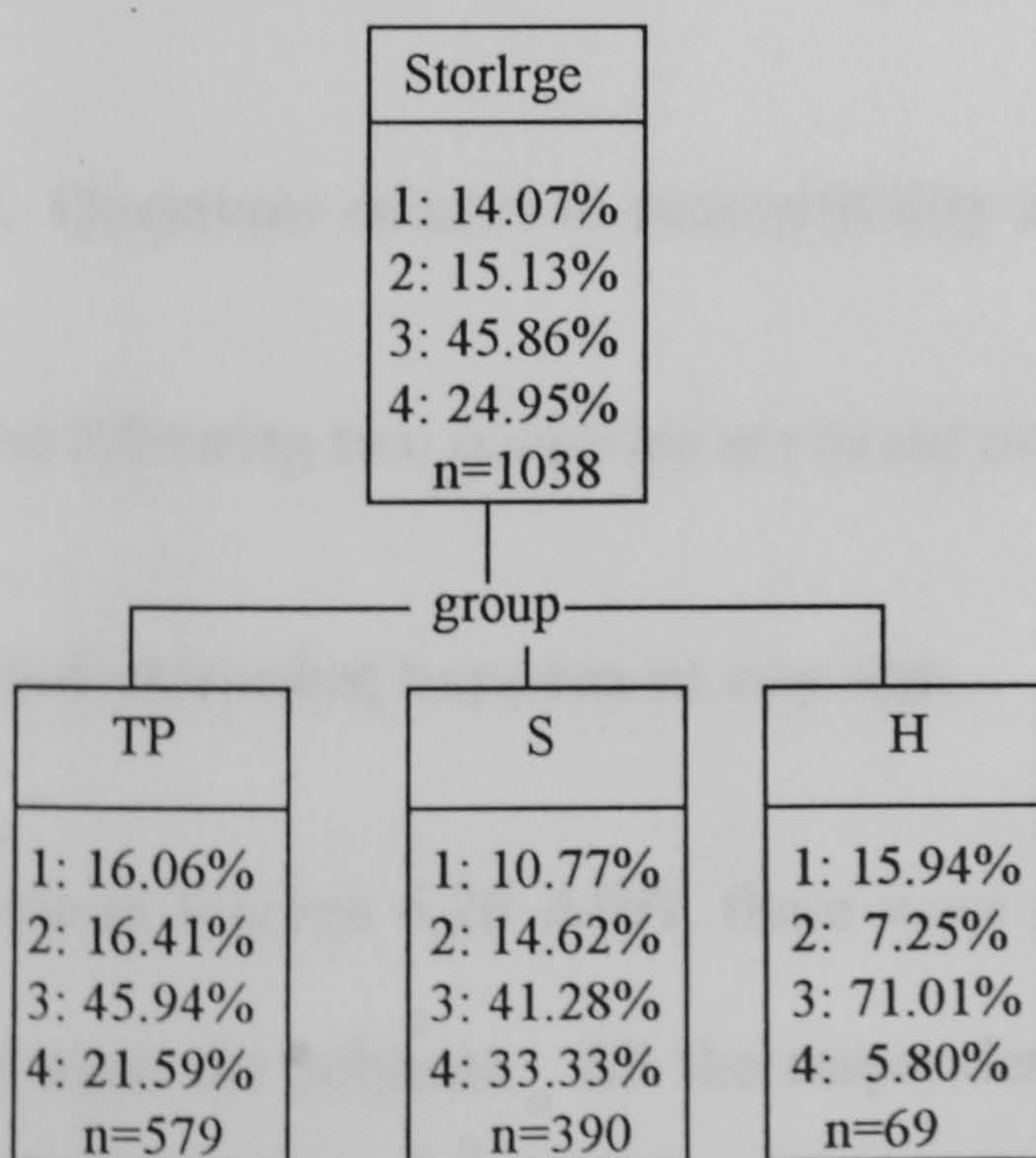


Figure 6.17 B: Raw foods come in contact with cooked foods (cross-contamination).

### Storing large quantities of foods in deep pans.

All the subjects felt that it is bad practice to store large quantities of foods in deep pans (Figures 6.18 A&B). Note that T and P had similar response rates which were statistically not different from each other.



LR chi-square=46.63 df=6 prob=1.3e-7 (adj.)

Figure 6.18 A: Storing large quantities of food in deep pans.

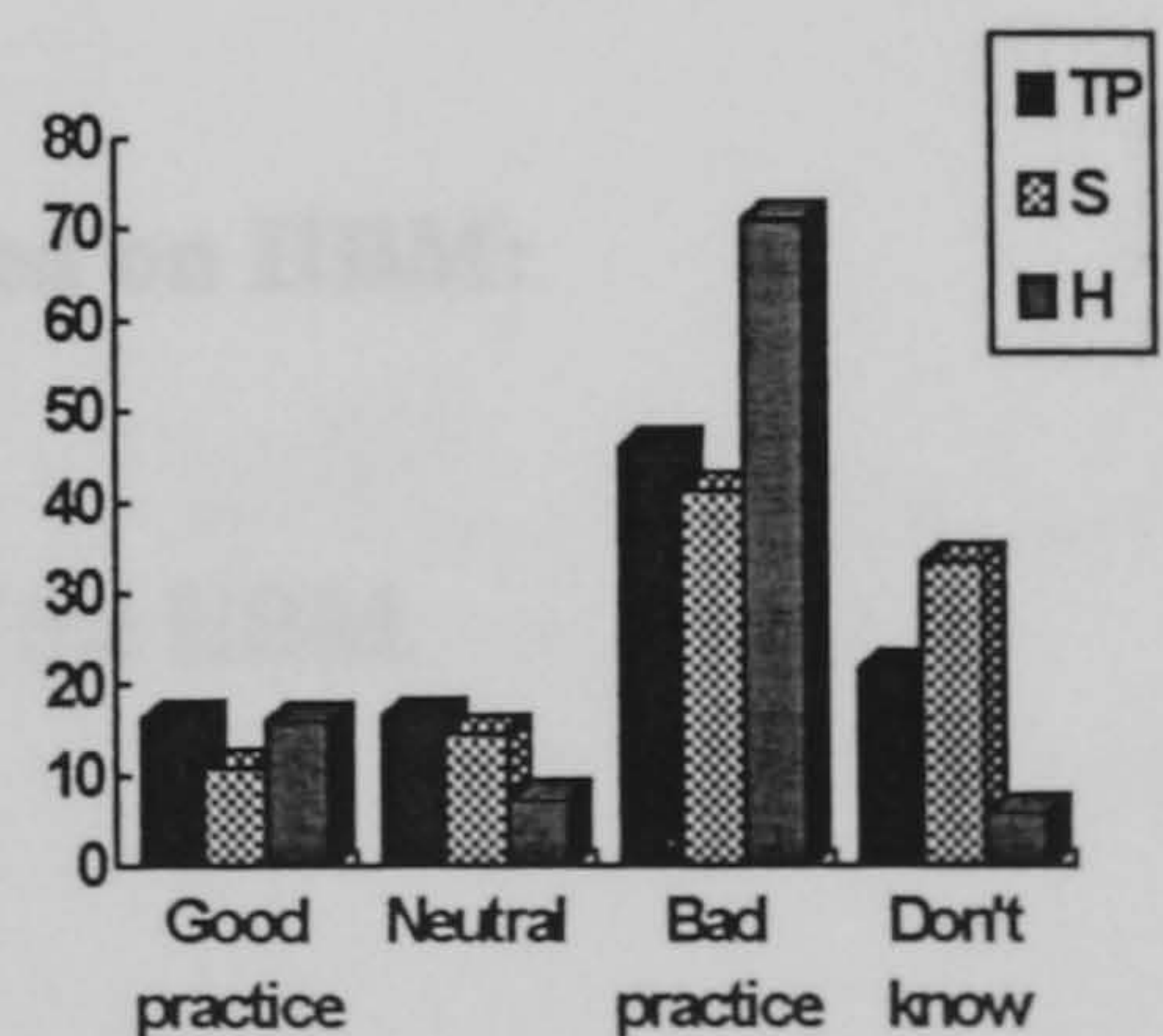


Figure 6.18 B: Storing large quantities of food in deep pans in refrigerator.

**Storing cooked foods in refrigerators overnight or longer.**

Figures 6.19 A&B showed that T and H had same rate of response, whereas S and P each had different rate of responses. The figures revealed that T and H felt that it is a neutral practice to store foods in refrigerators compared to S and P whom felt that it is bad practice.

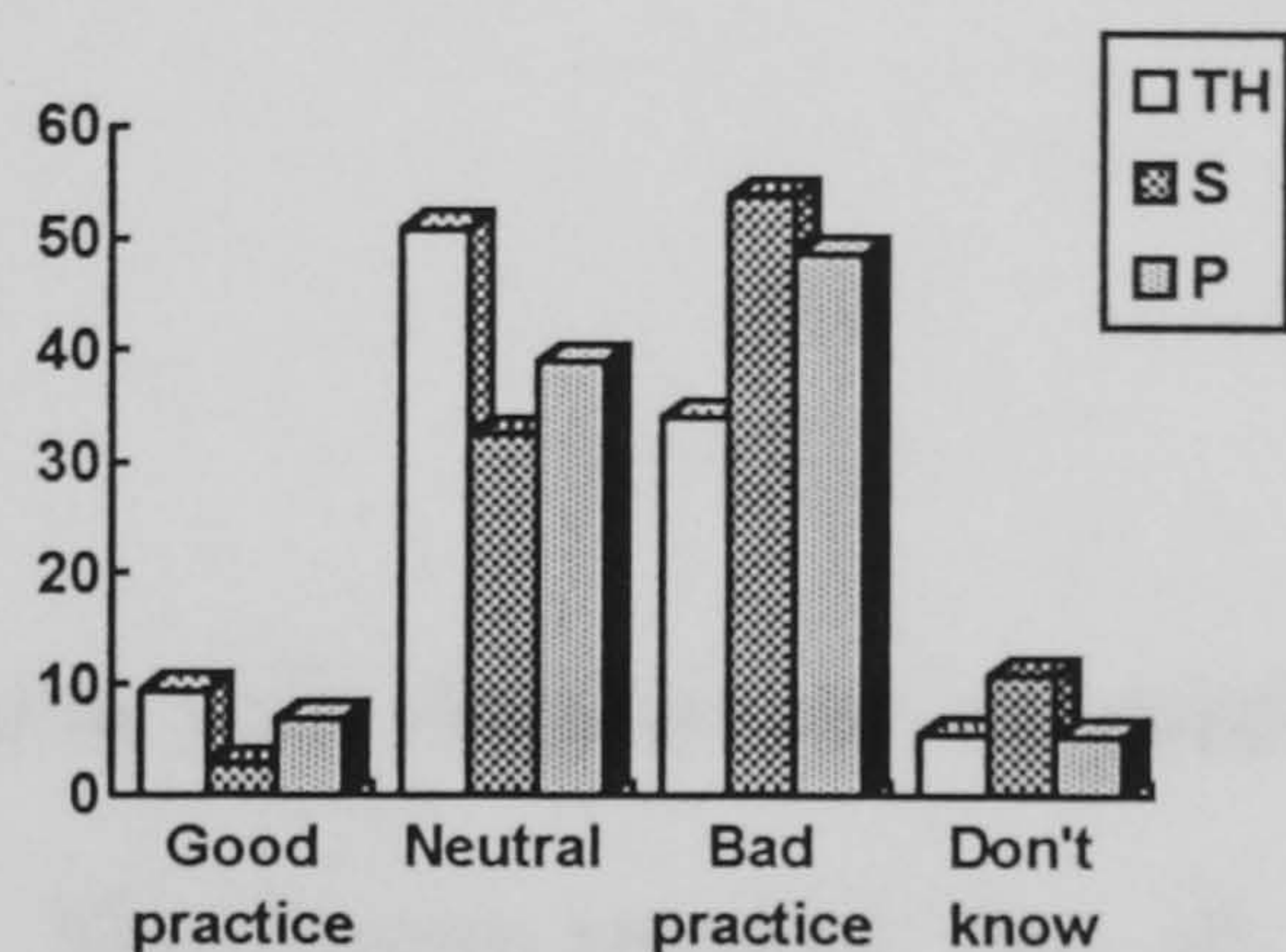
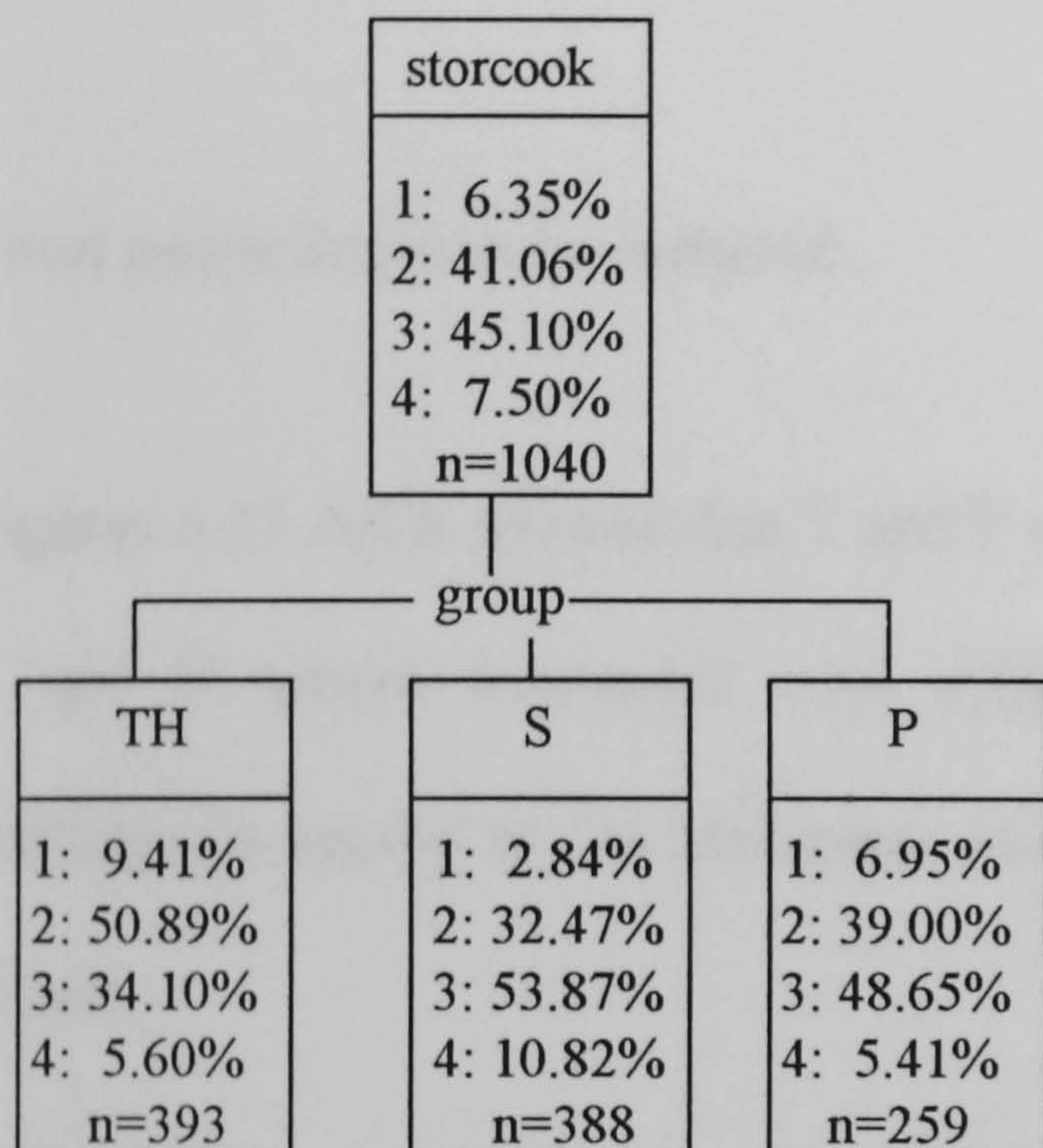


Figure 6.19 B: Storing cooked foods in refrigerators overnight or longer.

LR chi-square=58.34 df=6 prob=5.9e-10 (adj.)

Figure 6.19 A: Storing cooked foods in refrigerators overnight or longer.

**D. Questions related to susceptibility and control based on HBM:**

The following two questions are based on the postulate of the HBM.

**Food poisoning happens at any age.**

Note in Figures 6.20 A&B, there were no significant difference in the response rate between the subjects. All the respondents agreed that everybody is at risk and that there is no particular age who is not.

fdage	
1:	96.55%
2:	1.34%
3:	2.11%
n=1043	

Figure 6.20 A: Every age is at risk of foodborne illnesses.

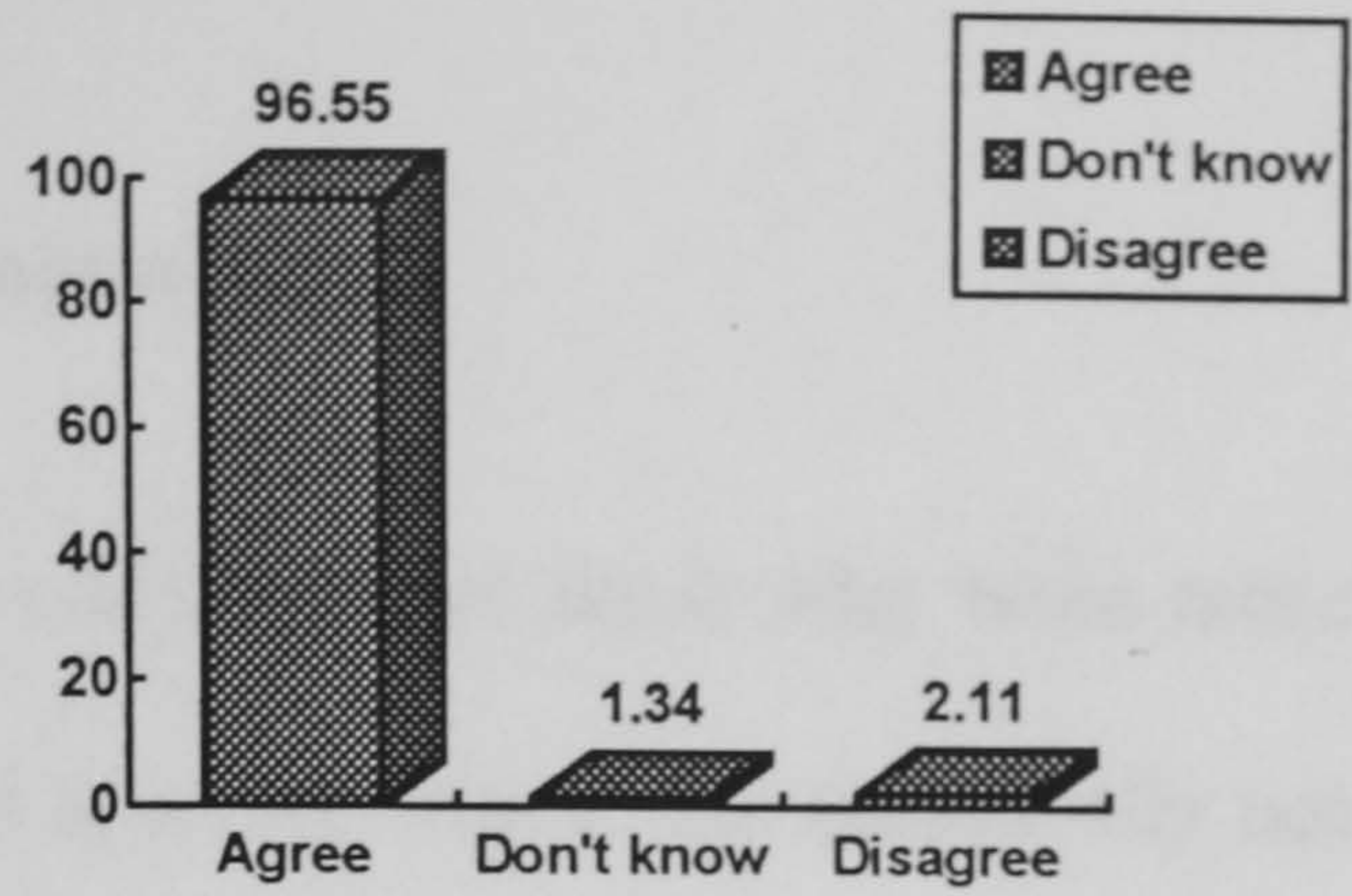


Figure 6.20 B: Every age is at risk of foodborne illnesses.

### Food poisoning can be reduced.

Figures 6.21 A&B showed that T and P responded at about the same rate compared to S and H whom responded each differently. The figures revealed that all the participants agreed to the statement, however, H were more likely to agree than the others.

fdred	
1:	83.77%
2:	10.76%
3:	5.48%
n=1041	

group	
TP	
1:	84.54%
2:	8.93%
3:	6.53%
n=582	
S	
1:	80.00%
2:	15.38%
3:	4.62%
n=390	
H	
1:	98.55%
2:	0.00%
3:	1.45%
n=69	

LR chi-square=30.57 df=4 prob=2.2e-5 (adj.)

Figure 6.21 A: Incidence of foodborne illnesses can be reduced.

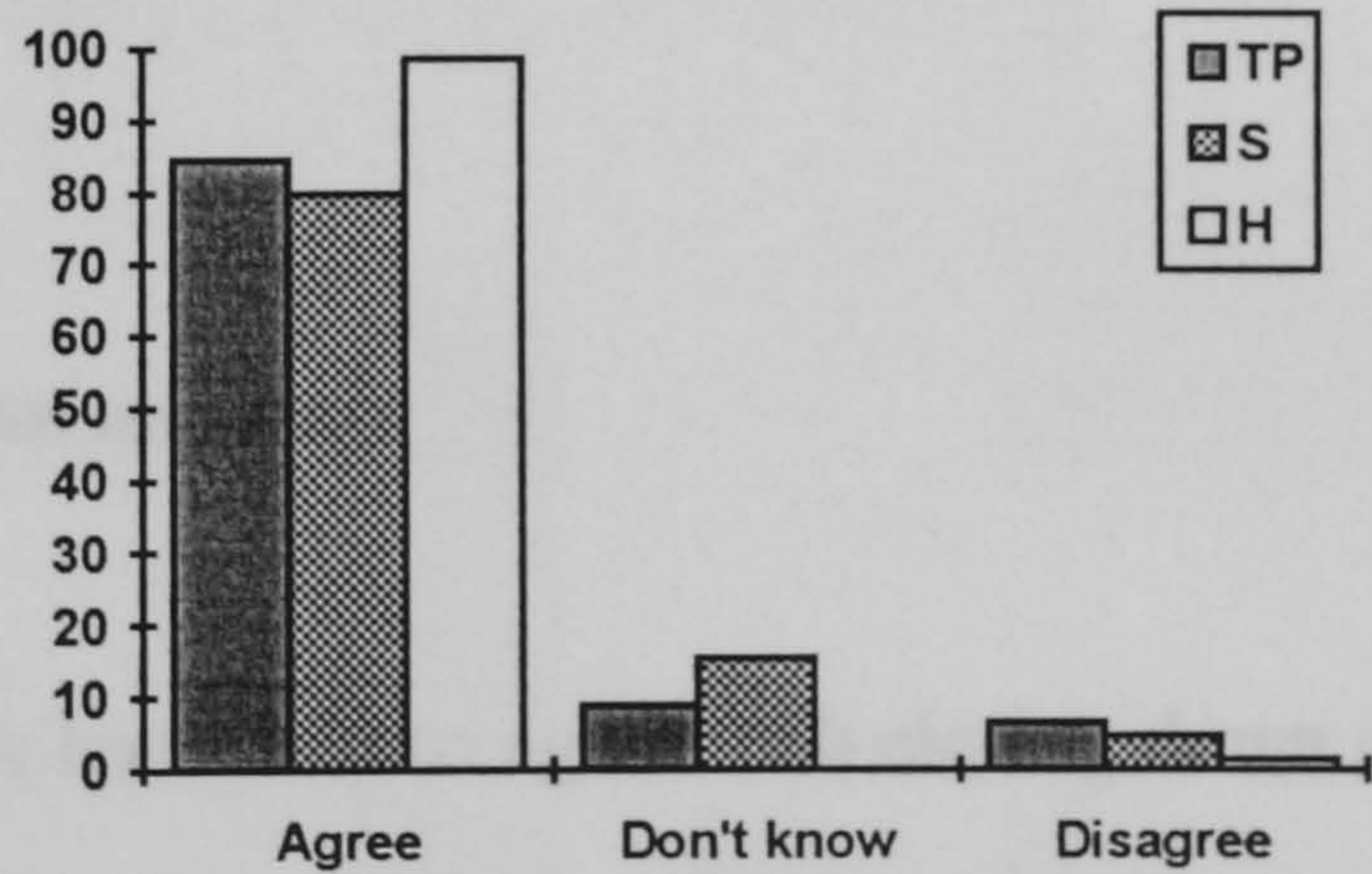


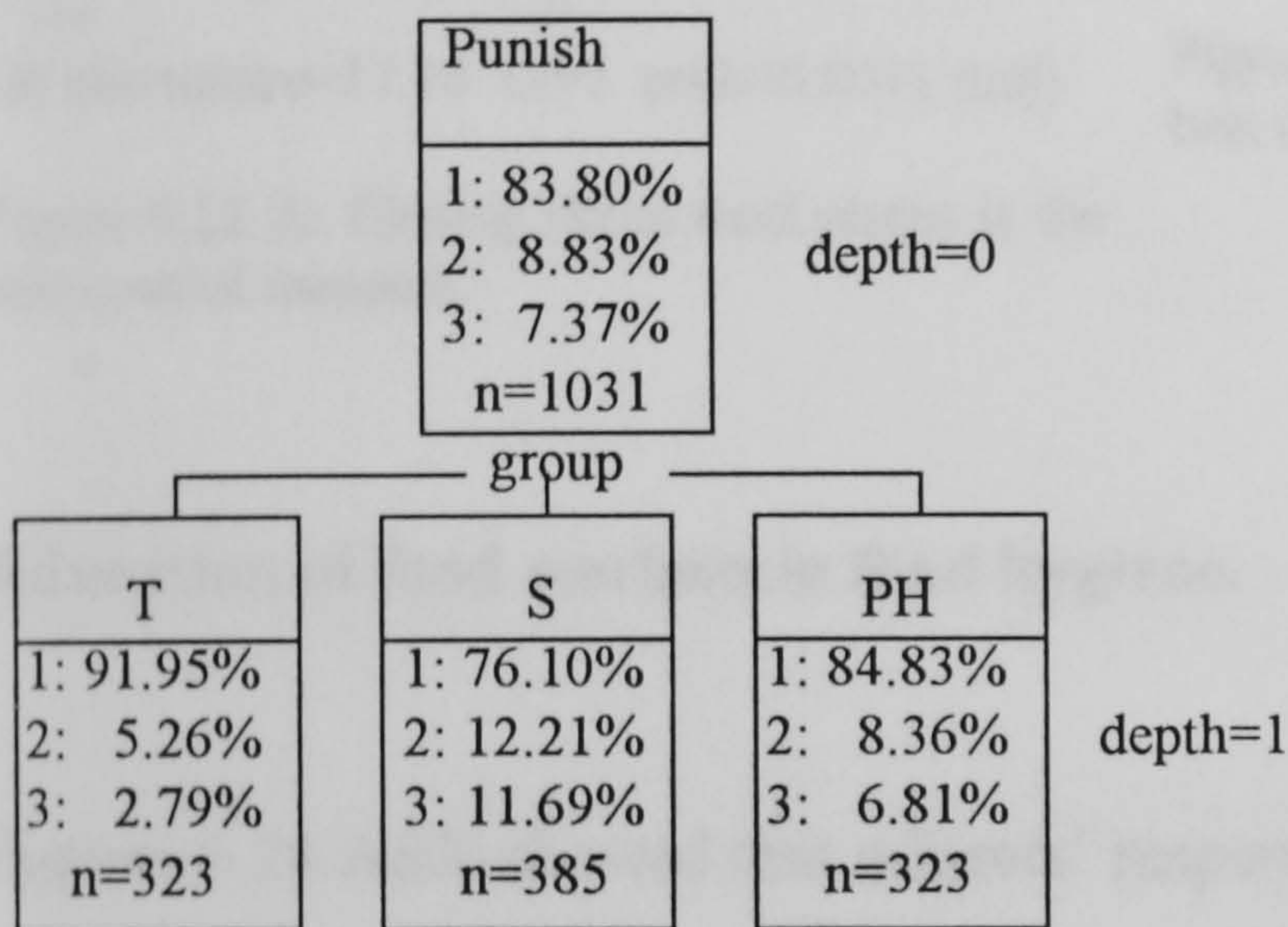
Figure 6.21 B: Incidence of foodborne illnesses can be reduced.



**E. Control measures:**

**Punishing food workers is the best control measure.**

Note in Figures 6.22 A&B, all agreed with the statement but those who were more likely to agree were T. P and H had responded at a rate which was statistically not different.



LR chi-square=35.80 df=4 prob=1.9e-6 (adj)

Figure 6.22 A: Punishing food workers is the best control measure of food poisoning.

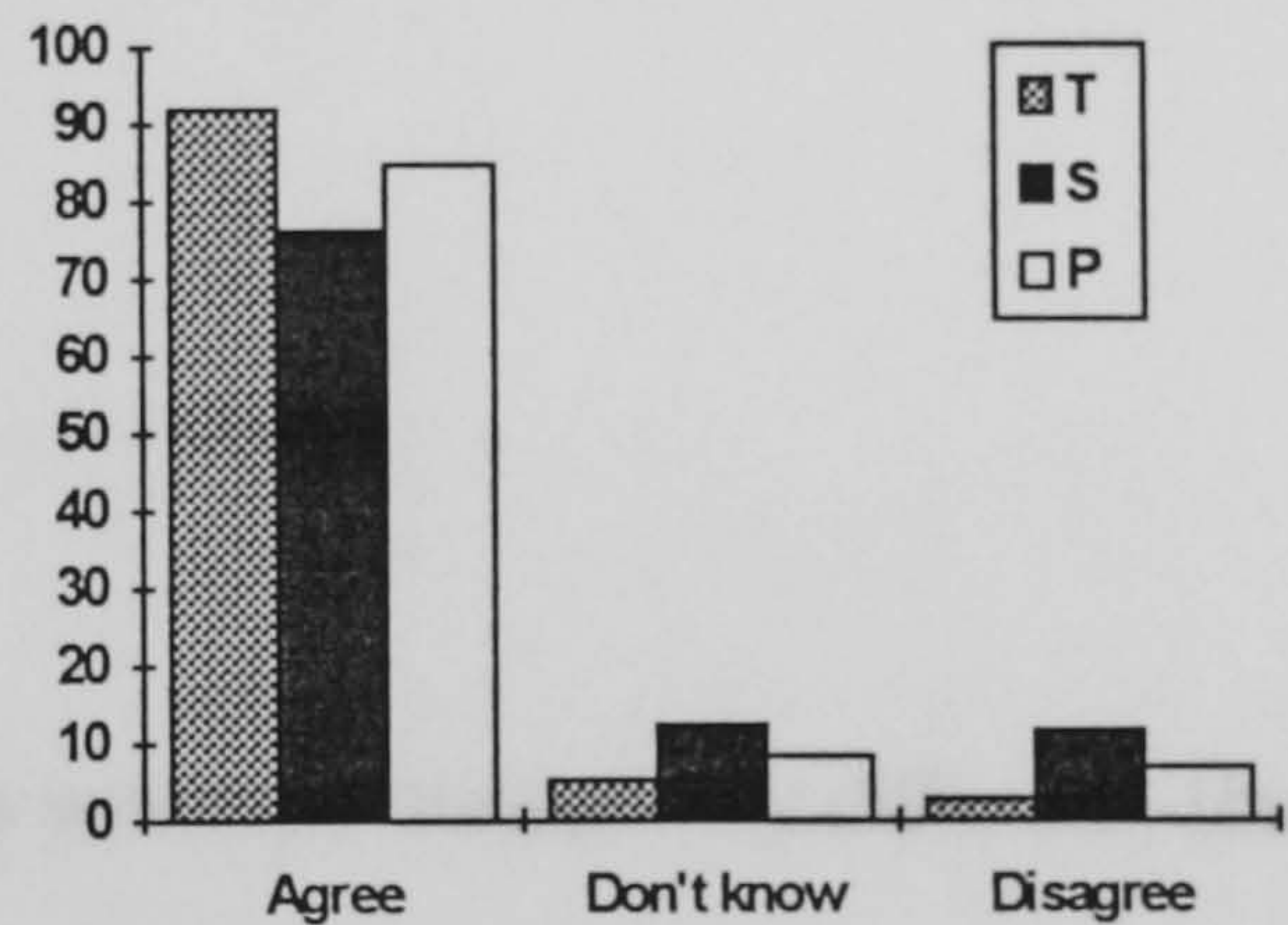
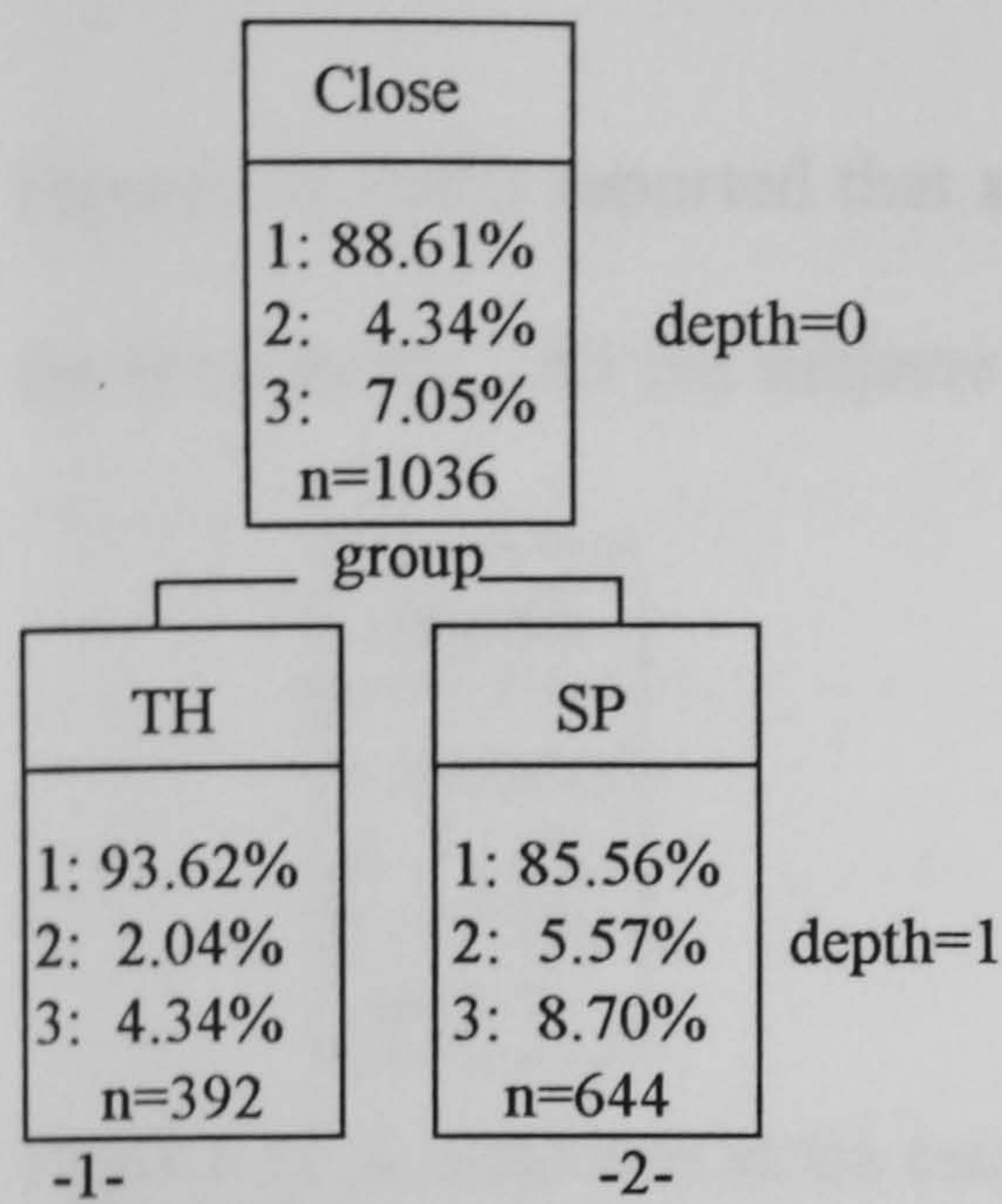


Figure 6.22 B: Punishing food workers is the best control measure of food poisoning.

**Closing down food places is the best control measure.**

Figures 6.23 A&B showed that S and P were less likely to agree with closing down of food places than T and H.



LR chi-square=17.44 df=2 prob=0.0011 (adj)

Figure 6.23 A: Closing down food places is the best control measure.

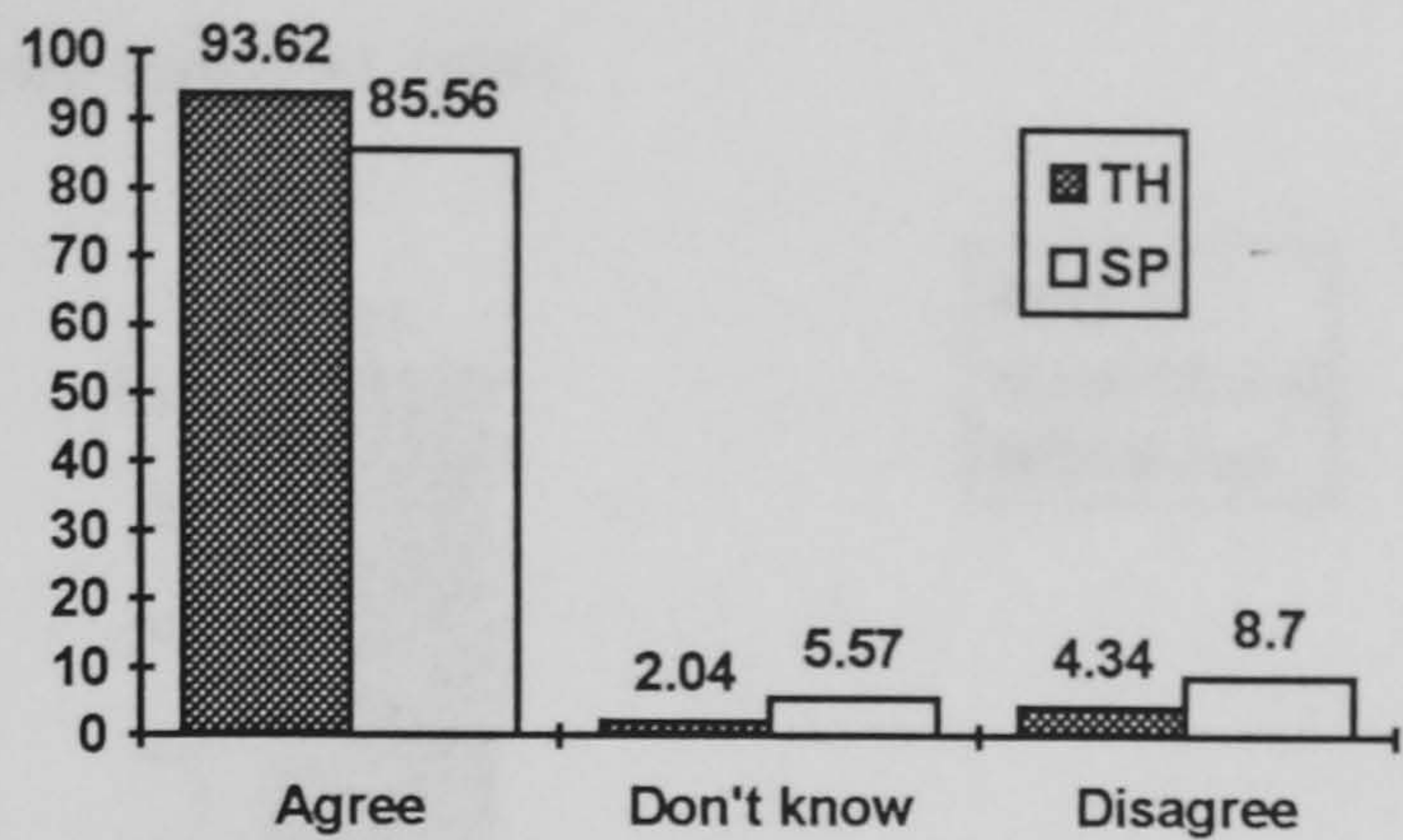


Figure 6.23 B: Closing down food places is the best control measure.

### Education of food workers in food hygiene.

Figures 6.24 A&B showed that subjects' responses were not statistically different, thus CHAID offered this kind of grouping. The figures indicated that all the subjects agreed with education of food workers as a method to control food poisoning.

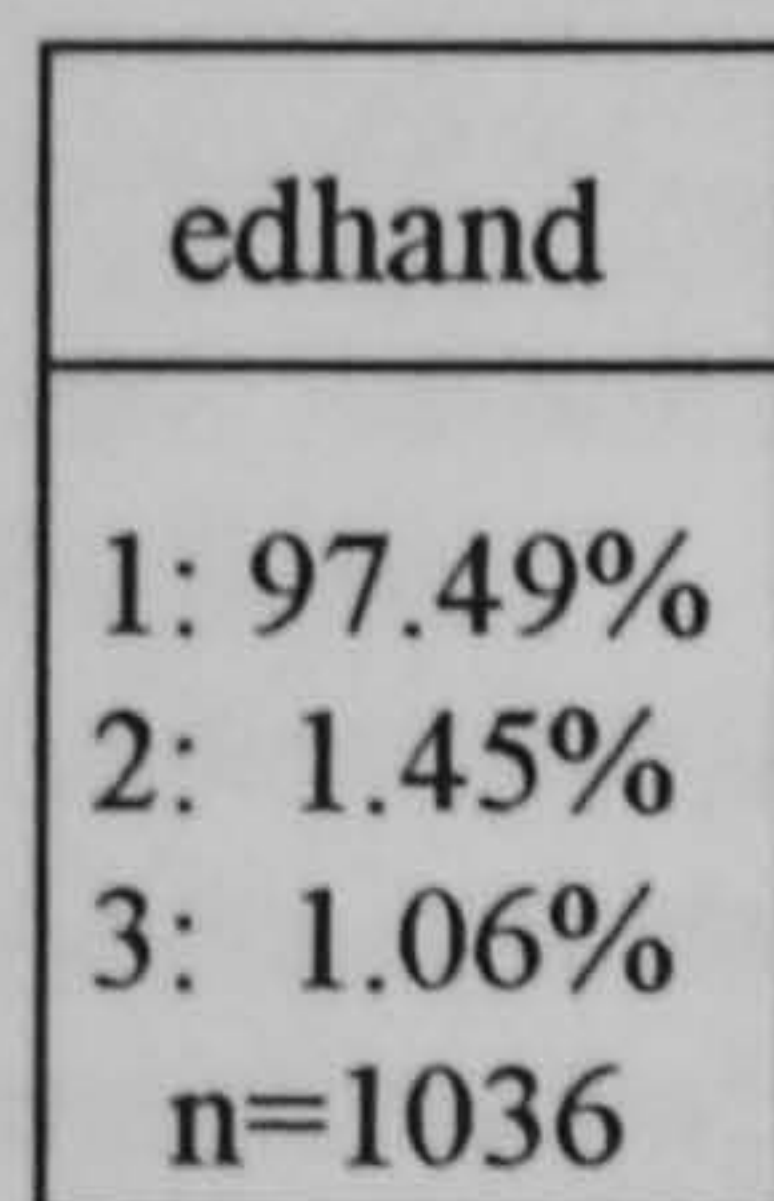


Figure 6.24 A: Education of food workers in food safety.

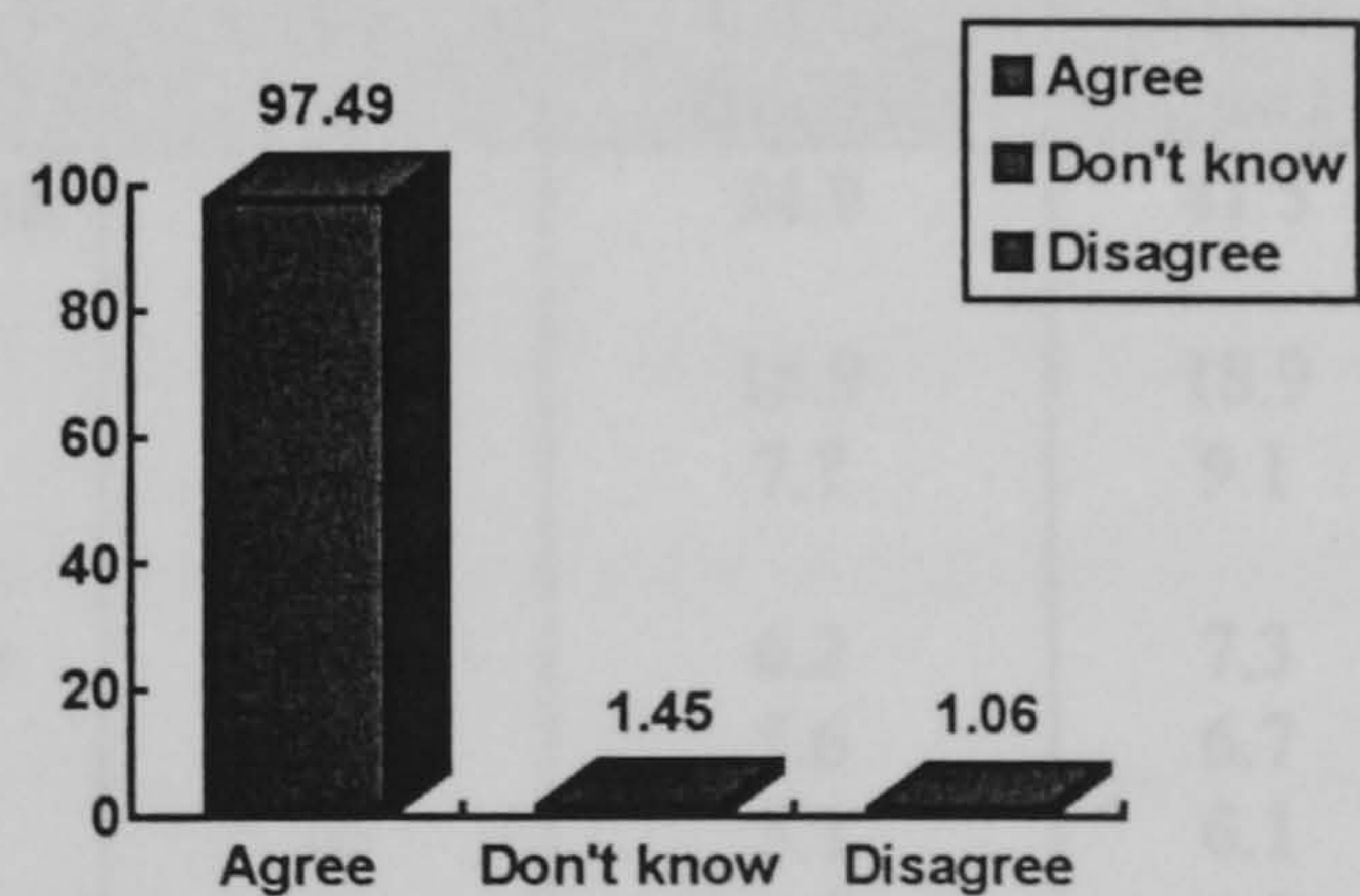


Figure 6.24 B: Education of food workers in food safety.

## Education of the community in food safety.

Figures 25 A&B reported that all the subjects were in favour of community education for food safety. All the subjects responded at a similar rates.

edcomm	
1:	97.00%
2:	2.61%
3:	0.39%
n=1033	

Figure 6.25 A: Education of the community in food safety.

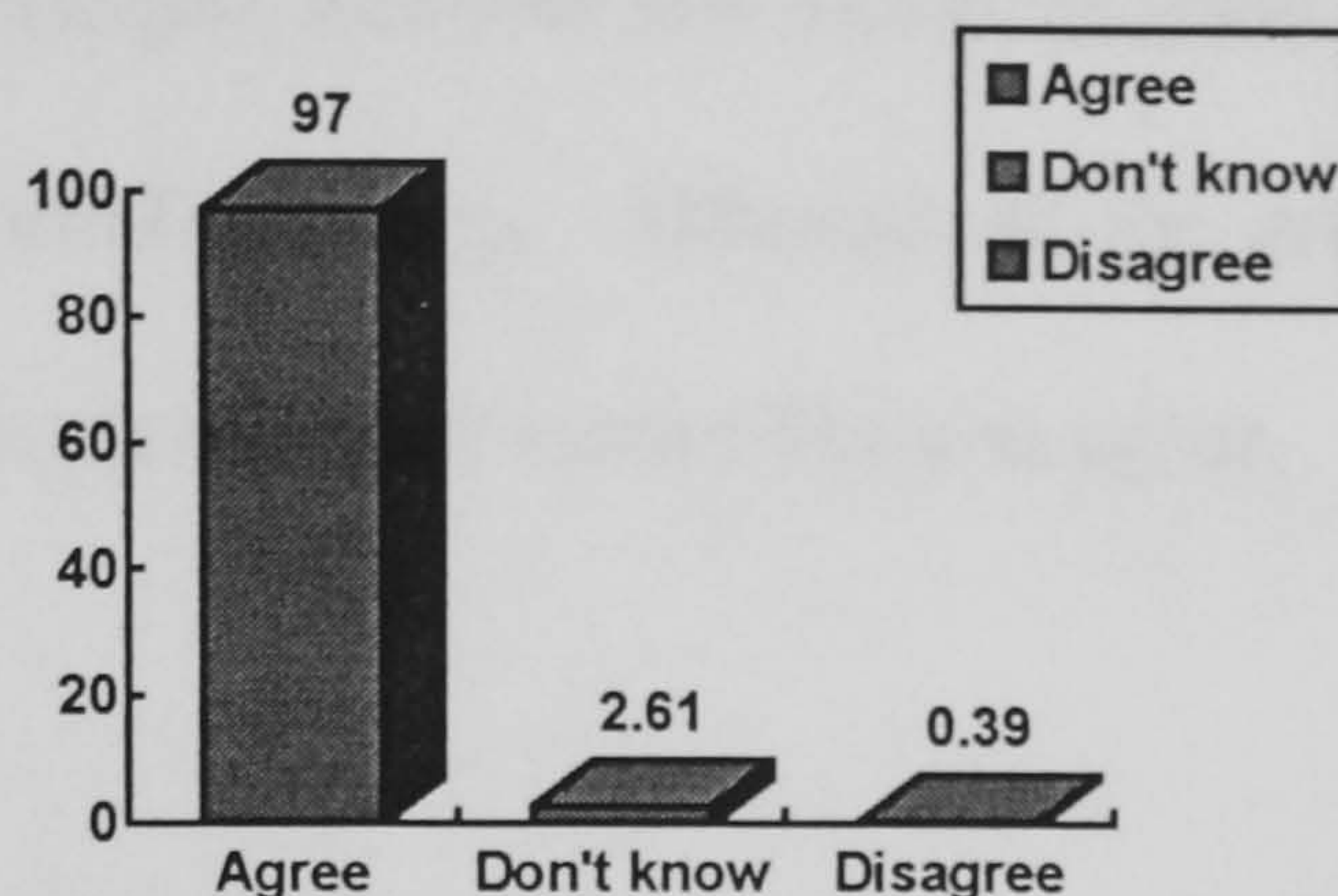


Figure 6.25 B: Education of the community in food safety.

## Responses to the open-ended question on control measure.

The subjects reported 31 methods for controlling foodborne illnesses. They felt that education is the best control measures as shown in Table 6.21.

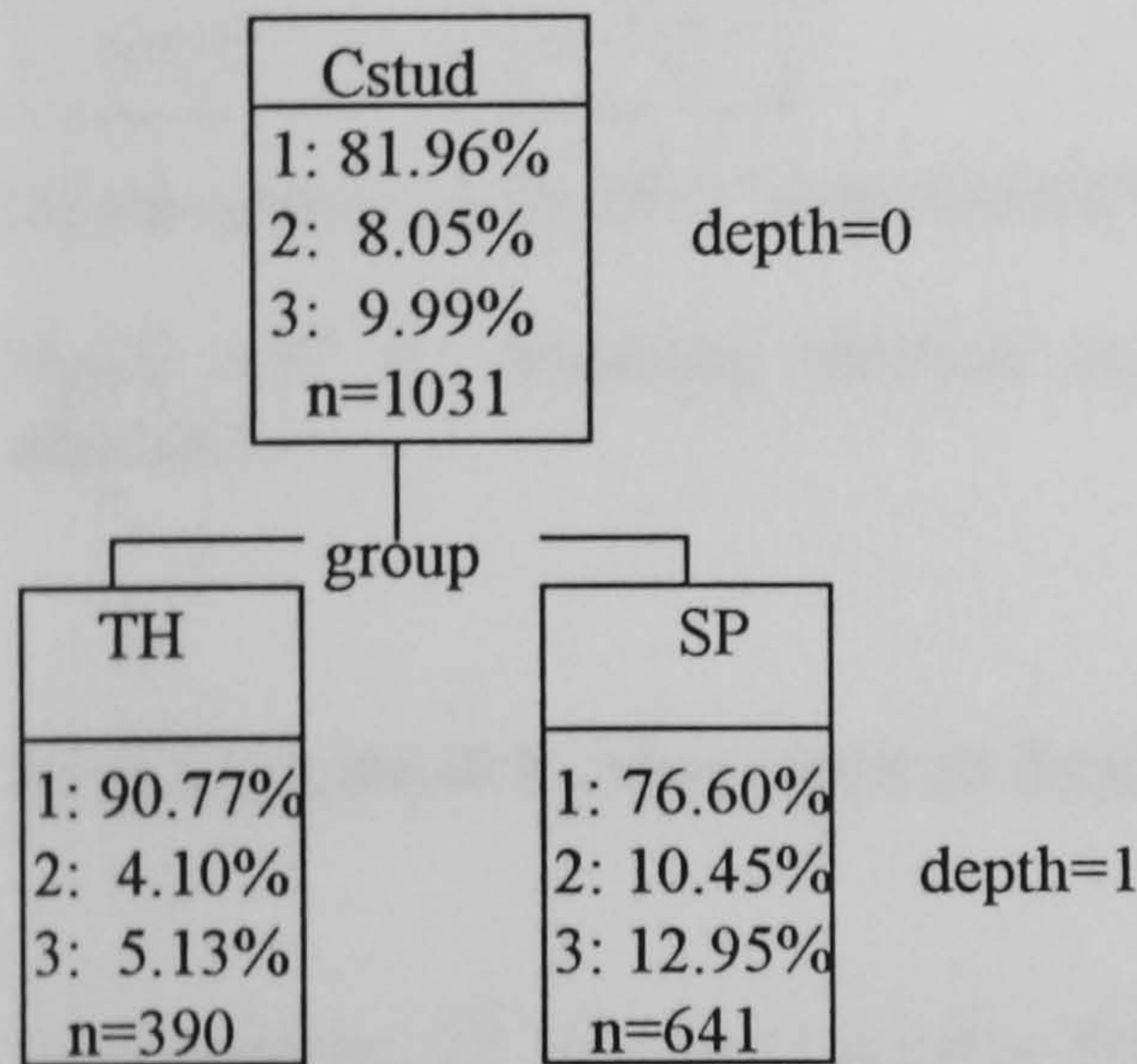
Table 6.21. Responses to the open-ended question on control measures.

No.	Responses	Count	Pct of Responses	Pct of Cases
1.	Offer education in food hygiene & health education	68	34.9	41.5
2.	Use mass media	31	15.9	18.9
3.	Promote personal hygiene & environmental sanitation	15	7.7	9.1
4.	Proper inspection of foods imported from outside	12	6.2	7.3
5.	Options given in the questionnaire are enough	11	5.6	6.7
6.	Store foods properly to prevent contamination	10	5.1	6.1
7.	Training of food workers	8	4.1	4.9
8.	Medical examination of food workers & housemaids	7	3.6	4.3
9.	Ensure the validity of expiry dates on food	6	3.1	3.7
10.	Do not hire or reduce number of expatriates working in food establishments	4	2.1	2.4

**F. Community involvement:**

**Involving students in health education.**

Figures 6.26 A&B showed that CHAID has merged teachers and health promoters in one group whereas students and parents in another group. Although all the groups agreed to the statement, teachers and health promoters were more likely to agree.



LR chi-square=35.66 df=2 prob=1.3e-7 (adj)

Figure 6.26 A: Involvement of students in health education.

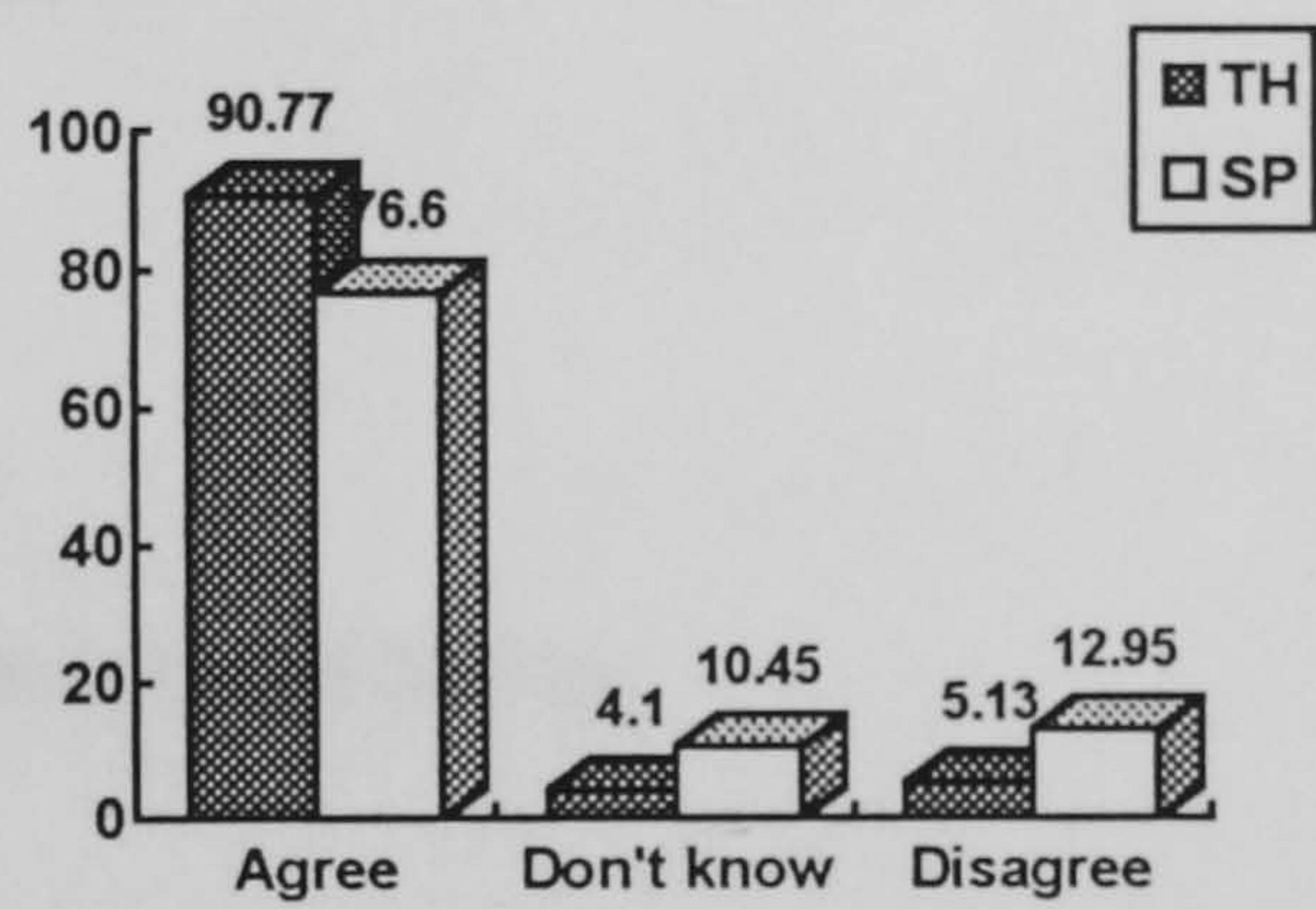
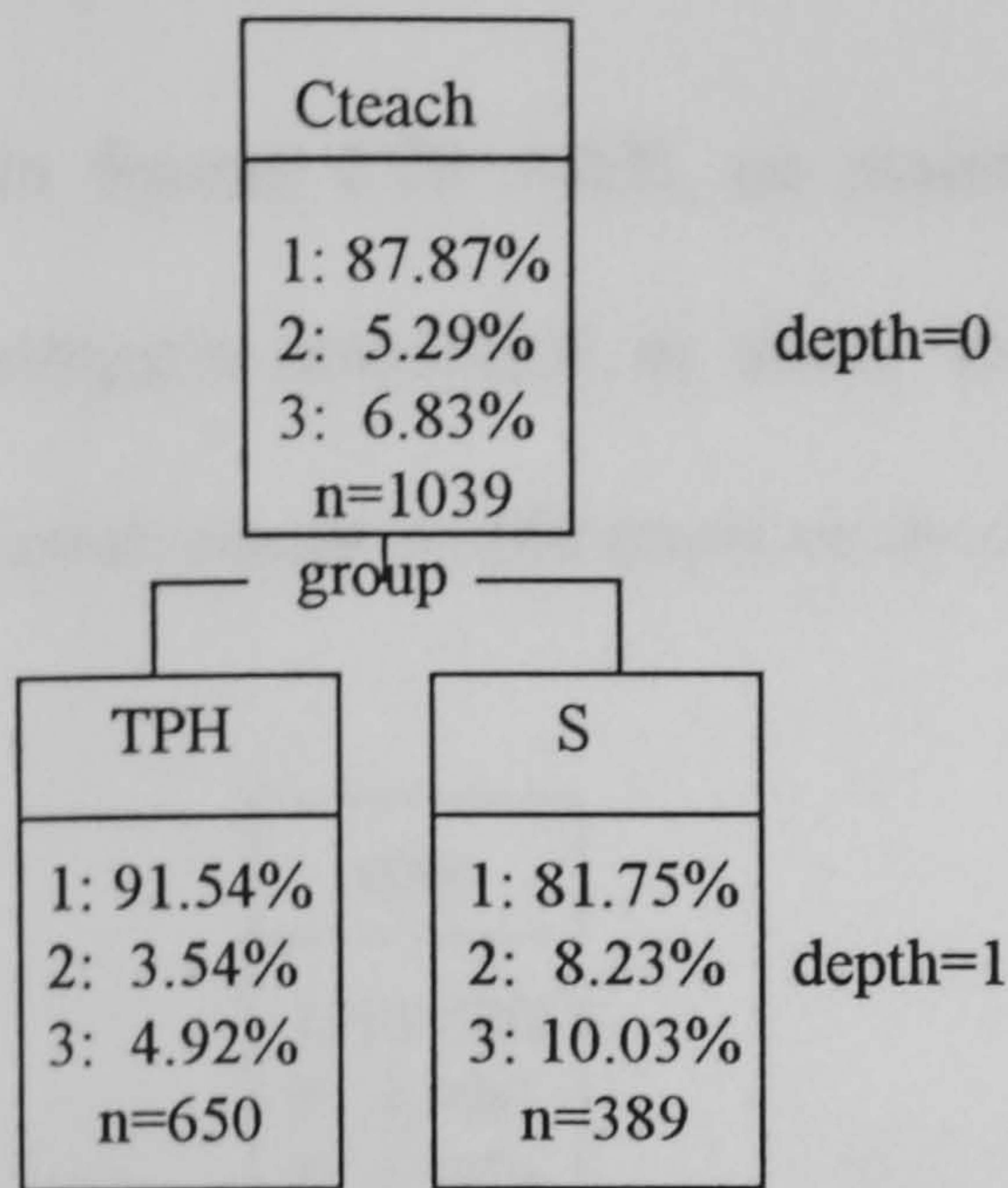


Figure 6.26 B: Involvement of students in health education.

**Involving teachers in health education.**

Table 6.27 A&B showed a rather interesting finding. CHAID has merged teachers, parents and health promoters together in one group whereas students in another group. Statistical differences are noticed between the respondents. Teachers, parents and health promoters were more likely to agree with involvement of teachers in health education.



LR chi-square=21.28 df=2 prob=0.00017 (adj)

Figure 6.27 A: Involving teachers in health education.

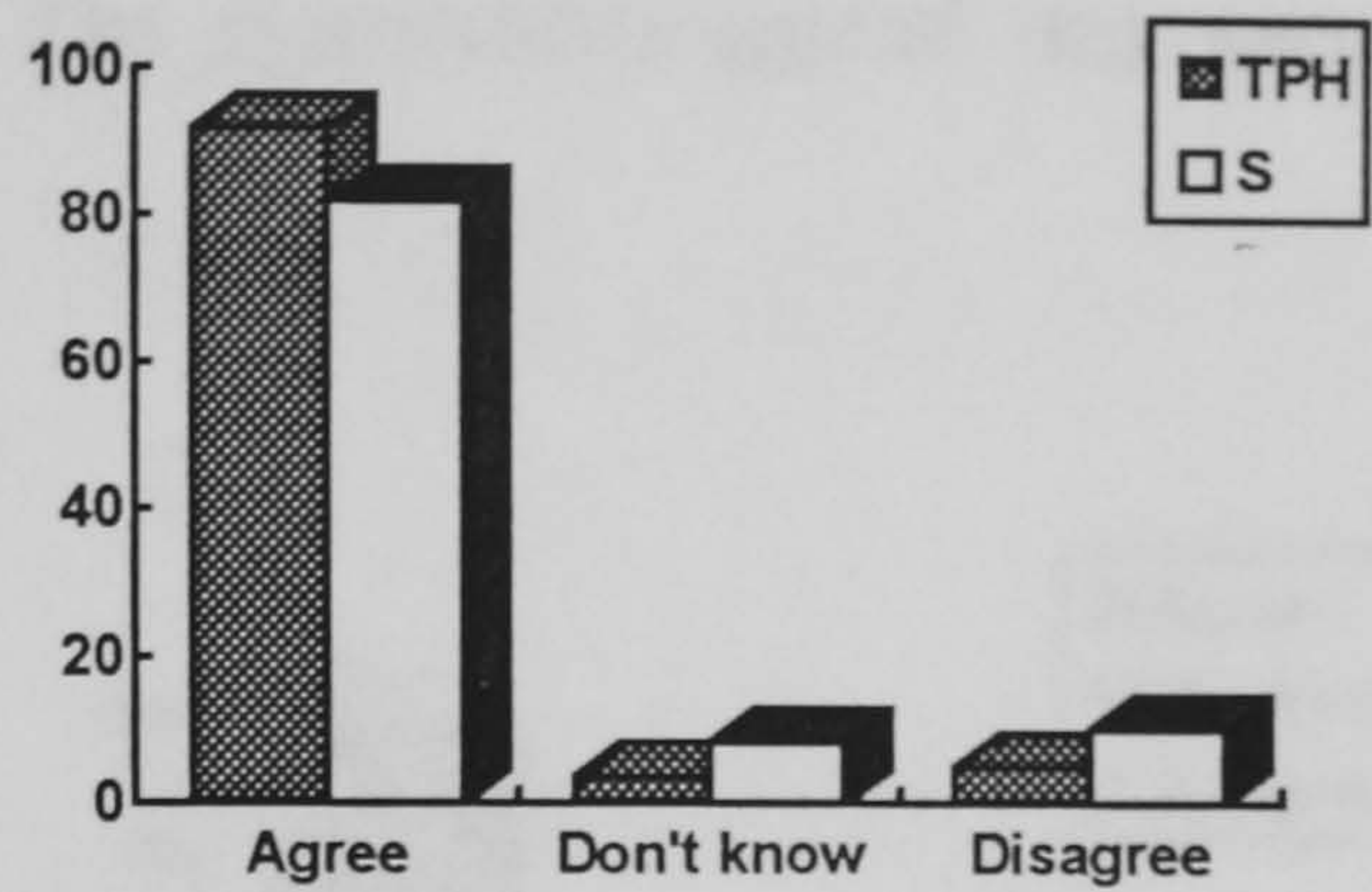


Figure 6.27 B: Involving teachers in health education.

### Involving health educators in health education in food safety.

As expected all the participants felt that involving health educators in food hygiene education would improve food safety. No statistical differences were detected between the subjects, as shown in figures 6.28 A&B .

che	
1: 96.05%	
2: 2.50%	
3: 1.44%	
n=1039	

Figure 6.28 A: Involving health educators in health education of food hygiene.

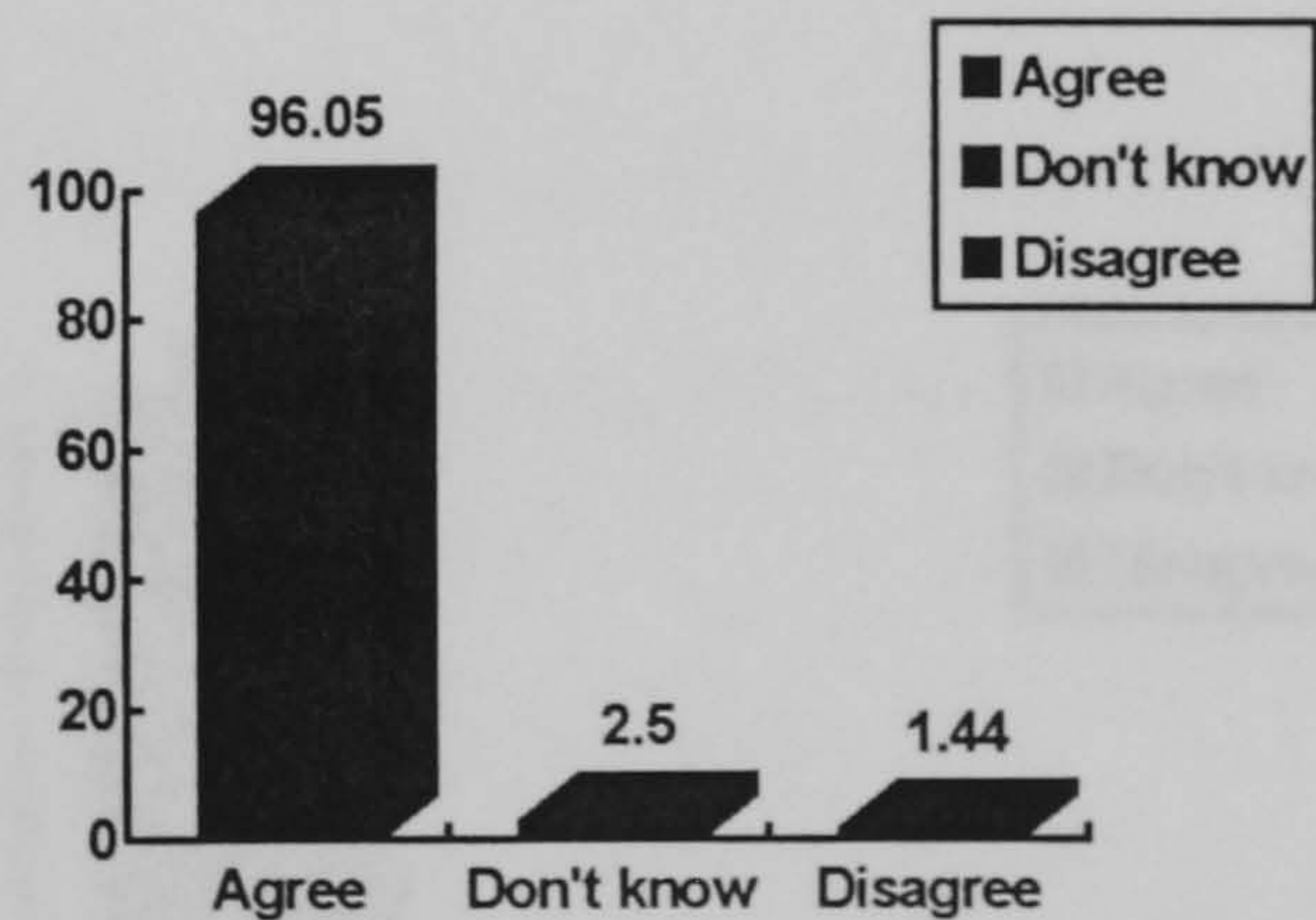


Figure 6.28 B: Involving health educators in health education of food hygiene.

### Involving parents in health education to control food poisoning.

In figures 6.29 A&B, no statistically significant differences were noticed. All the subjects responded at about the same rate. The respondents agreed that parents involvement would improve food safety.

cpar	
1:	91.53%
2:	4.09%
3:	4.38%
n=1027	

Figure 6.29 A: Involving parents in health education.

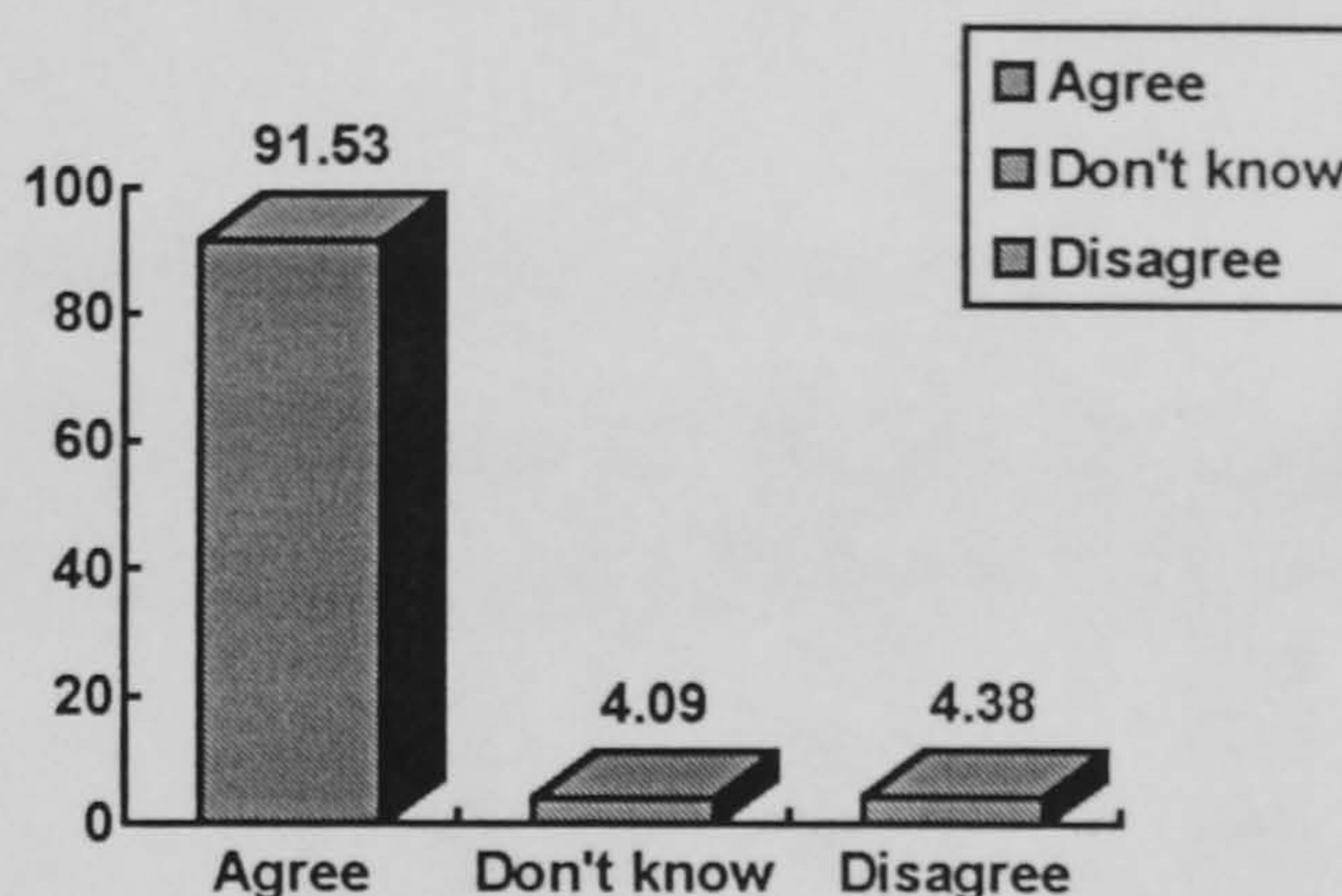


Figure 6.29 B: Involving parents in health education.

### Involving doctors in health education.

All the subjects agreed that doctors should be involved in health education activities to insure food safety. No statistically significant differences were noticed between the respondents, as shown in Figures 6.30 A&B.

cdoc	
1:	97.69%
2:	1.16%
3:	1.16%
n=1037	

Figure 6.30 A: Involving doctors in health education.

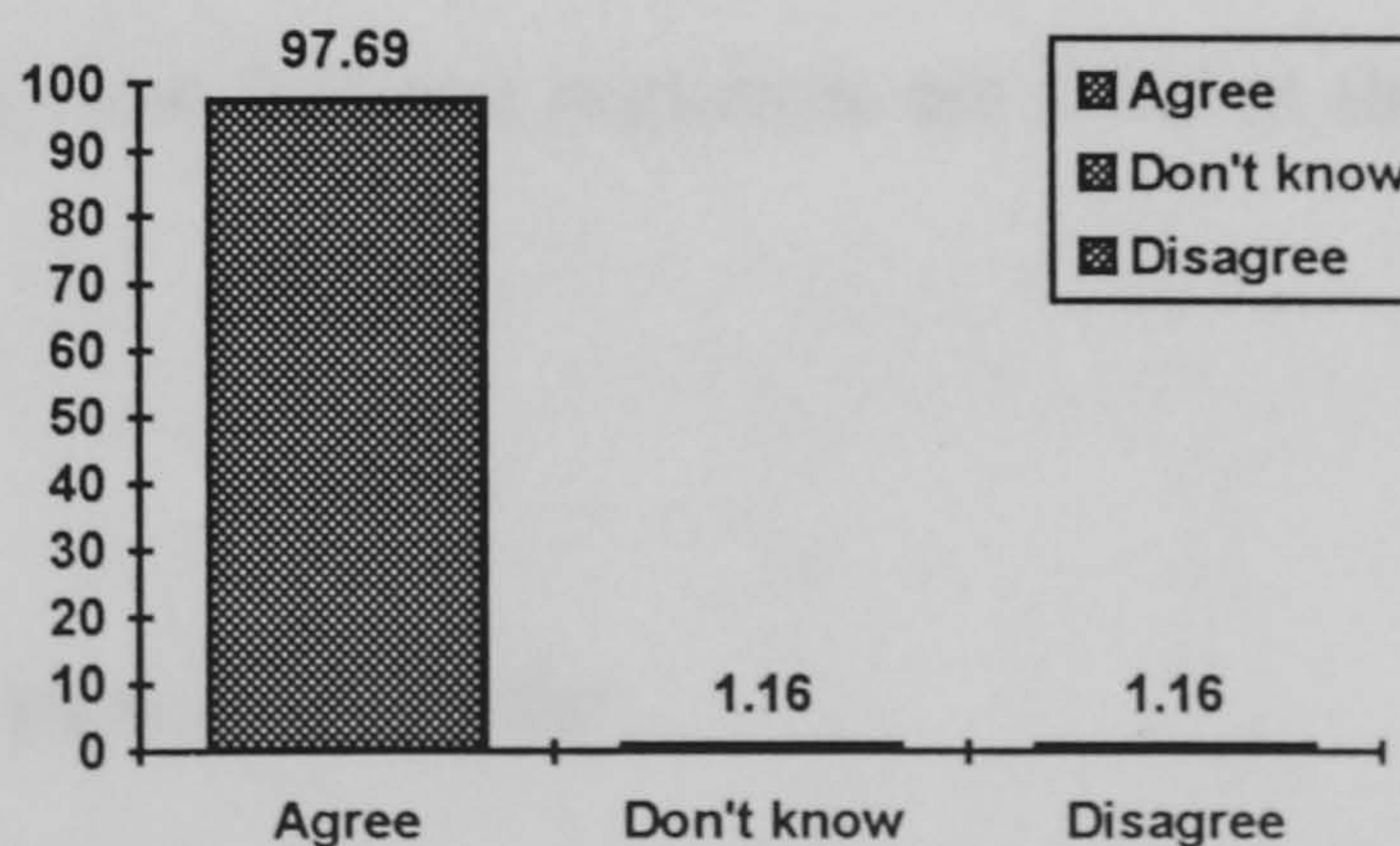


Figure 6.30 B: Involving doctors in health education.

### Responses to the open-ended question on Community & resources involvement:

The subjects have provided 27 answers for this question. Only the 10 most frequent ones are given in Table 6.22. The respondents considered involvement of mass media, food workers and the public in health education activities to be at the top of priorities for action.

Table 6.22. Responses to the open-ended question on community and resource involvement.

No.	Responses	Count	Pct of Responses	Pct of Cases
1.	Mass media	73	19.5	25.2
2.	Food workers	62	16.5	21.4
3.	Everybody	42	11.2	14.5
4.	Friends	29	7.7	10.0
5.	House-maids & servants	25	6.7	8.6
6.	Family	23	6.1	7.9
7.	Mothers	22	5.9	7.6
8.	Cold stores & restaurant's owners	14	3.7	4.8
9.	Religious leaders	13	3.5	4.5
10.	Health inspectors	12	3.2	4.1

### G. Responses to the open-ended questions:

In the following three tables, only the 10 mostly reported answers are given in a descending order of their frequencies. The most frequent responses are listed at the top and the least at the bottom of the tables.

### Responses to the open-ended question on perceived needs:

The subjects felt that these are the problems which affect their well-being and which should be involved in any health promotion programmes (Table 6.23). Note that

respondents considered food poisoning as the most serious threat followed by nutrition and others as shown in Table 6.23.

Table 6.23. Responses to the open-ended question on perceived needs.

Responses	Count	Pct of Responses	Pct of Cases
1. Food hygiene/poisoning	212	20.0	34.8
2. Nutrition	170	16.0	27.9
3. Personal & general hygiene	147	13.8	24.1
4. Health education	99	9.3	16.3
5. Communicable diseases	66	6.2	10.8
6. Smoking	59	5.6	9.7
7. Environmental health	53	5.0	8.7
8. Sex education	41	3.9	6.7
9. Drugs	35	3.3	5.7
10. Health behaviour	13	1.2	2.1

#### Responses to the open-ended question on perceived barriers:

Scarcity of resources, lack of qualified personnel, carelessness of schools and the MoE and lack of interest as per students emerged as the most important barriers to health promotion in schools (Table 6.24). For this question, 20 barriers were reported by the subjects.

Table 6.24. Responses to the open-ended question on perceived barriers.

No.	Responses	count	Pct of Responses	Pct of Cases
1.	Lack of proper facilities	267	25.0	39.3
2.	Lack of qualified personnel	222	20.8	32.7
3.	Carelessness & neglect by schools & MoE	137	12.8	20.2
4.	Lack of interest as per students	118	11.0	17.4
5.	There is no problem (barrier)	101	9.4	14.9
6.	Tight school schedules	85	8.0	12.5
7.	Lack of co-ordination between schools and health authorities	40	3.7	5.9
8.	Parents are not co-operative	28	2.6	4.6
9.	Health programmes are unknown	24	2.2	3.5
10.	Teachers & social workers are busy	22	2.1	3.2



## Responses to the open-ended question (subjects' comments):

Table 6.25 was meant to involve the community and listen to their suggestions and comments which might be valuable for future health promotion. The subjects suggested that health education should be introduced in schools. This was highly ranked as shown in the table. These responses are extremely important and should be considered by health and educational authorities when designing health promotion activities.

Table 6.25. Comments given by the subjects.

No.	Responses	Count	Pct of responses	Pct of Cases
1.	Introduce health education in schools	260	23.9	43.6
2.	Provide a full time health inspector in schools for continuous inspection of canteens	117	10.7	19.6
3.	Provide health education through mass-media	99	9.1	16.6
4.	Provide healthy foods to students	71	6.5	11.9
5.	No comments	69	6.3	11.6
6.	Increase supervision & examination of food workers	63	5.8	10.6
7.	Strengthen the inspection of food services establishments	60	5.5	10.1
8.	Allocate a health educator in schools	56	5.1	9.4
9.	Introduce methods of controlling food poisoning in schools	35	3.2	5.9
10.	Involve students and teachers in health education	35	3.2	5.9

#### **6.1.4. Analysis within the groups (Independent variables):**

This section deals with the differences within the groups. As discussed in section 5.7.1., the independent variables are demographic factors such as age, gender, nationality, occupation, school, and sections within the schools. The aim was to study the differences in responses so that target population are identified and relevant health promotional packages are designed for them.

For the purpose of the comparison, re-coding of the variables was done. Re-coding was as follows:

##### **Age:**

This variable has been re-coded into those who are < 40 years old and those who are ≥ 40. This variable was asked to teachers.

##### **Section:**

This variable was related to teachers and students. It has been re-coded into: 1= science and 2= other sections.

## **Education:**

This variable was related to teachers. It was re-coded into two: 1= those have school level qualification and 2= those have university qualification.

Only the statistically significant differences were reported in this section. The statements which were statistically different were:

### **A. Causes of foodborne illnesses:**

#### **Microbes or their toxins are responsible for foodborne illnesses.**

Figures 6.31 A&B through 6.40 A&B reported responses of the subjects to the statements related to causes of foodborne illnesses. Note that CHAID has split the responses into three branches (Figure 6.31 A). The first branch contains the total response rate for students. The second branch reported that there were statistically significant differences in the response rates between government and private schools. Note that students in the private schools were more inclined to agree that microbes or their toxins are responsible for food poisoning. The third branch, however, reported statistically significant differences between males and females in government schools. Females were more likely to agree with the statement.

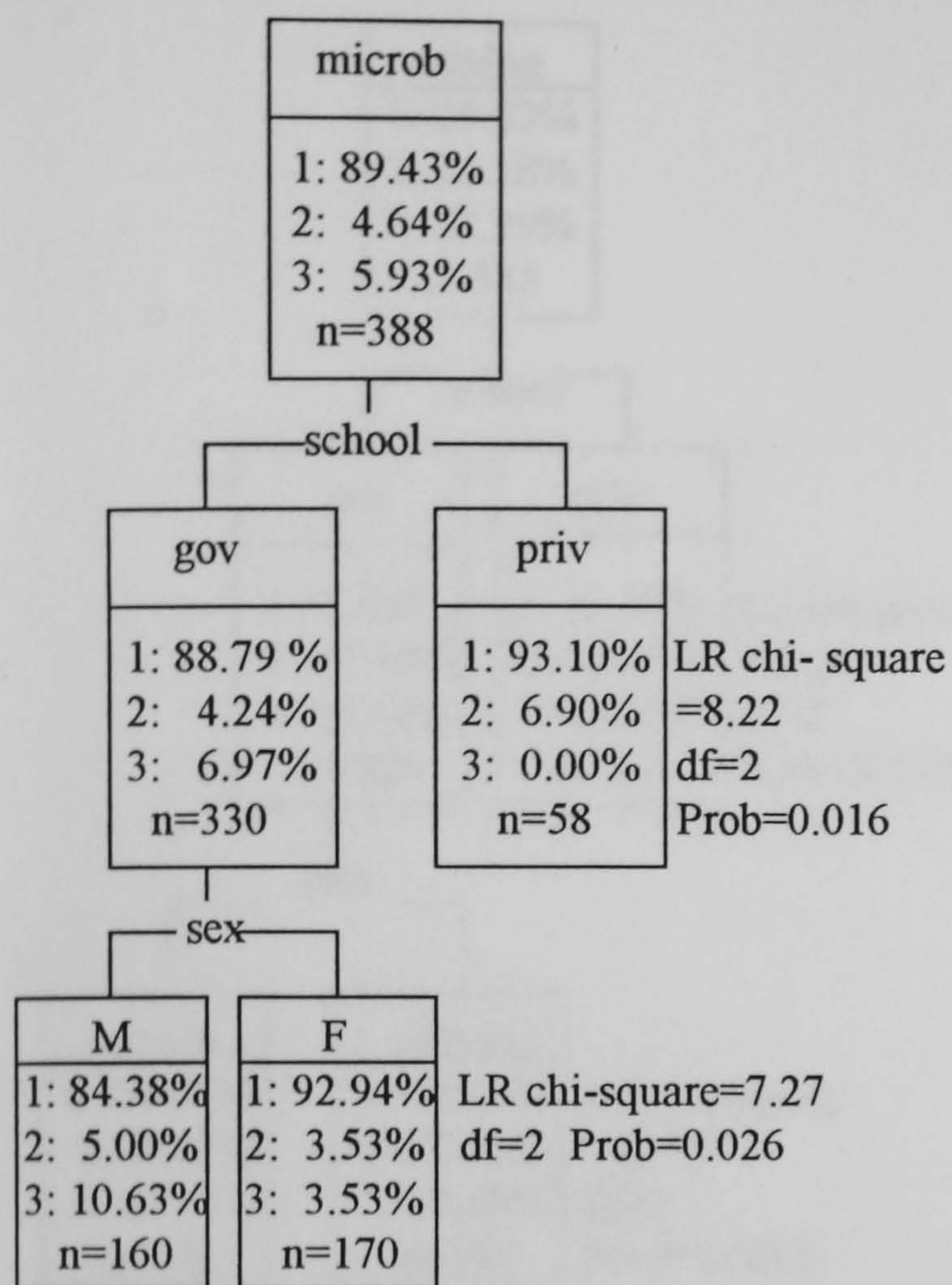
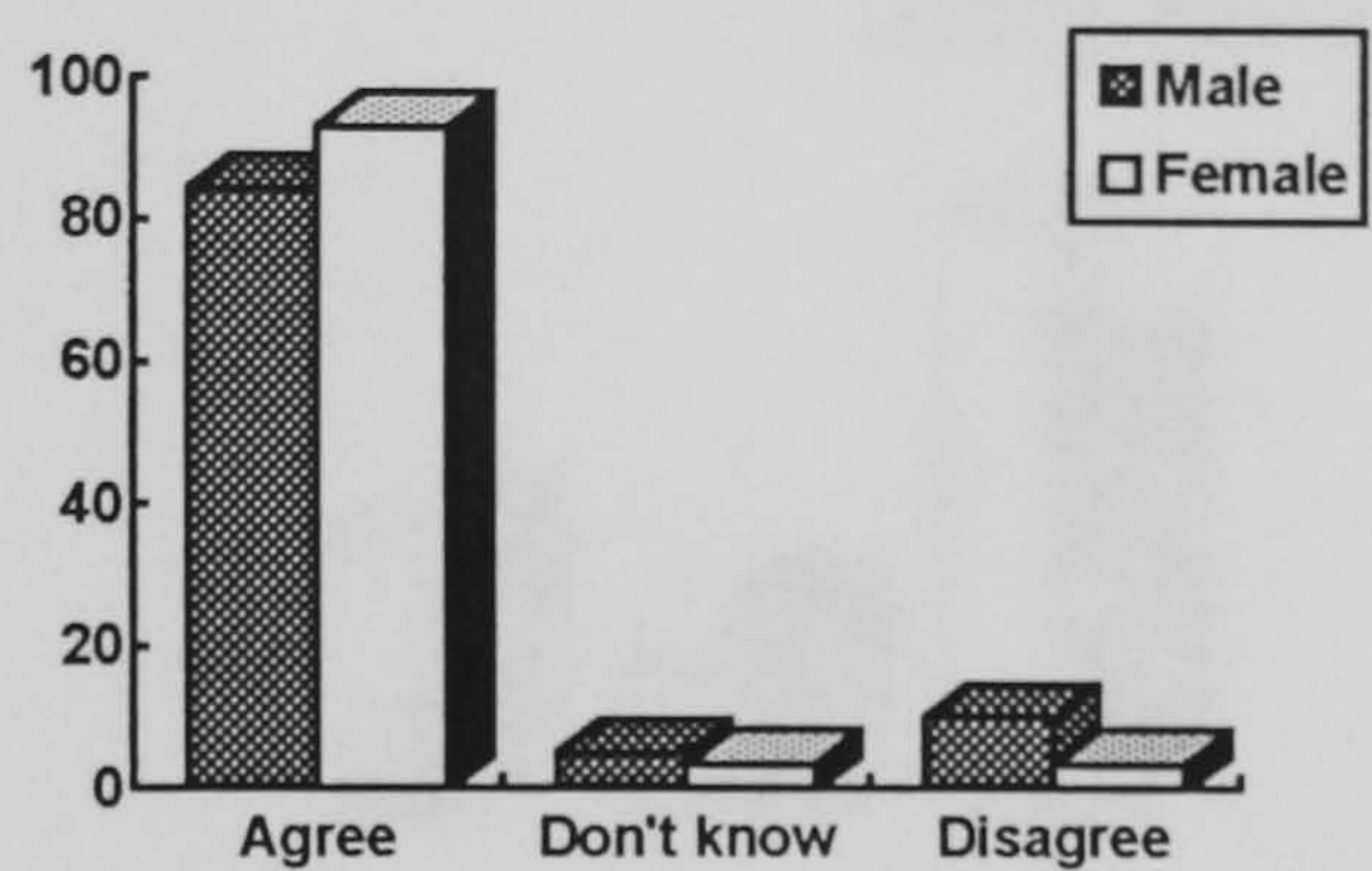
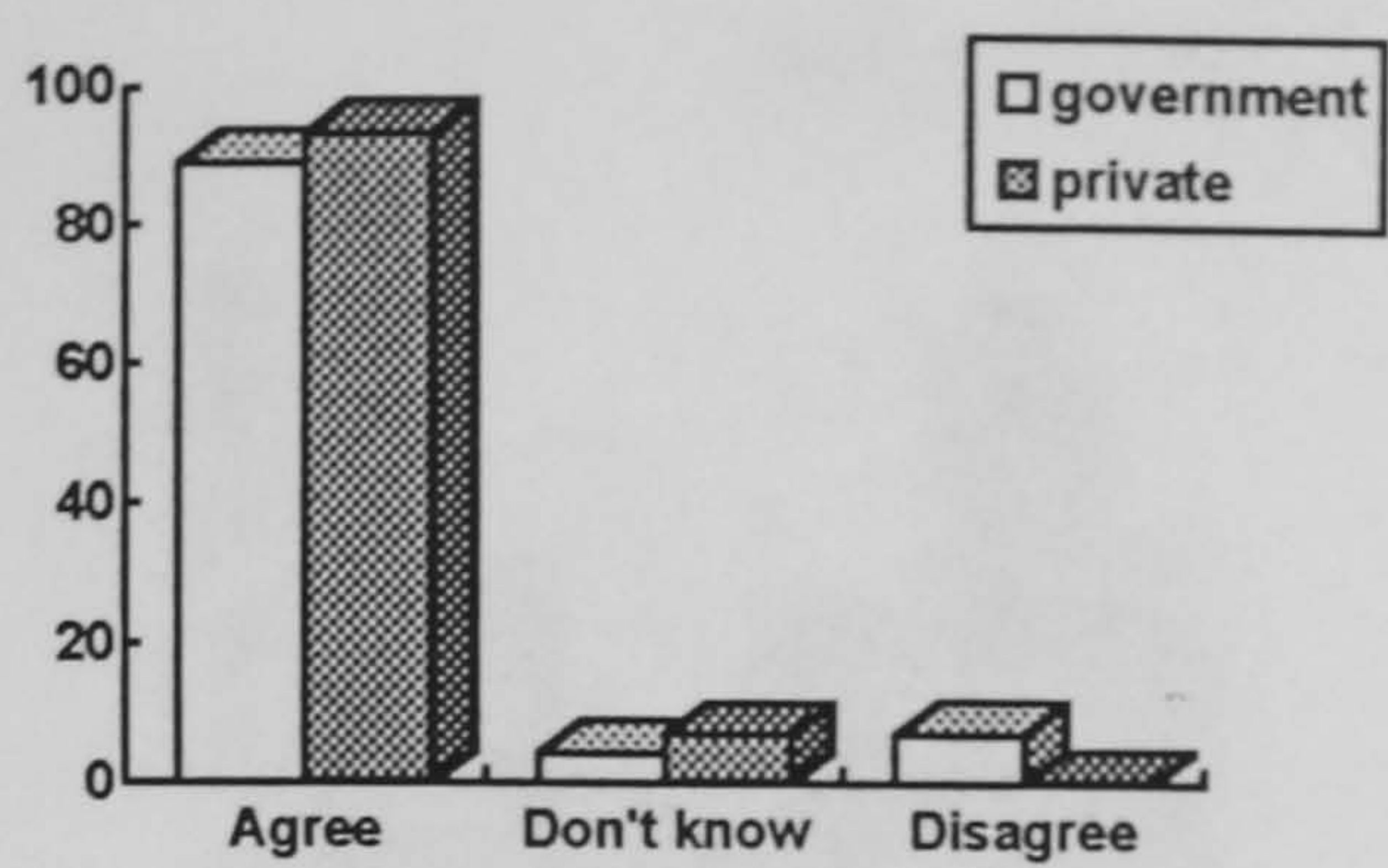


Figure 6.31 A : Food poisoning occurs because of the presence of microbes or their toxins (students)



Figures 6.31 B: Food poisoning occurs because of the presence of microbes or their toxins (students).

**Mixing certain foods at a meal is responsible for foodborne illnesses.**

Statistically significant differences between responses of students in public and private schools have been noticed (Figures 6.32 A &B). It was found that students in the private schools were more likely to believe that mixing certain foods at a meal would lead to food poisoning. It was also found that those in the government schools who believed in this statement were more likely to be non-science students (Figures 6.32 A &B, branch three).

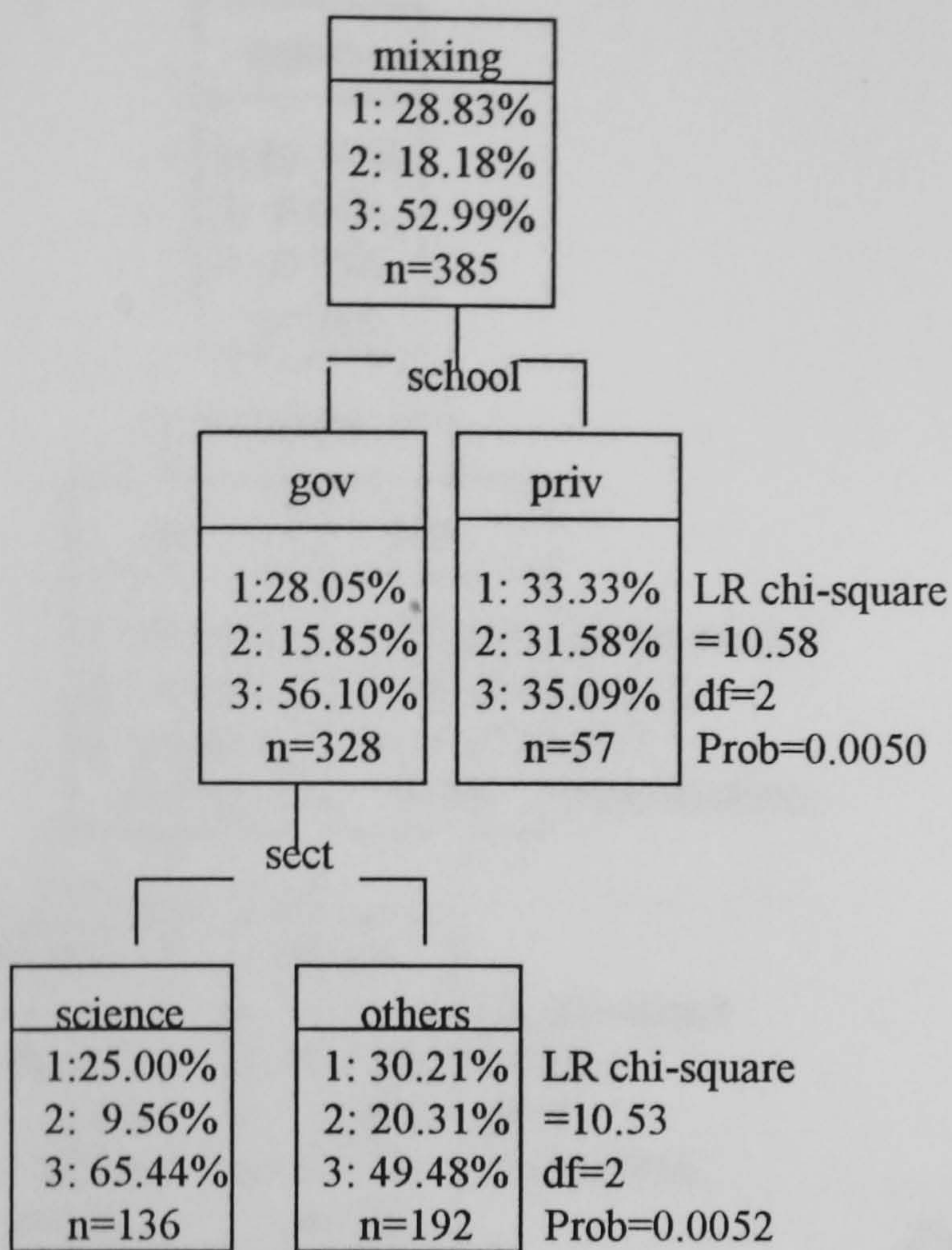
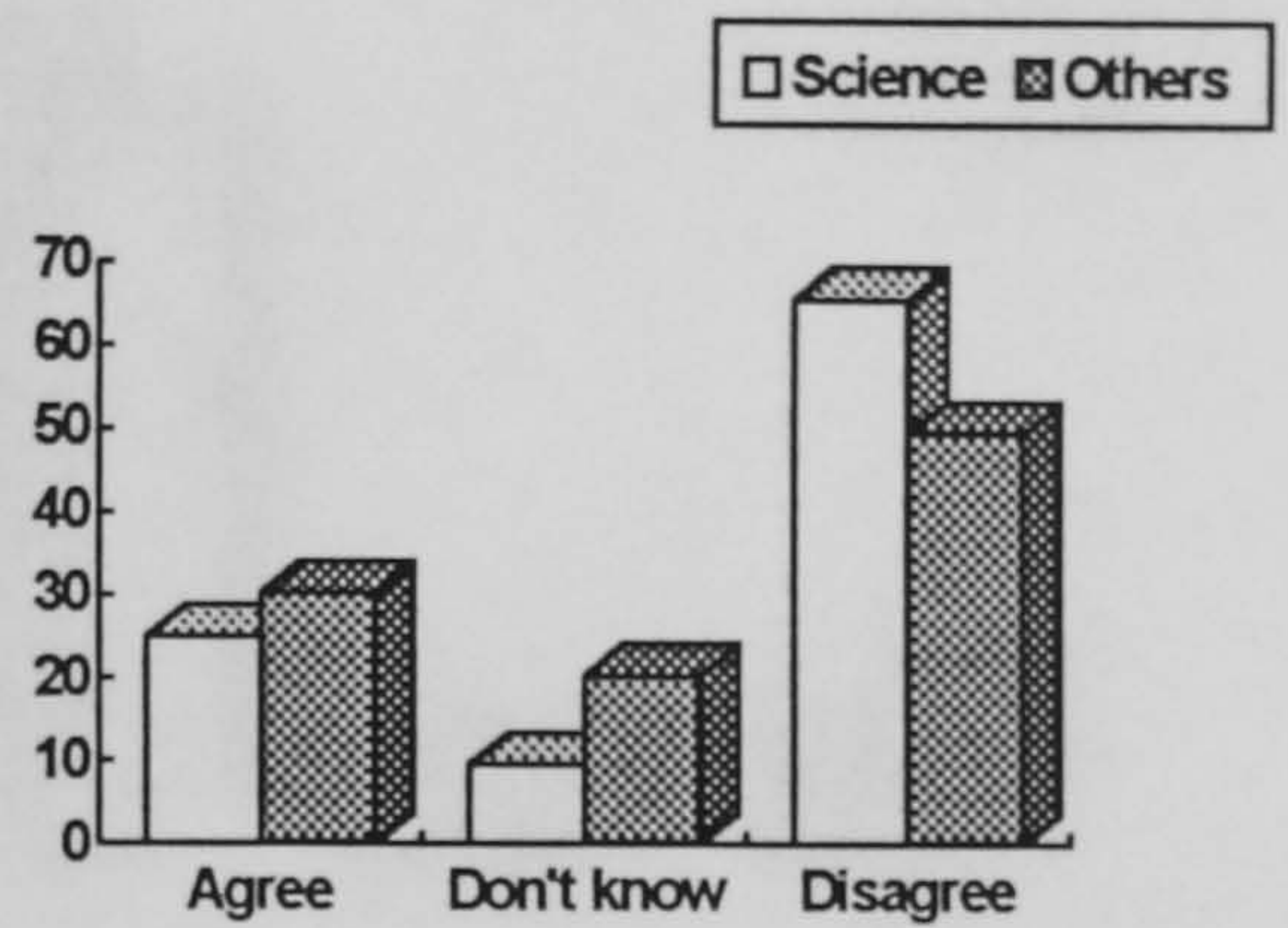
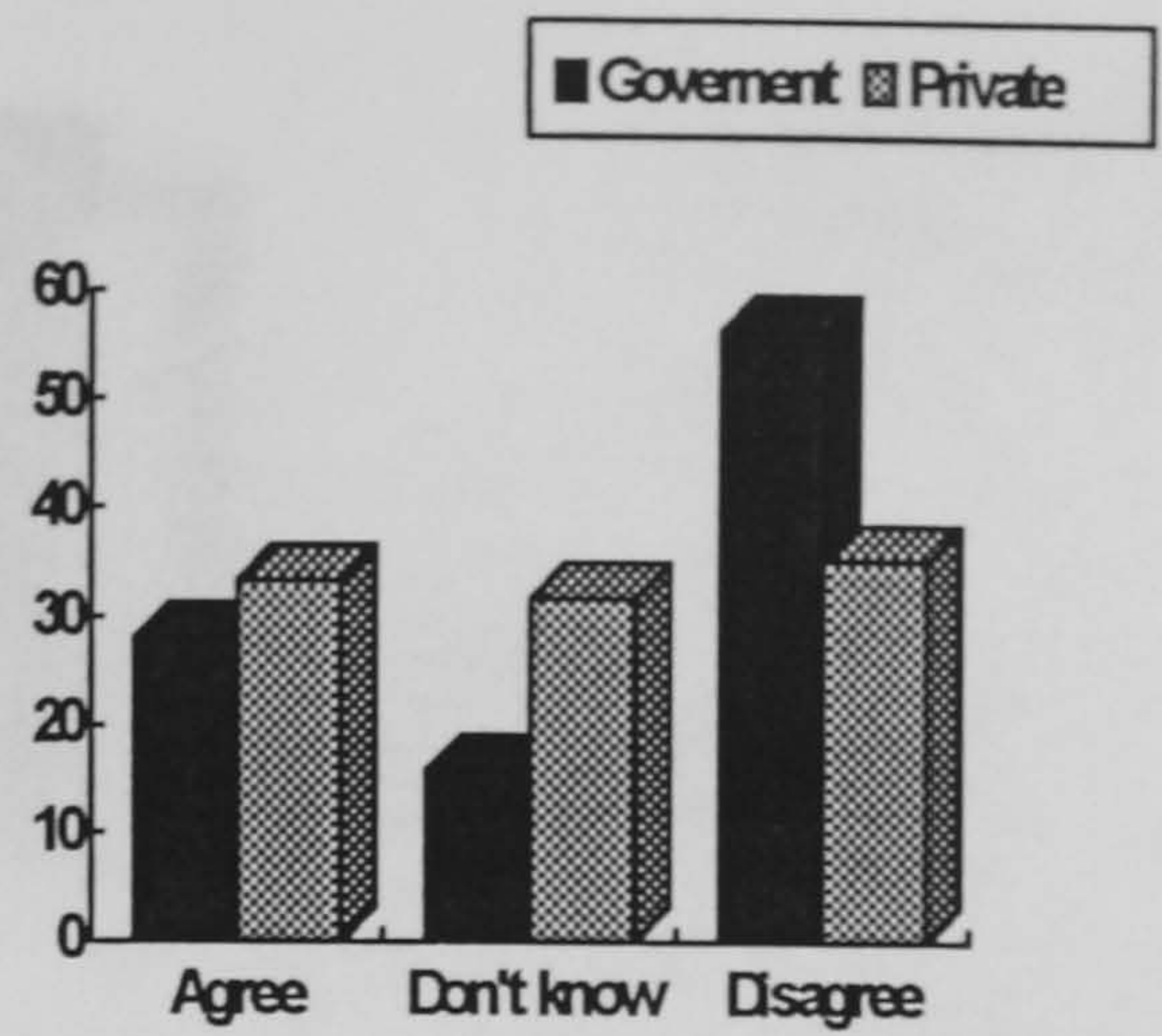


Figure 6.32 A: Mixing certain foods at a meal is responsible for food poisoning (students).



Figures 6.32 B: Mixing certain foods at a meal is responsible for food poisoning (students).

**Food poisoning occurs because of improper supervision of canteens.**

Figures 6.33 A&B reported statistically significant differences between students in the government and private school. Those who believed that food poisoning happens as a result of improper supervision of canteens were more likely to be science students in the government schools.

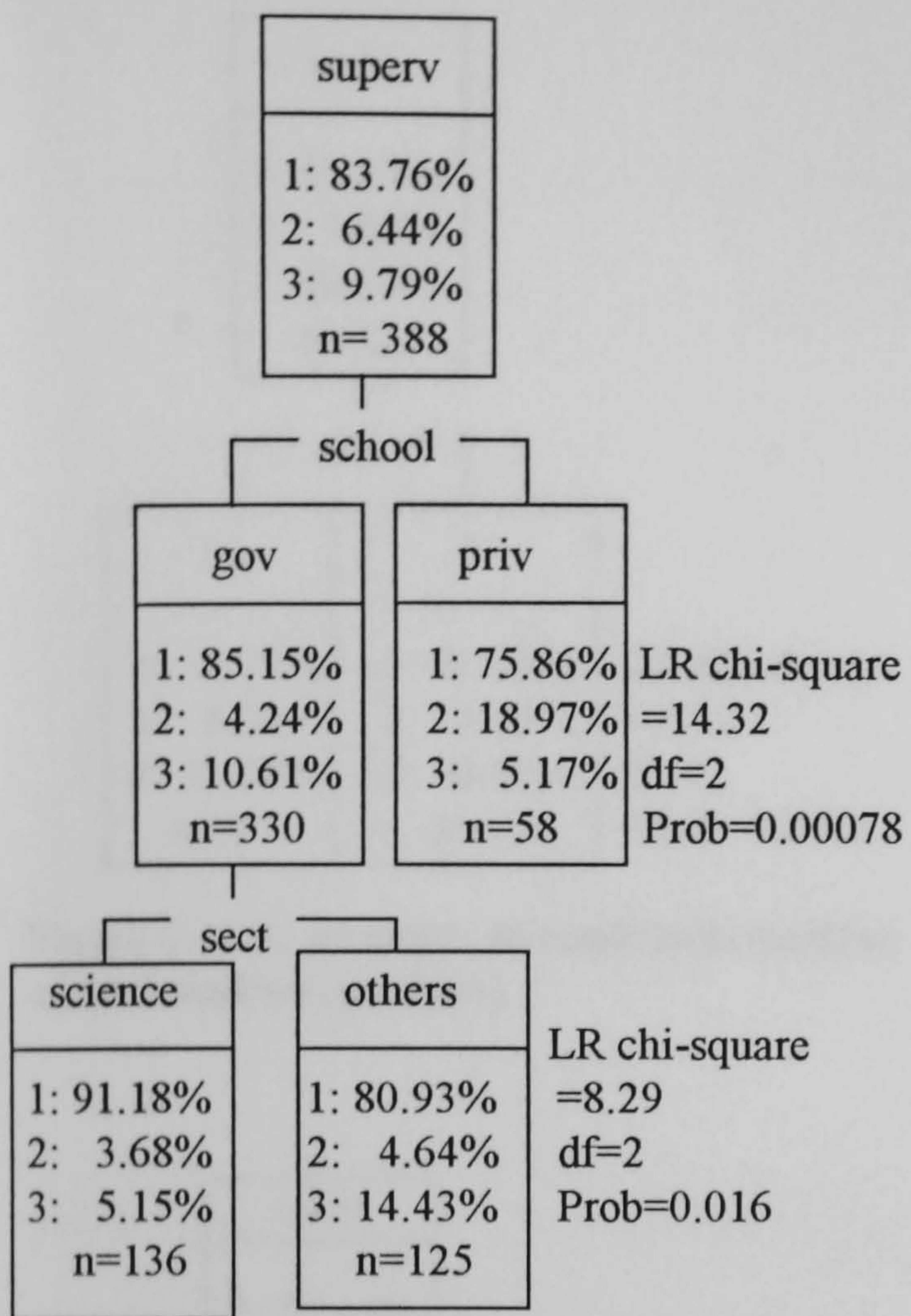
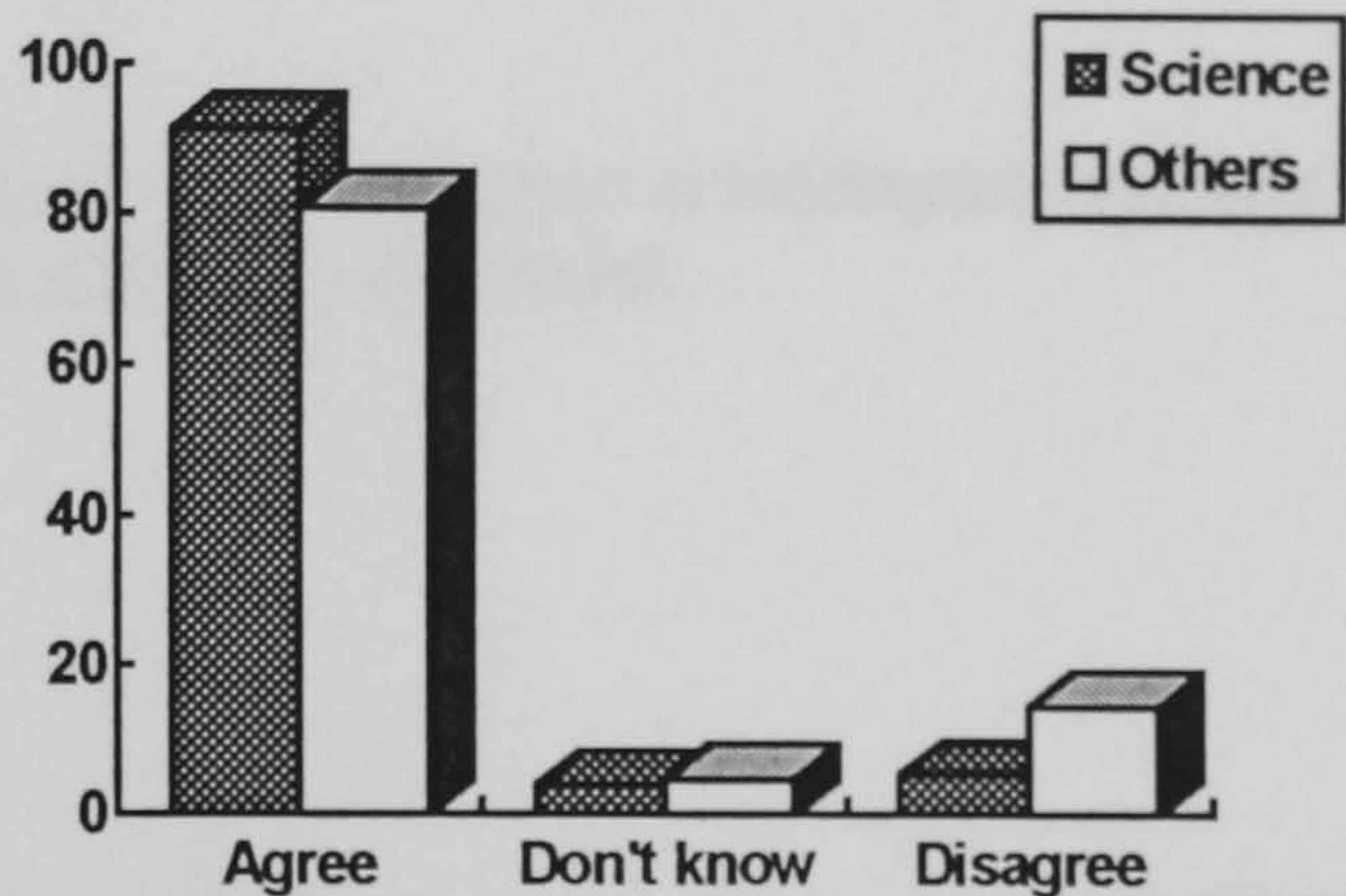
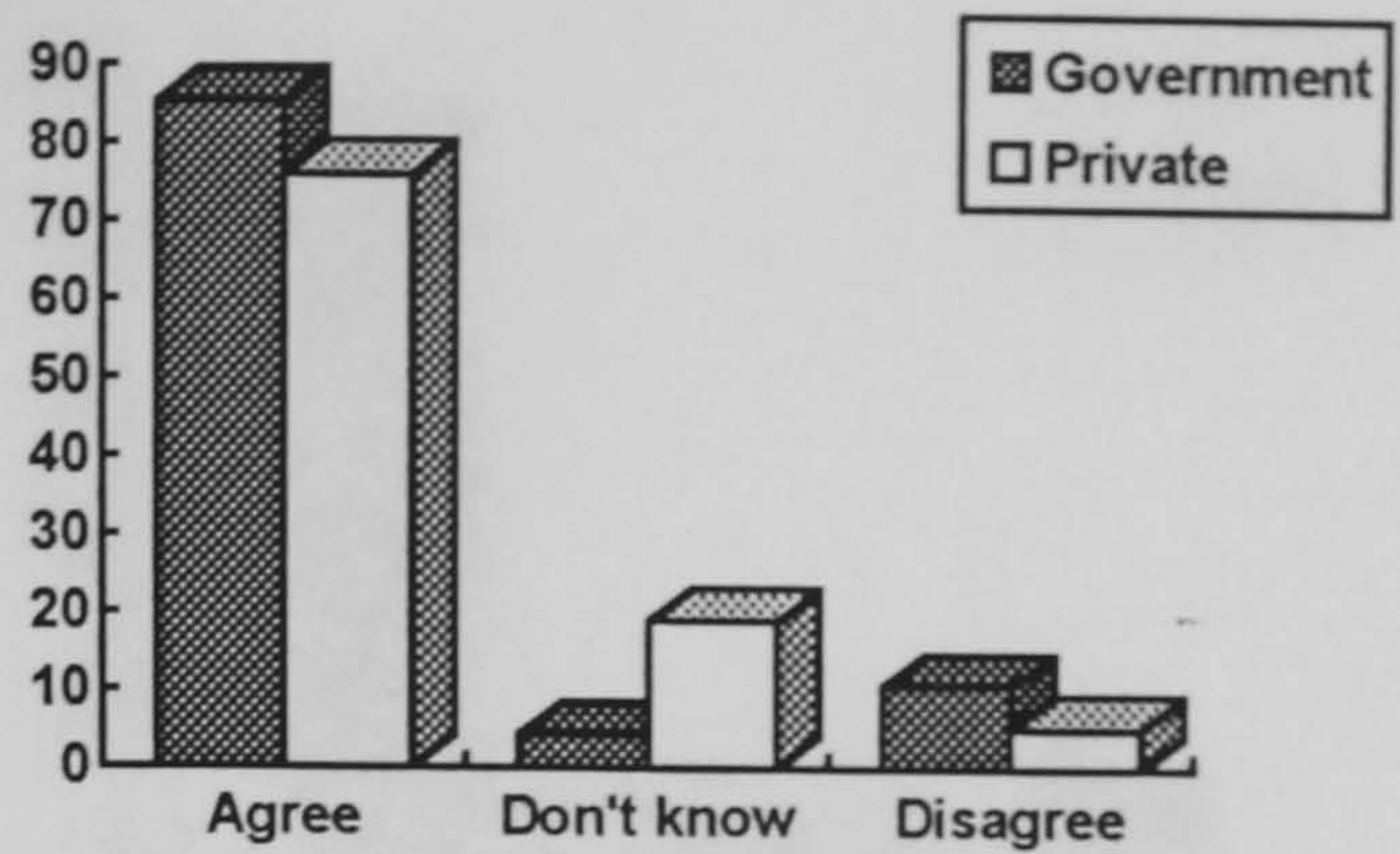


Figure 6.33 A: Food poisoning occurs because of improper supervision of canteens (students).



Figures 6.33 B: Food poisoning occurs because of improper supervision of canteens (students).

**Food poisoning occurs because of inadequate health training of food workers.**

As shown in Figures 6.34 A&B, statistically significant differences were noted between male and female teachers. Females were more likely to agree that inadequate training of food workers is an important factor related to food poisoning. However, Figures 6.35 and 6.36 A&B reported the responses of students and parents to the statement. Note that sciences students and Non-Bahraini parents were more likely to agree with the statement.

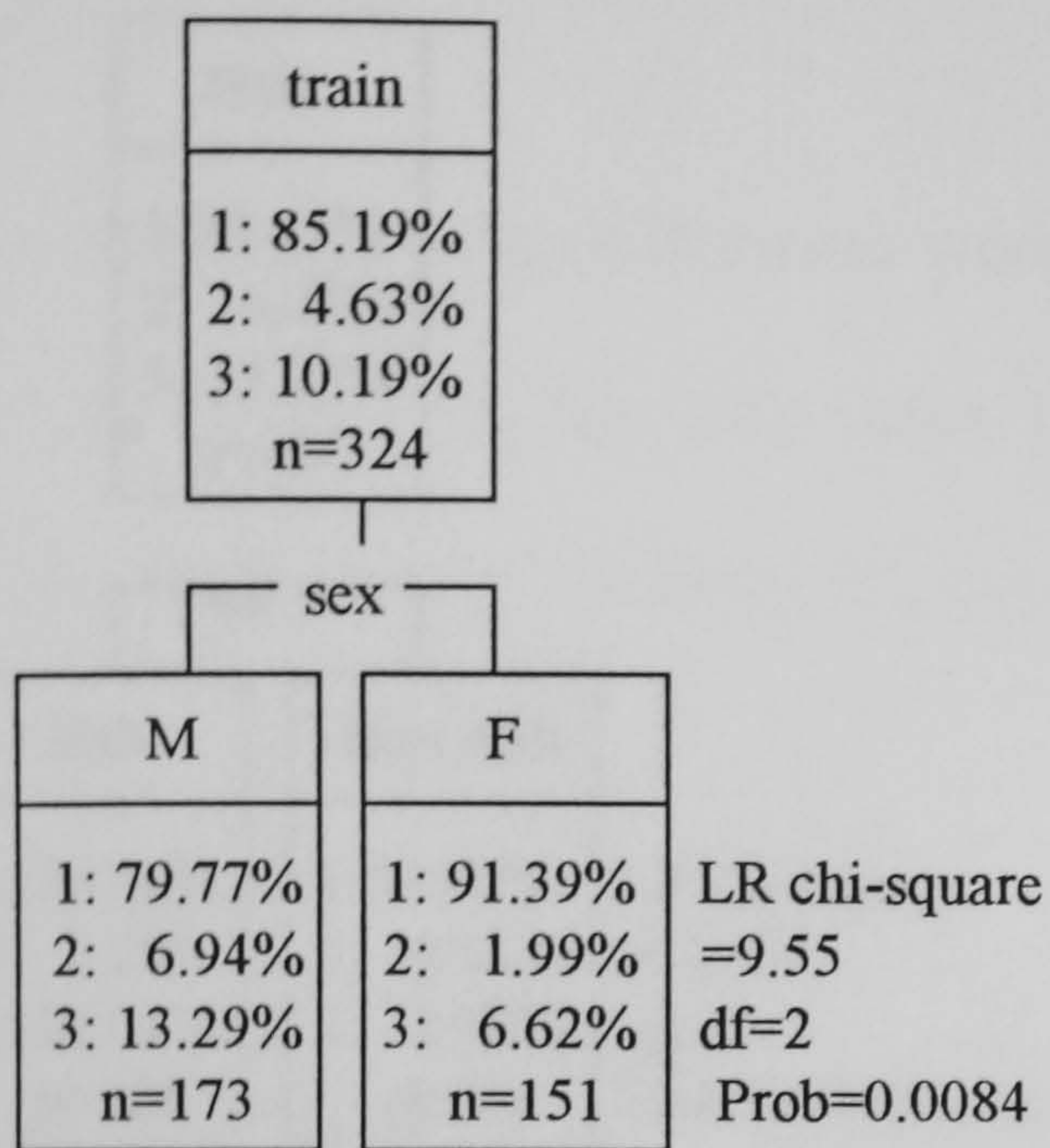


Figure 6.34 A: Response to inadequate training of food workers (teachers).

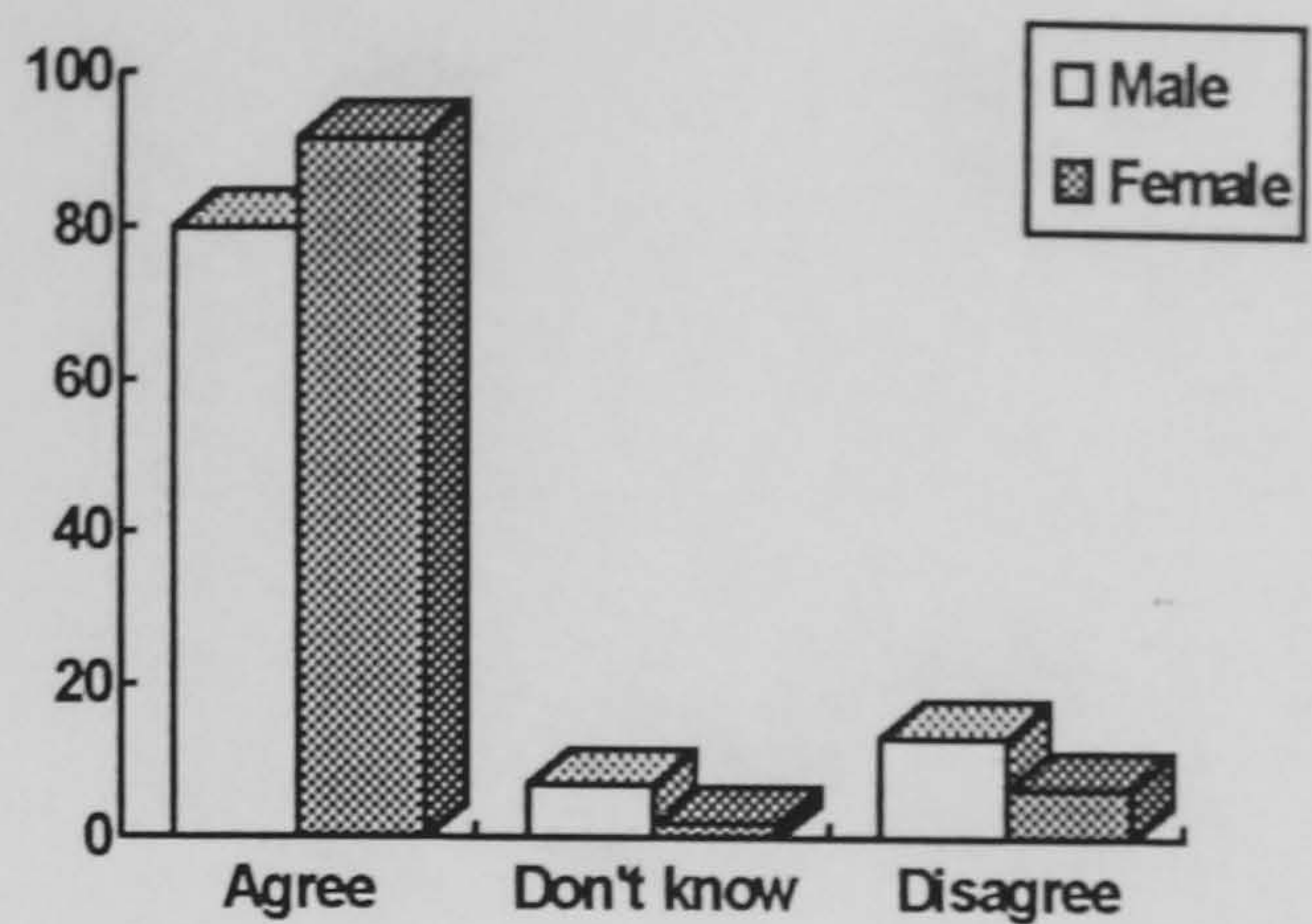


Figure 6.34 B: Response to inadequate training of food workers (teachers).

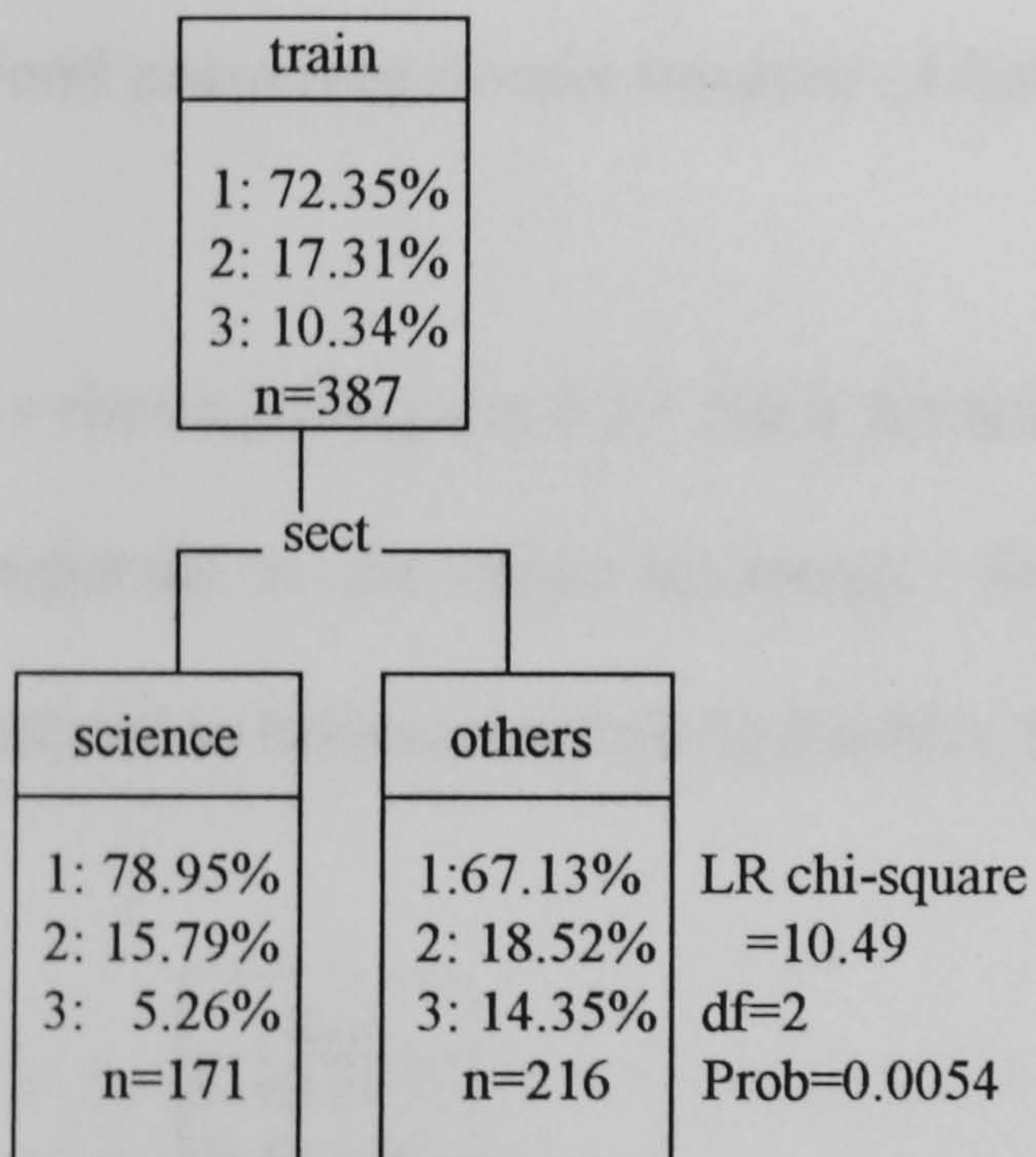


Figure 6.35 A: Response to inadequate training of food workers (students).

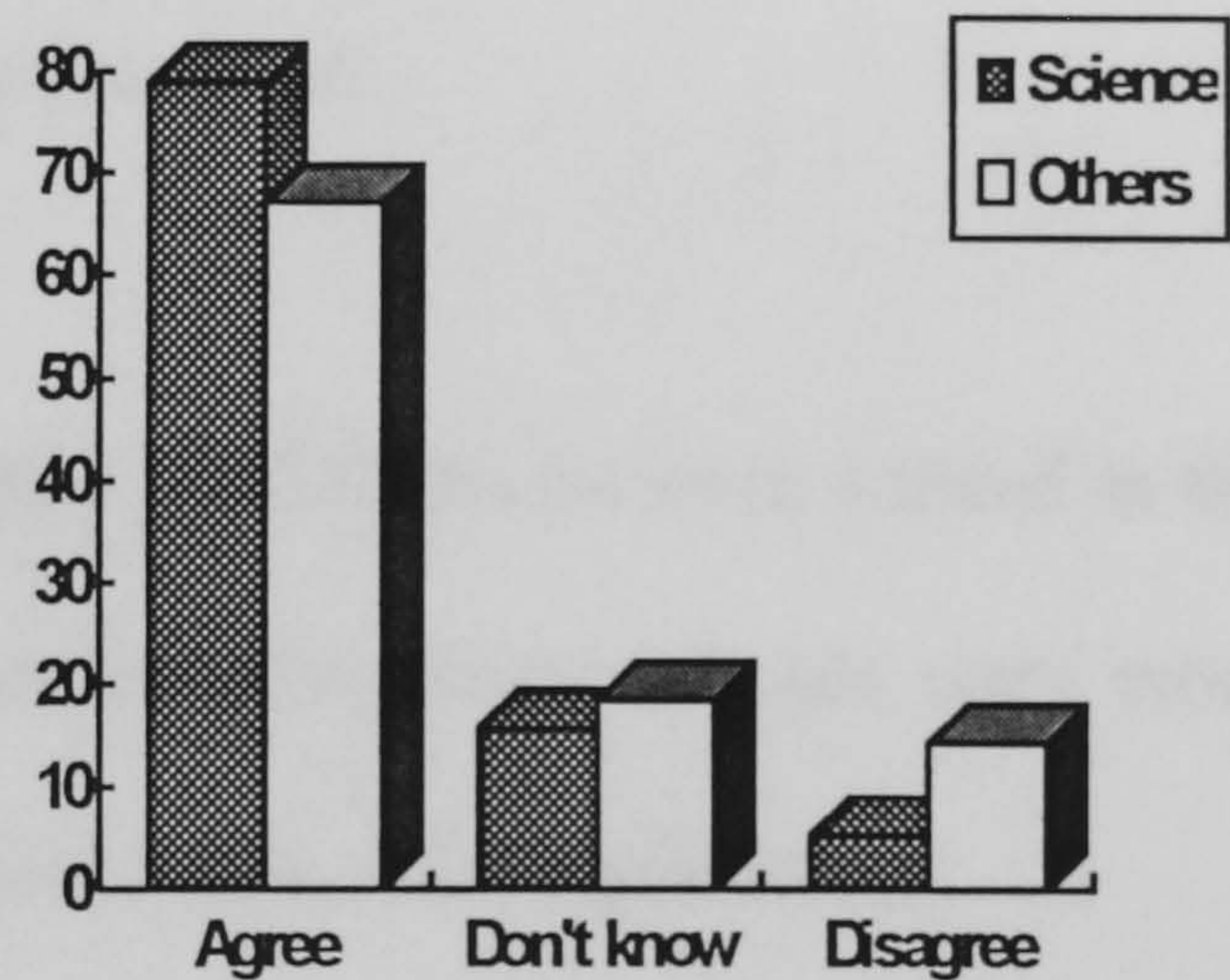


Figure 6.35 B: Response to inadequate training of food workers (teachers).

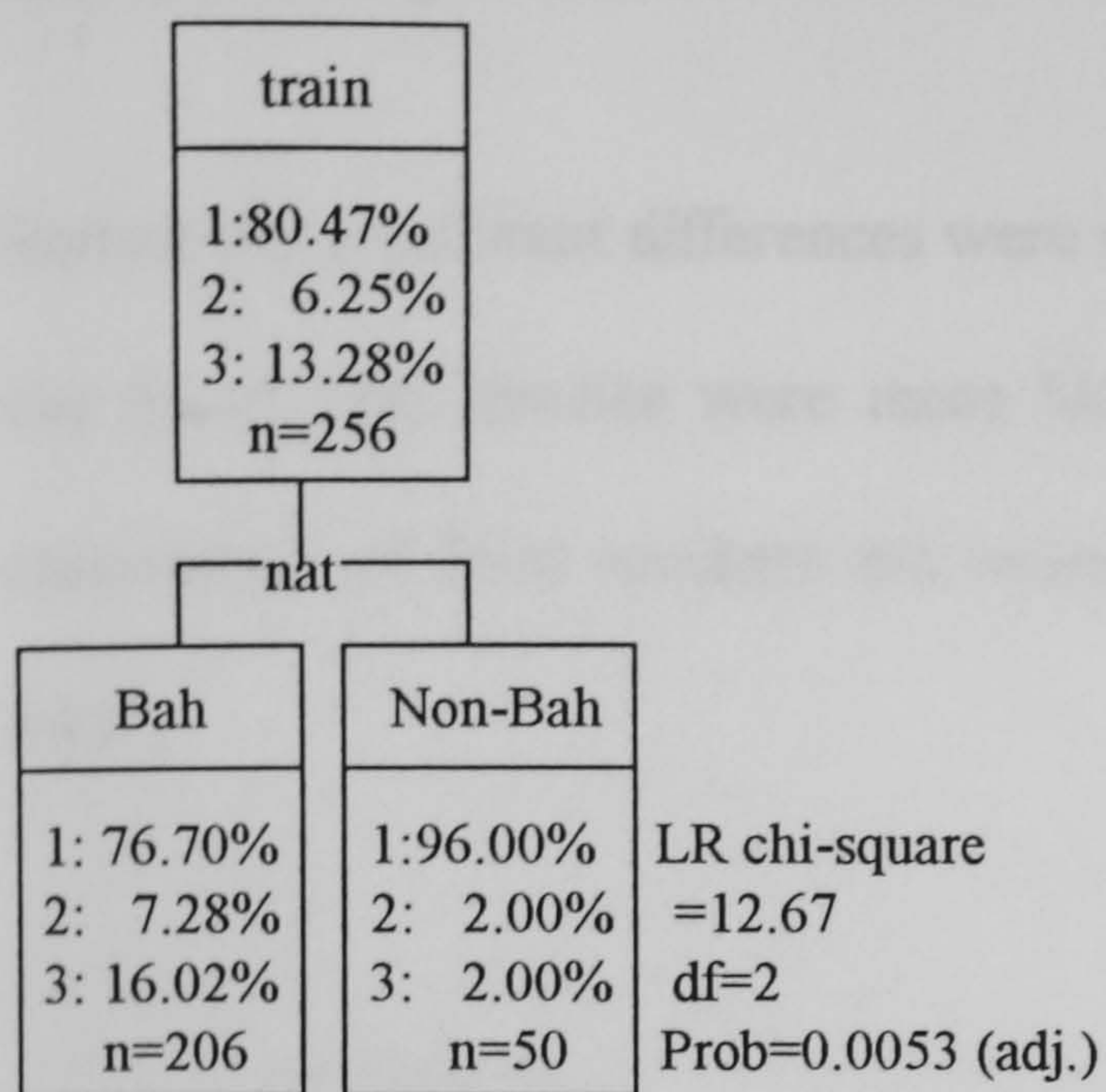


Figure 6.36 A: Response to inadequate training of food workers (parents).

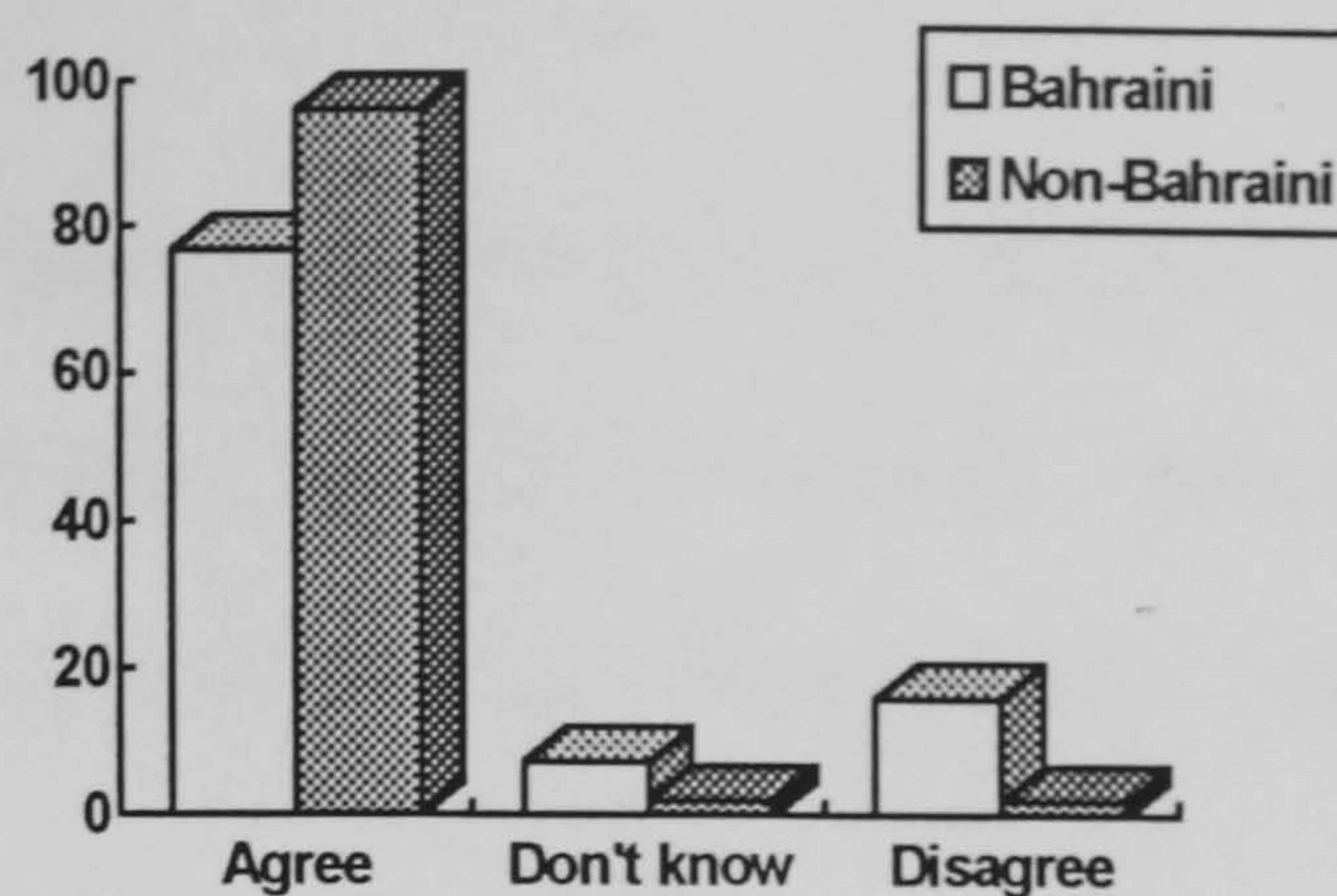


Figure 6.36 B: Response to inadequate training of food workers (parents).

**Food poisoning occurs because of hair falling into food.**

As shown in Figures 6.37 A&B statistically significant differences were noticed in the responses to the above statement. Students in the government schools were more inclined to believe that hair in foods is an important cause of food poisoning.

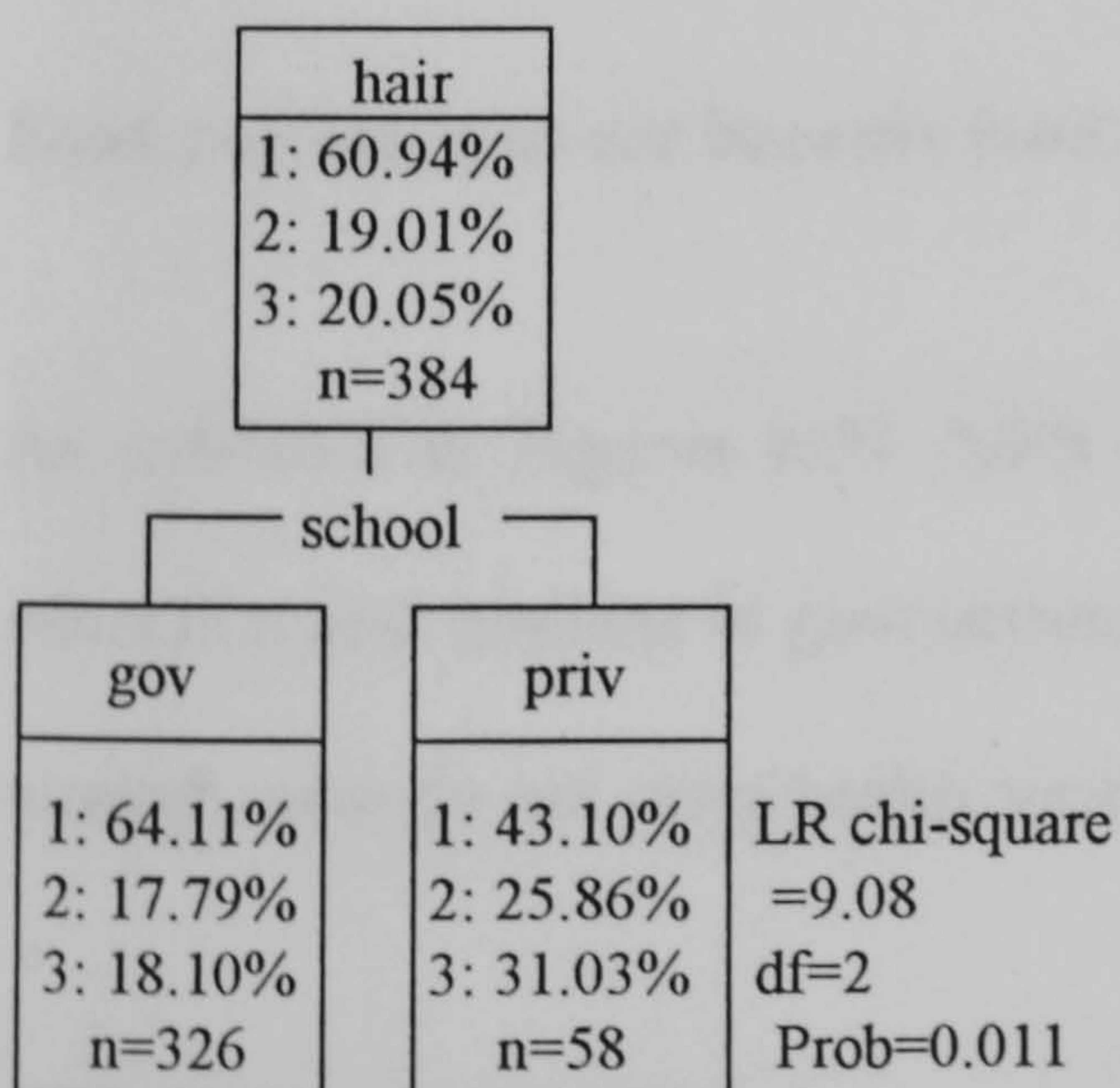


Figure 6.37 A: Hair falling into food cause food poisoning (students).

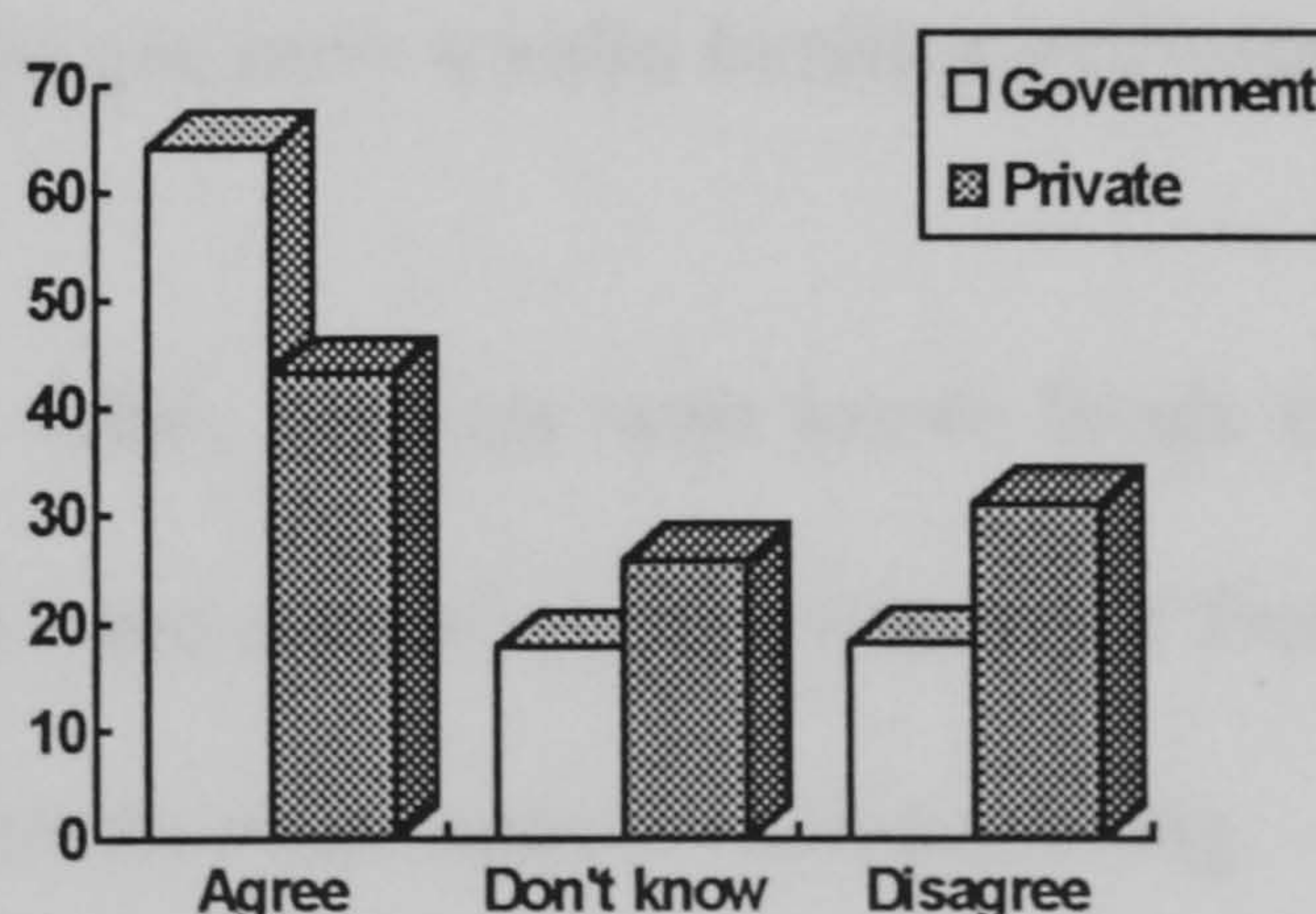


Figure 6.37 B: Hair falling into food cause food poisoning (students).



**Food poisoning occurs because food workers are not periodically examined.**

Statistically significant differences were noticed between male and female students. It was found that females were more likely to believe that lack of periodic medical examination of food workers are important factor in food poisoning (Figures 6.38 A&B).

exam	
1:	74.74%
2:	13.68%
3:	11.58%
n=380	

sex	
M	F
1:	72.38%
2:	11.05%
3:	16.57%
n=181	
1:	76.88%
2:	16.08%
3:	7.04%
n=199	

LR chi-square =9.60  
df=2  
Prob.=0.0082

Figure 6.38 A: Food workers are not periodically examined (students).

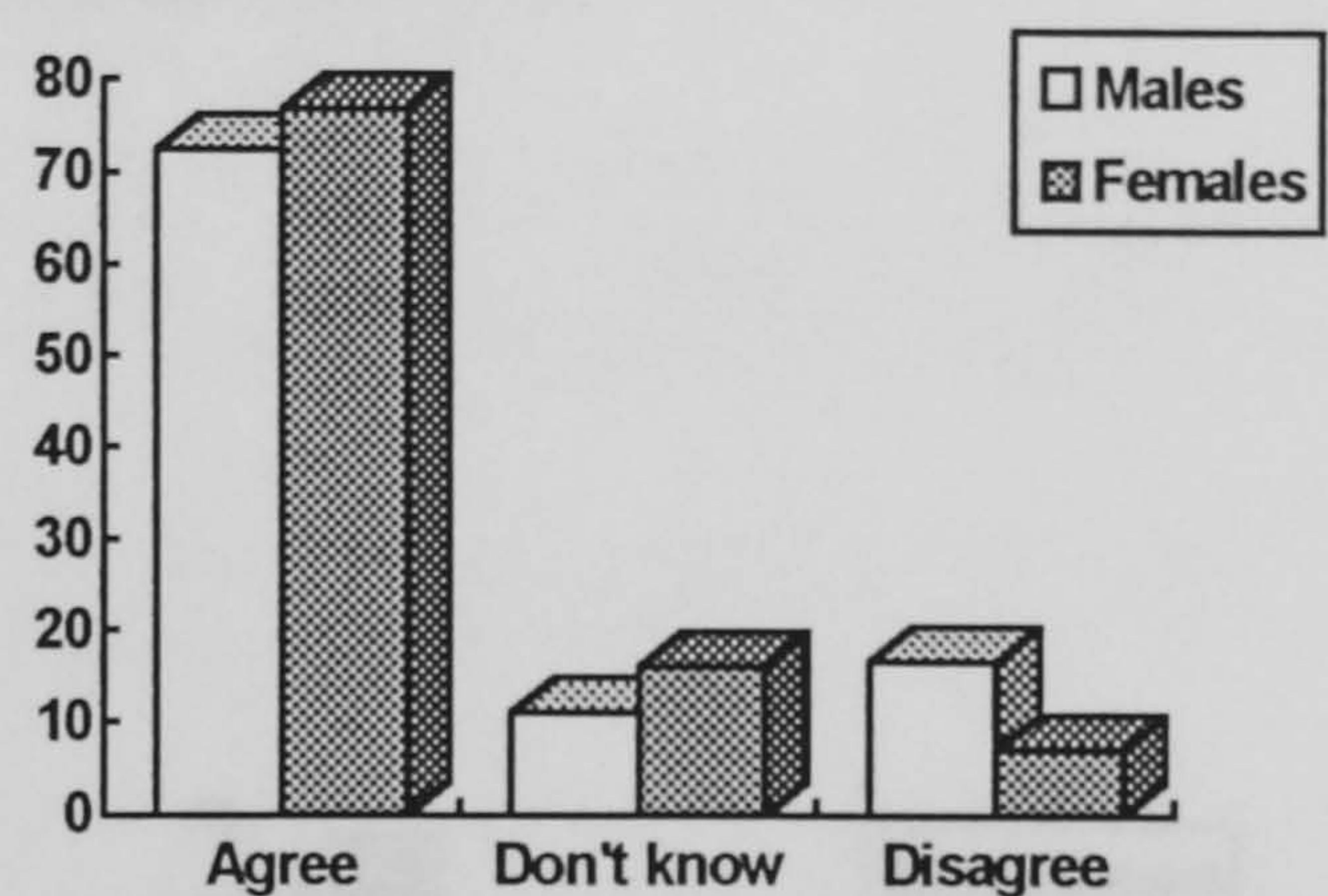


Figure 6.38 B: Food workers are not periodically examined (students).

**Food poisoning occur because food workers do not have a valid health certificate.**

As indicated in Figures 6.39 A&B and 6.40 A&B, teachers with lower levels of education and students in governmental schools were more likely to believe that food workers who do not carry health certificates were the main cause of food poisoning.

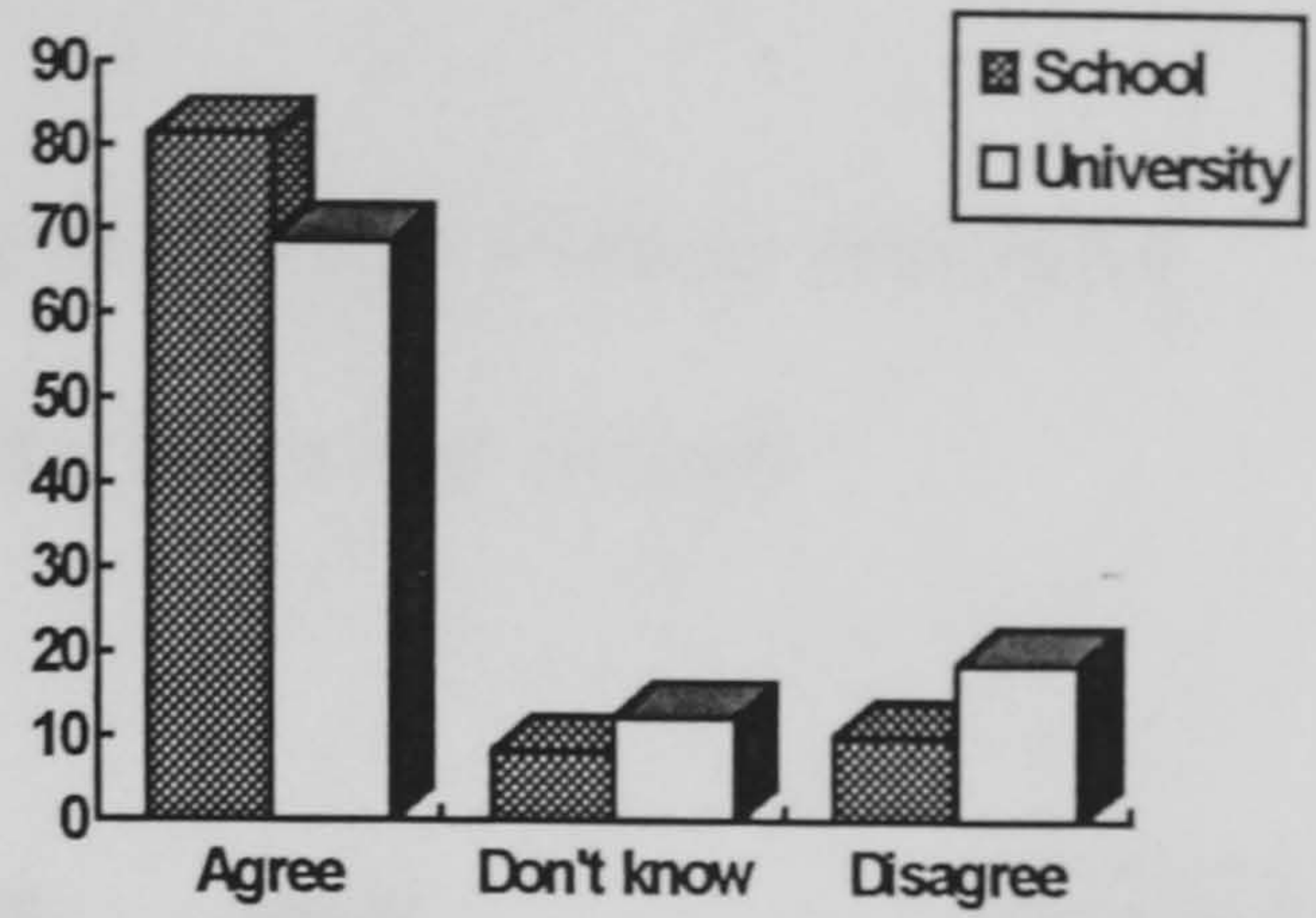
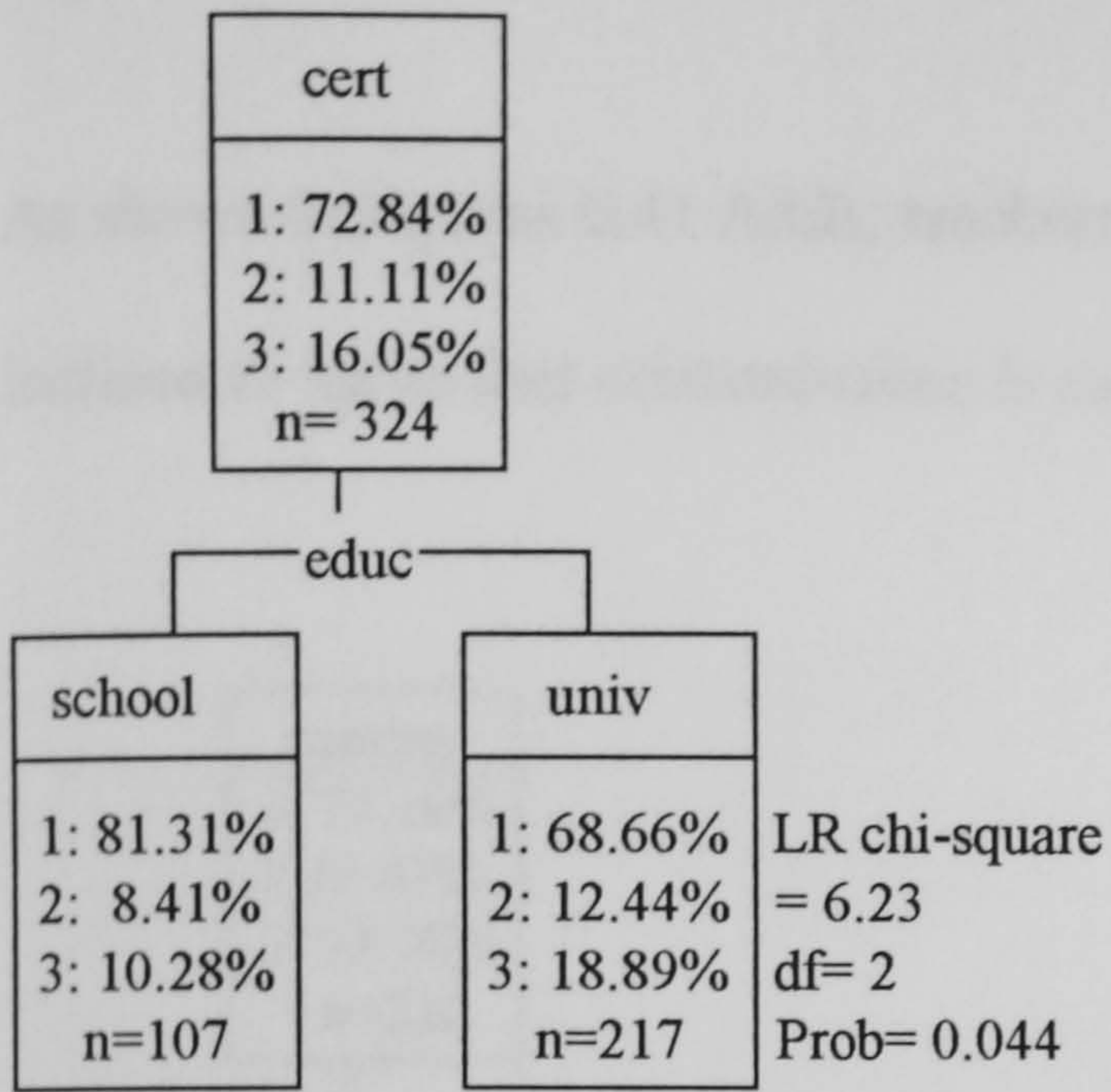


Figure 6.39 B: Food poisoning happen because food workers do not carry a valid health certificate (teachers).

Figure 6.39 A: Food poisoning happen because food workers do not carry a valid health certificate (teachers).

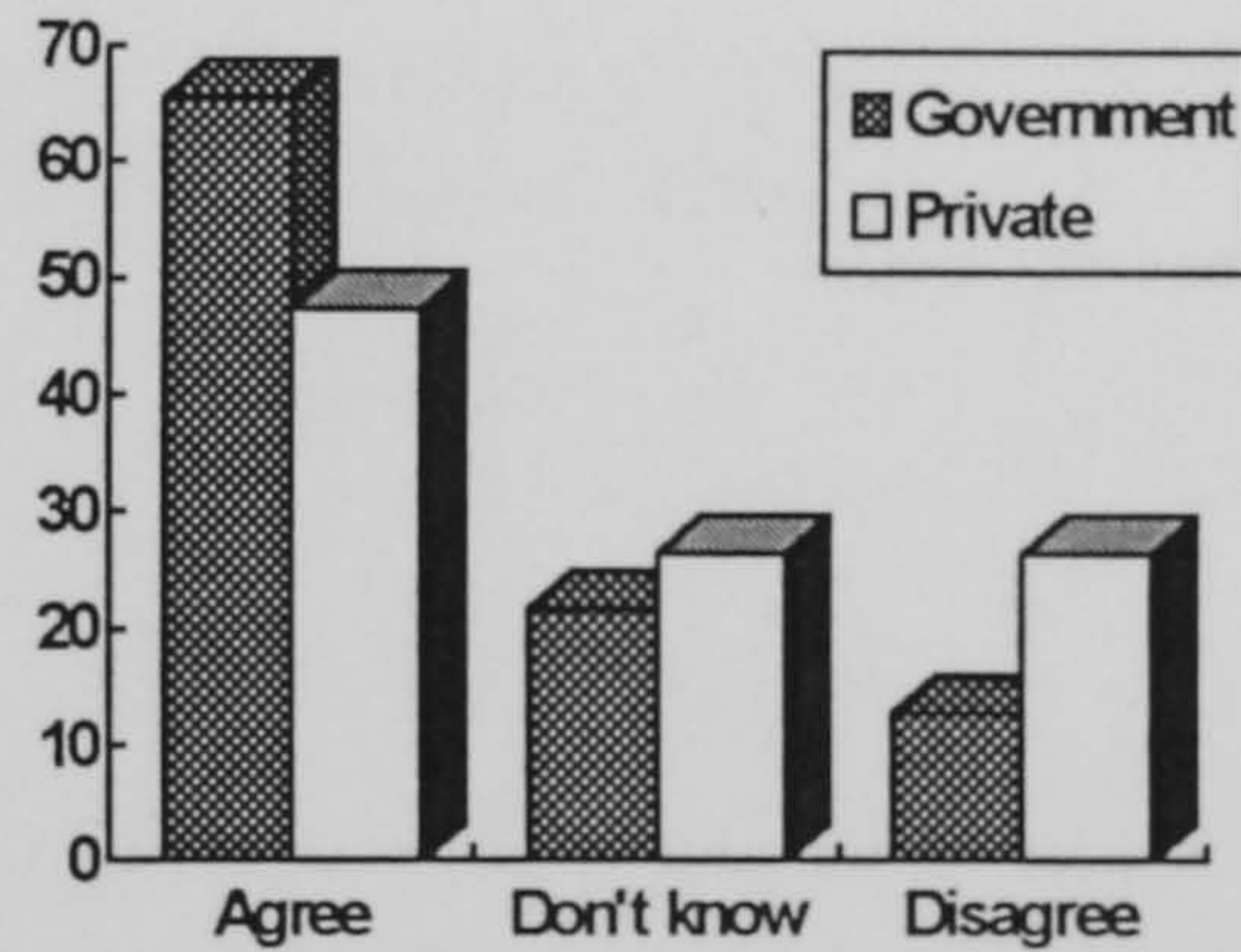
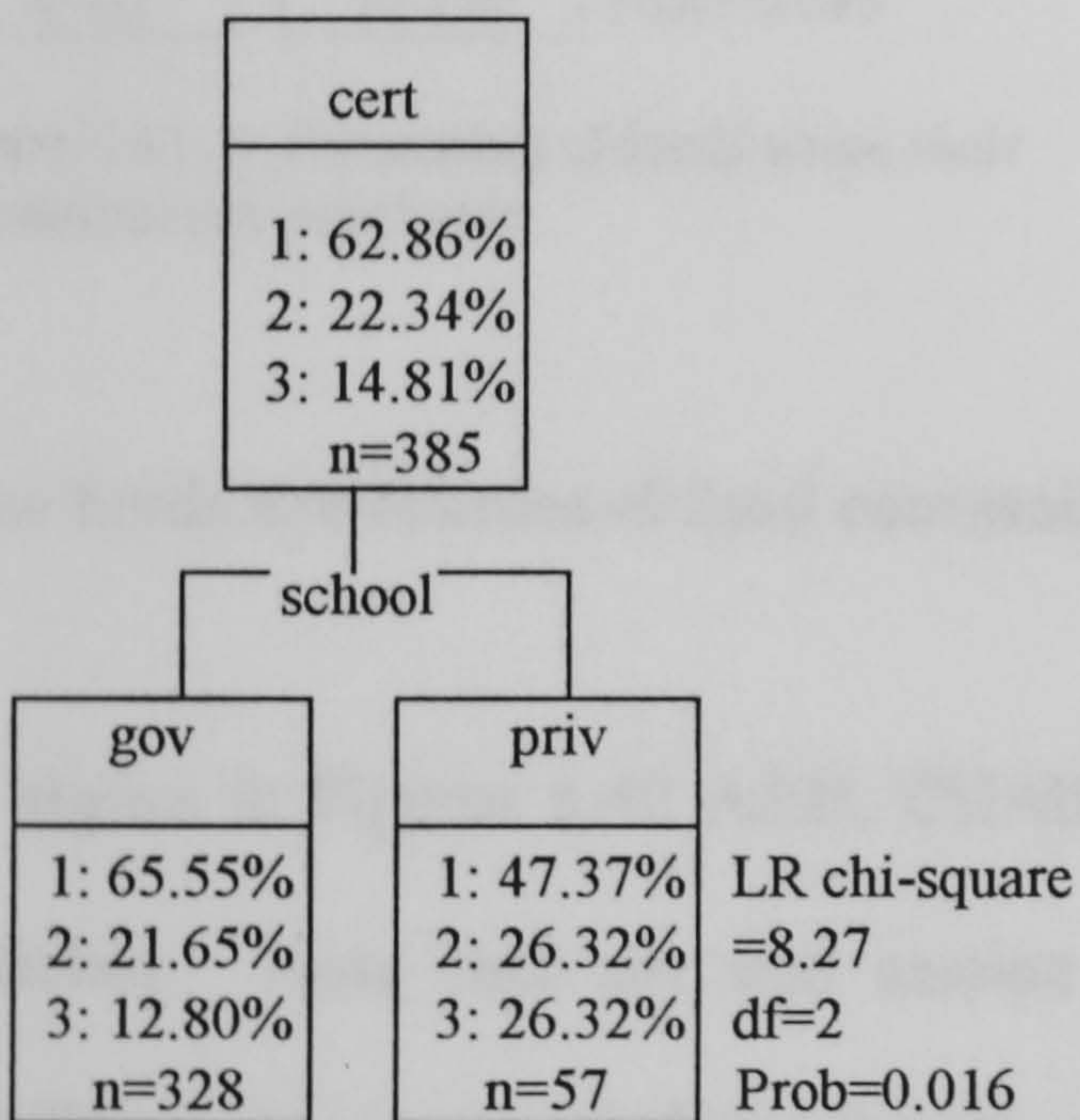


Figure 6.40 B: Food poisoning happen because food workers do not carry a valid health certificate (teachers).

Figure 6.40 A: Food poisoning happen because food workers do not carry a valid health certificate(students).

### B. Sources of contamination:

This part deals with the sources of food contamination. CHAID has detected four items which were statistically significant. These were:

**Processing of foods cause their contamination.**

As shown in Figures 6.41 A&B, teachers teaching non-science sections were more inclined to agree that contamination is caused during processing of food.

process	
1:	75.16%
2:	10.87%
3:	13.98%
n=322	

sect		
science	others	
1: 62.90%	1: 78.08%	LR chi-square =6.06 df=2 Prob=0.048
2: 14.52%	2: 10.00%	
3: 22.58%	3: 11.92%	
n=62	n=260	

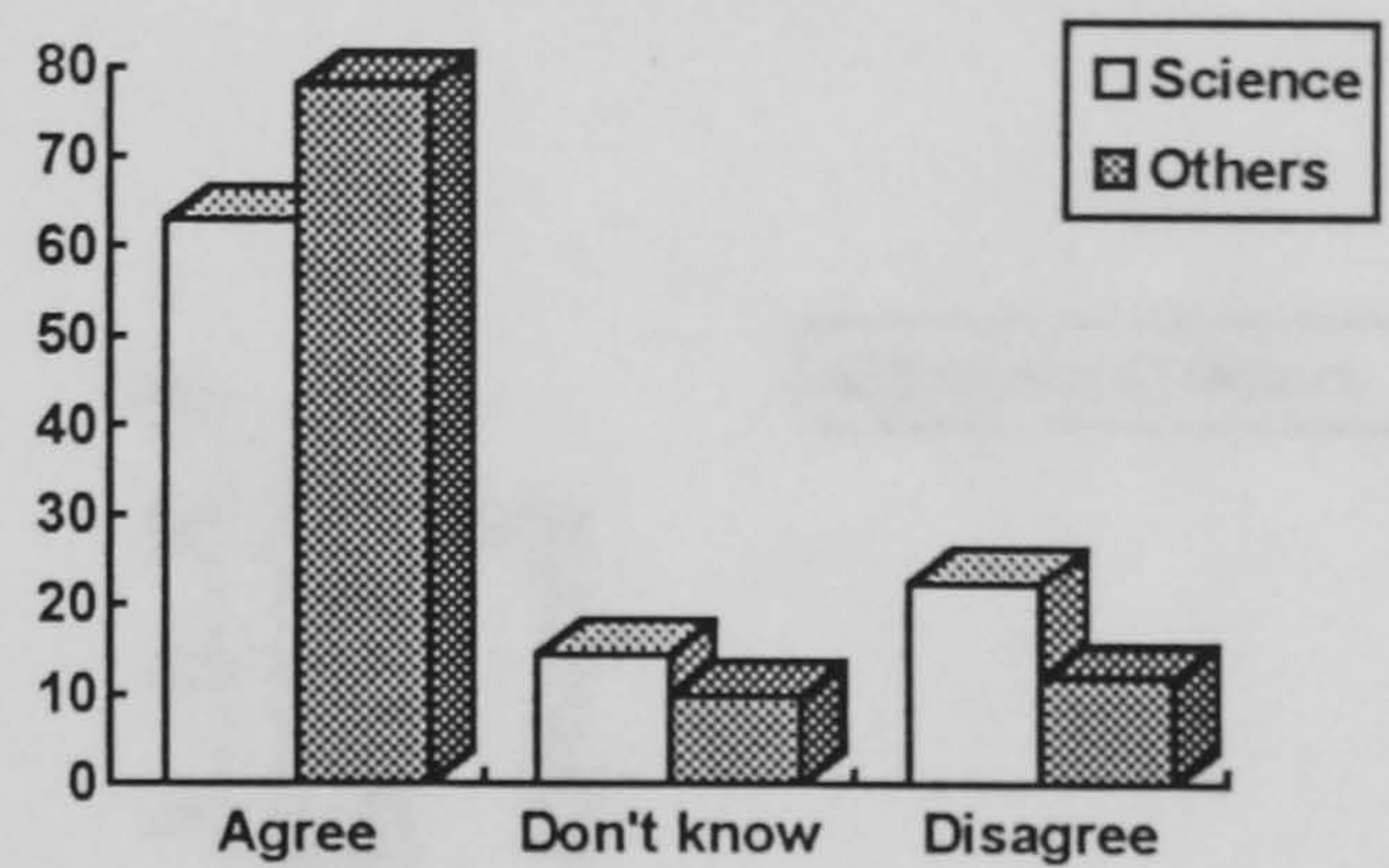


Figure 6.41 B: Processing of foods cause their contamination (teachers).

Figure 6.41 A: Processing of foods cause their contamination (teachers).

**Raw foods are sources of food contamination.**

As shown in Figures 6.42 A&B, CHAID has divided students' responses into three branches. Note that sex and section at which students learn were statistically significant. It was revealed that females and particularly those in science sections were more likely to agree that raw foods are the source contamination.

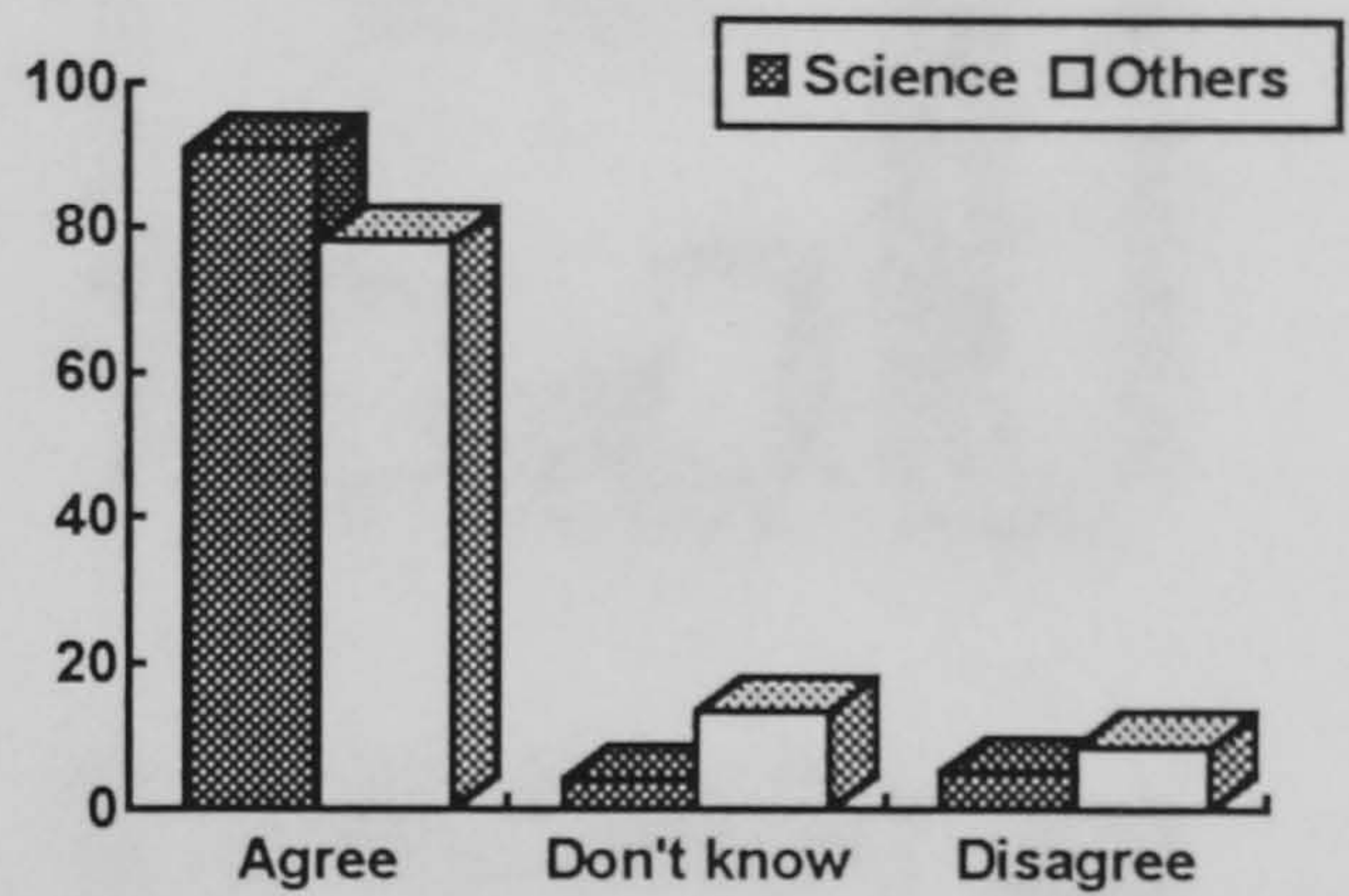
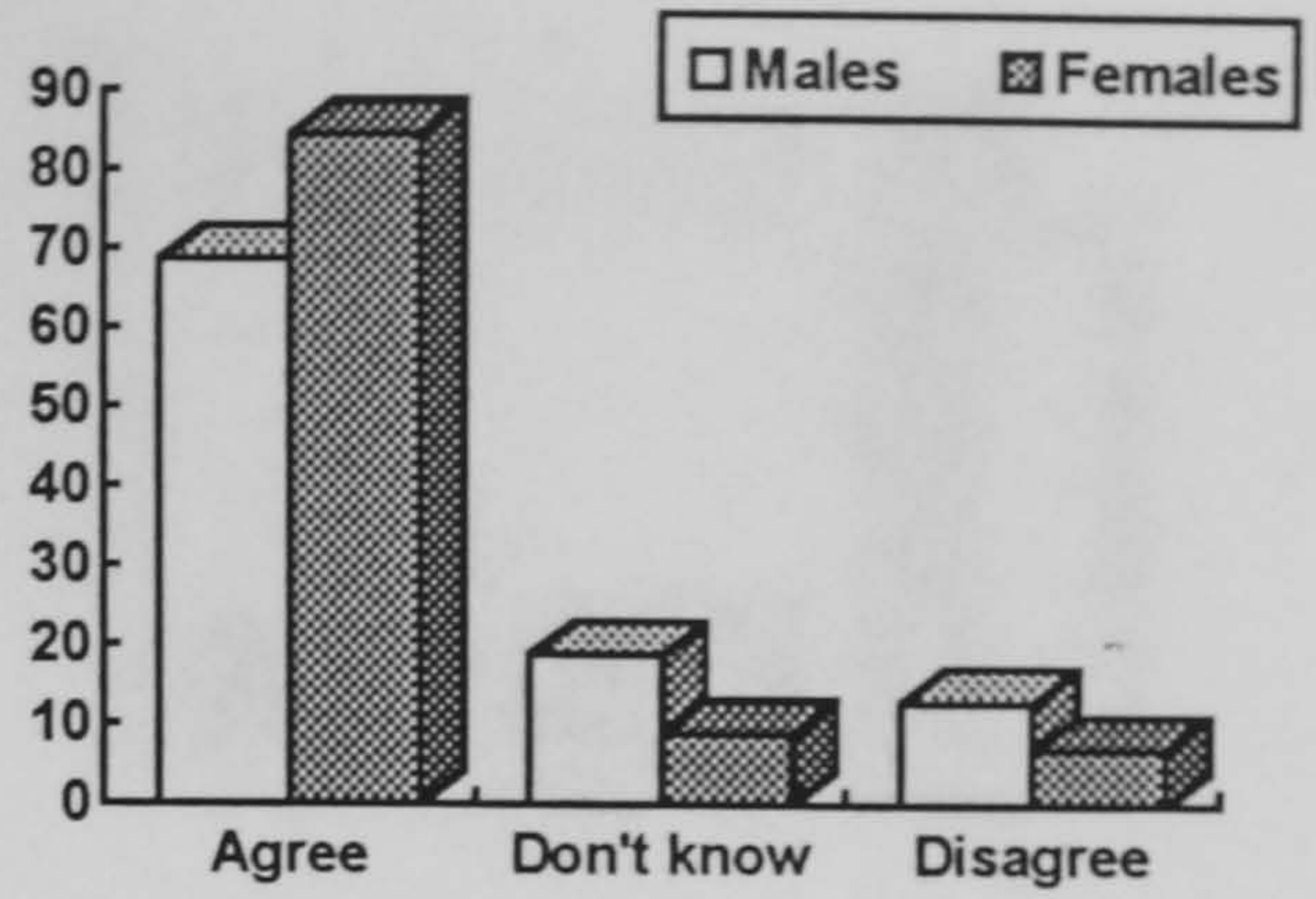
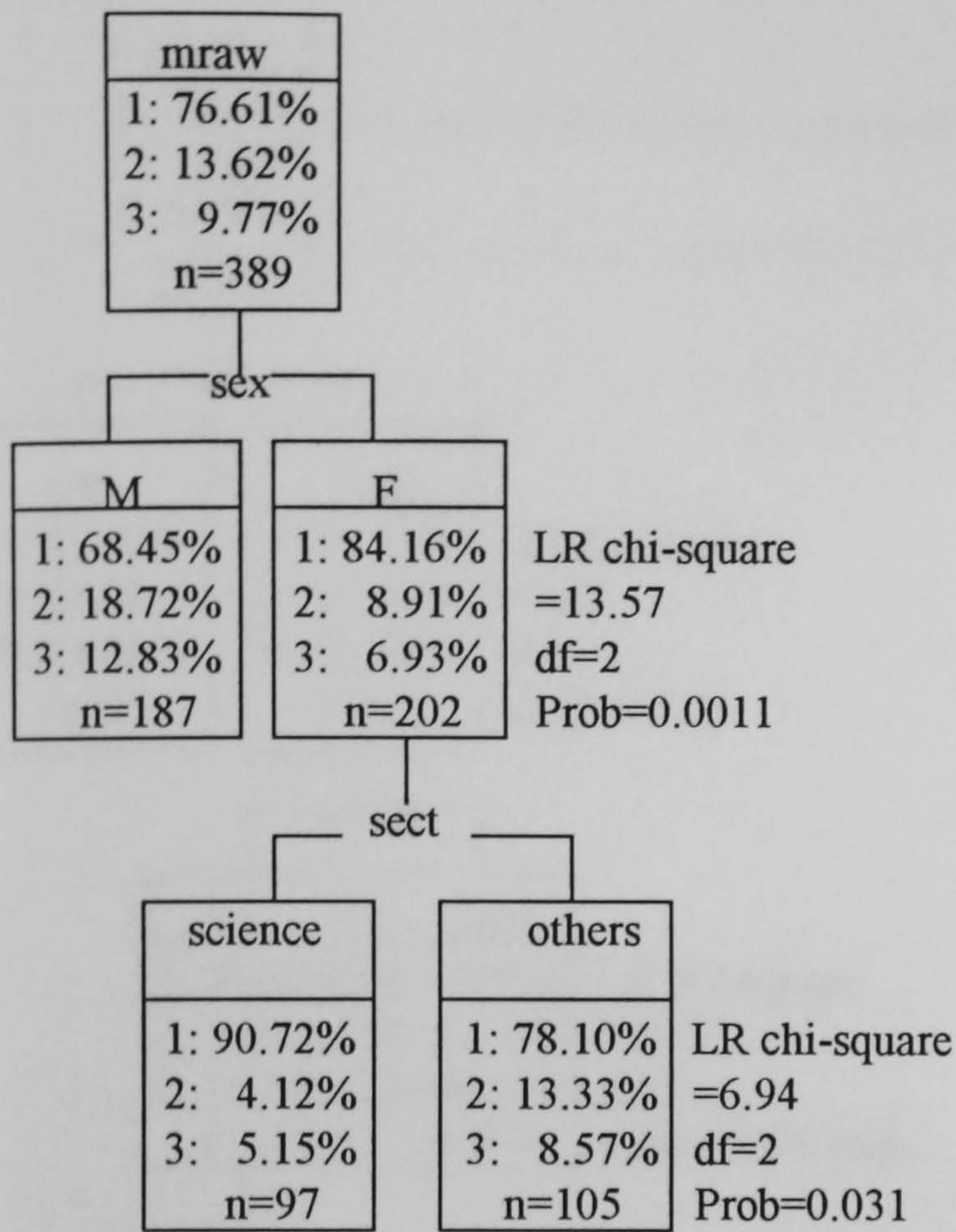


Figure 6.42 A: Raw foods are sources of contamination to other foods (students).

Figures 6.42 B: Raw foods are sources of contamination to other foods (students).

### Cooked foods are sources of contamination.

Statistically significant differences emerged between teachers (Figures 6.43 A&B). Although all the teachers disagreed with the statement, however, those < 40 years old, those teaching in the primary (p) and intermediate (I) and teachers with a university level of education were more likely to disagree. Note that under the variable "level", (S) means teaching in the secondary and (M) means teaching in more than one level.

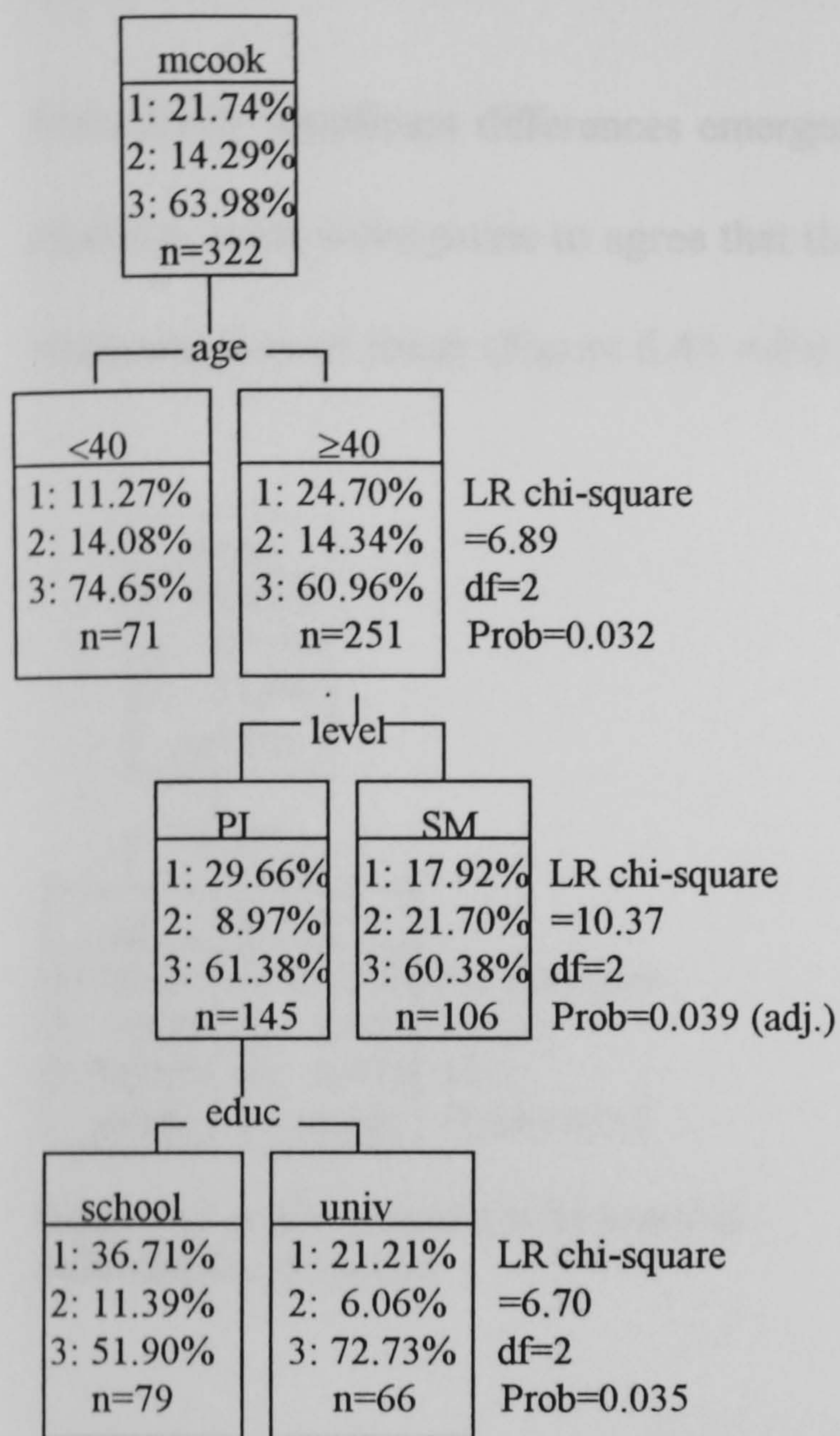
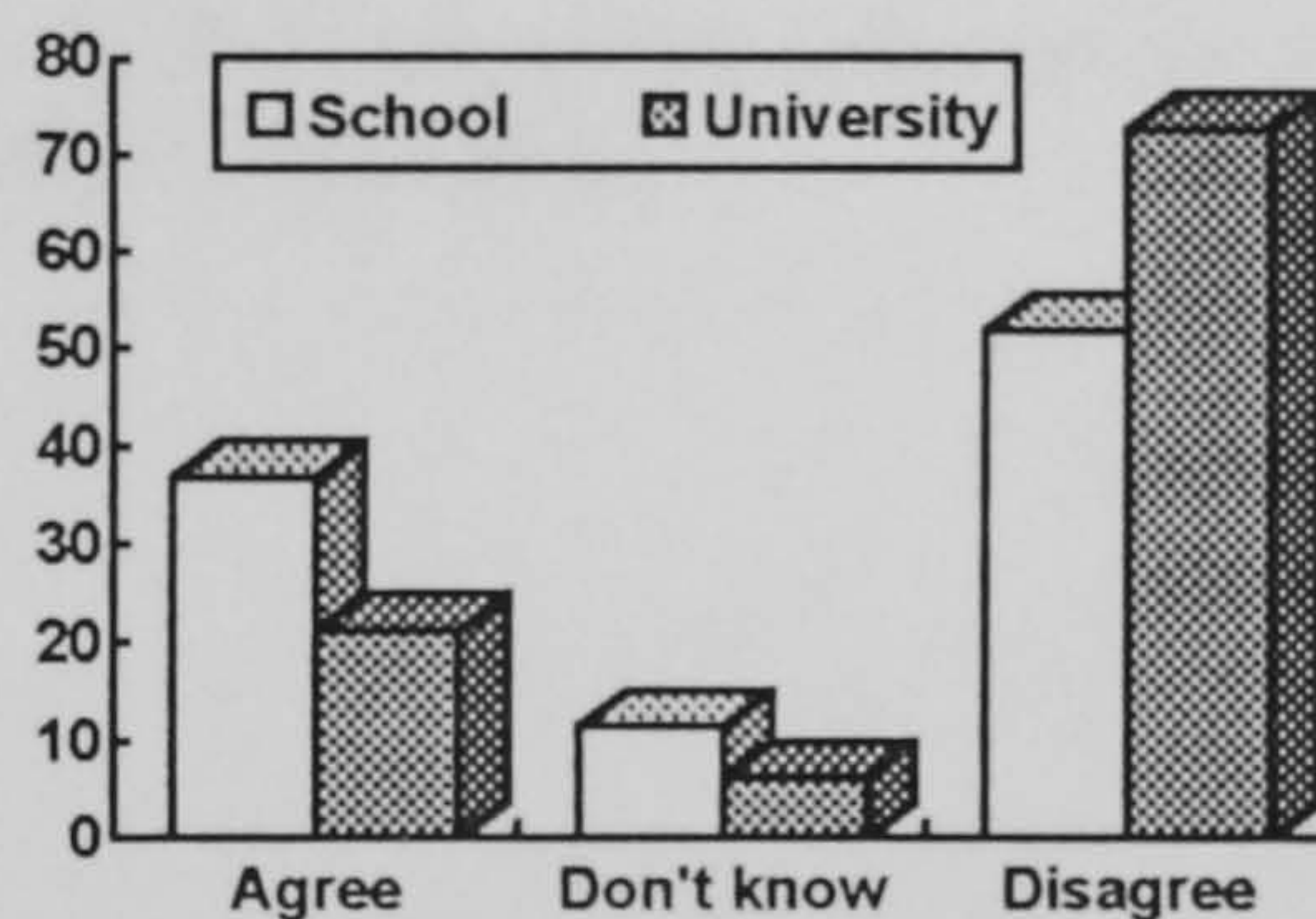
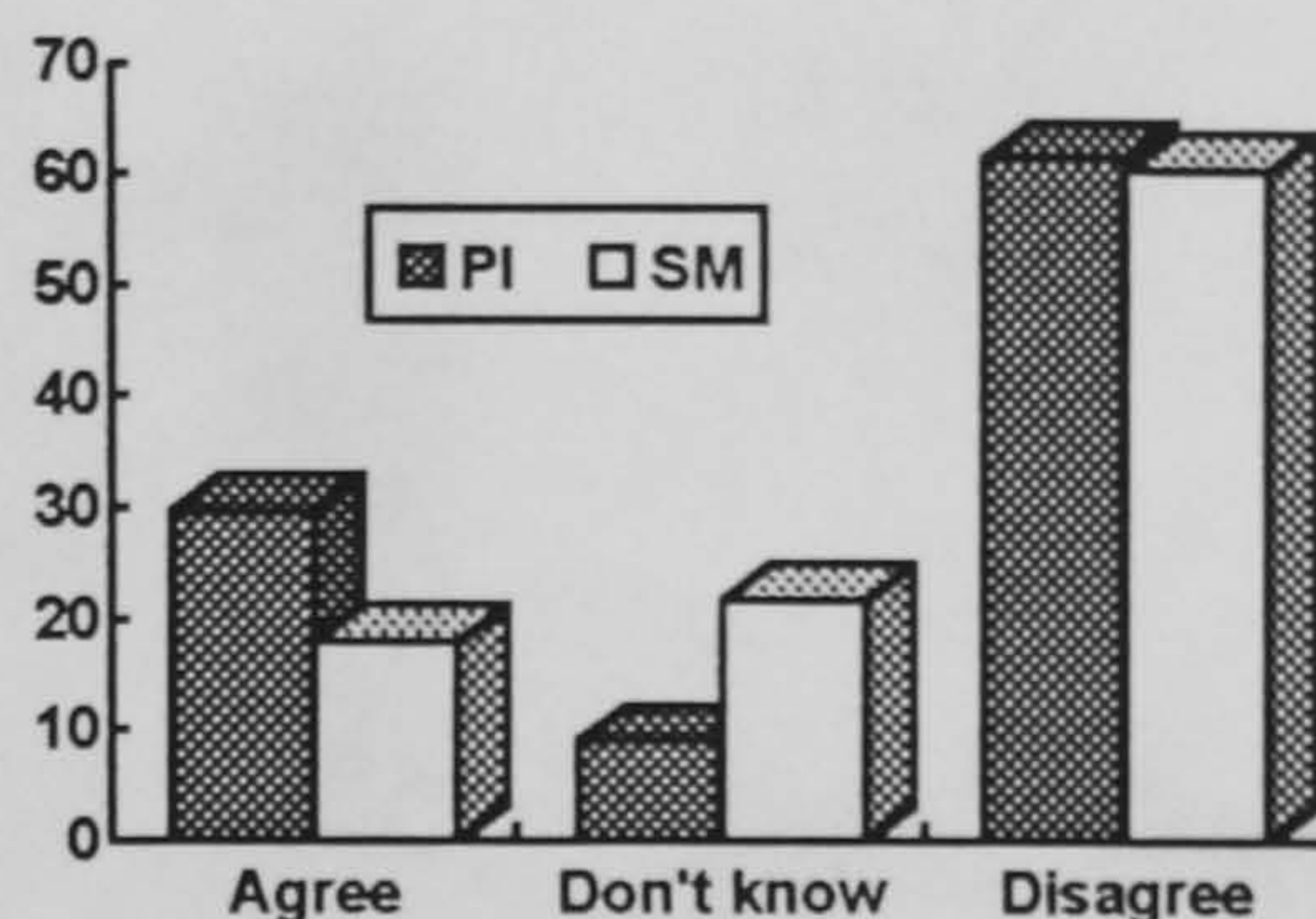
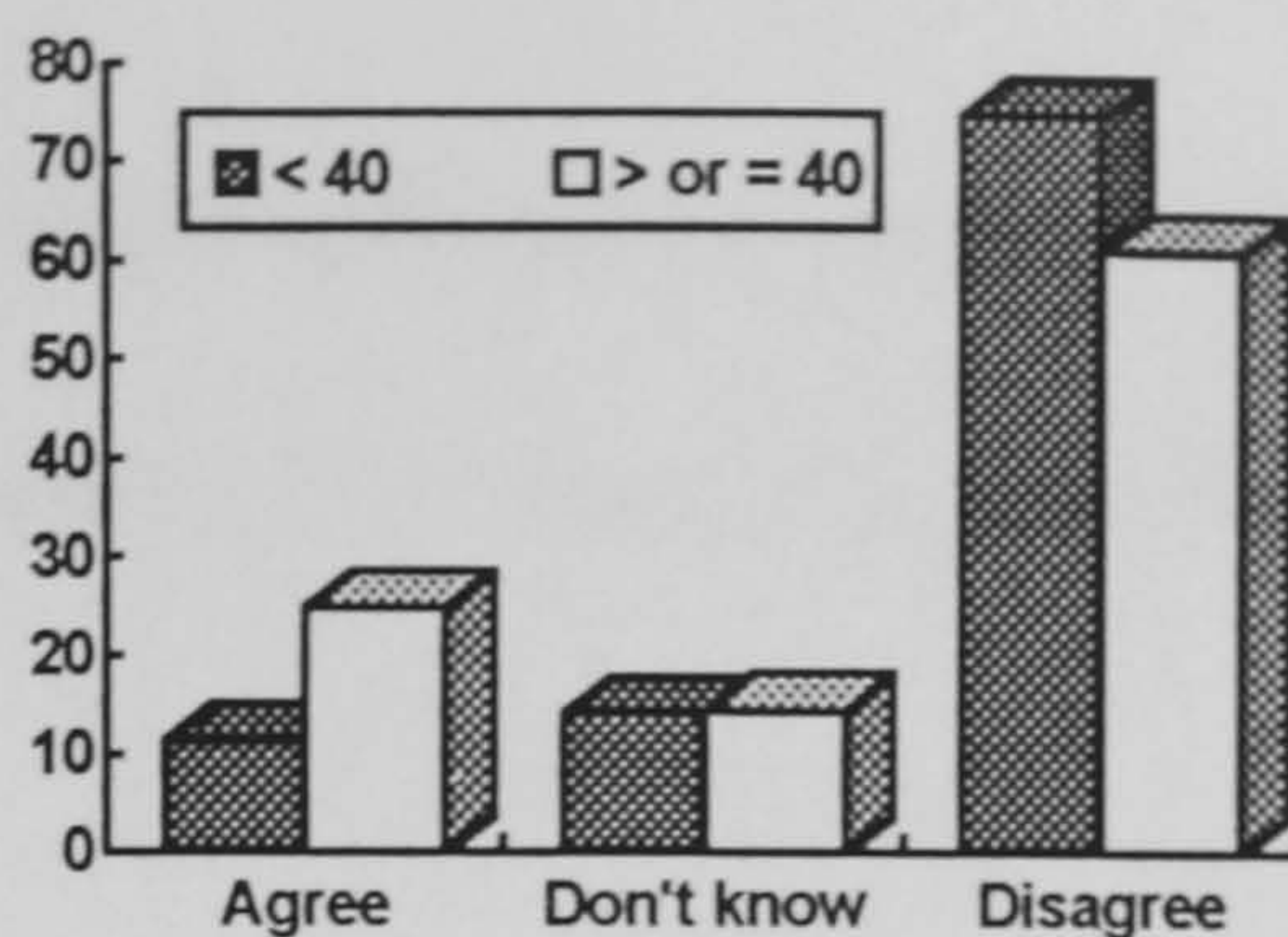


Figure 6.43 A: Cooked foods are sources of food contamination (teachers).



Figures 6.43 B: Cooked foods are sources of food contamination (teachers).

As indicated in Figures 6.44 A&B, students in the governmental schools were more likely to disagree with the statement.

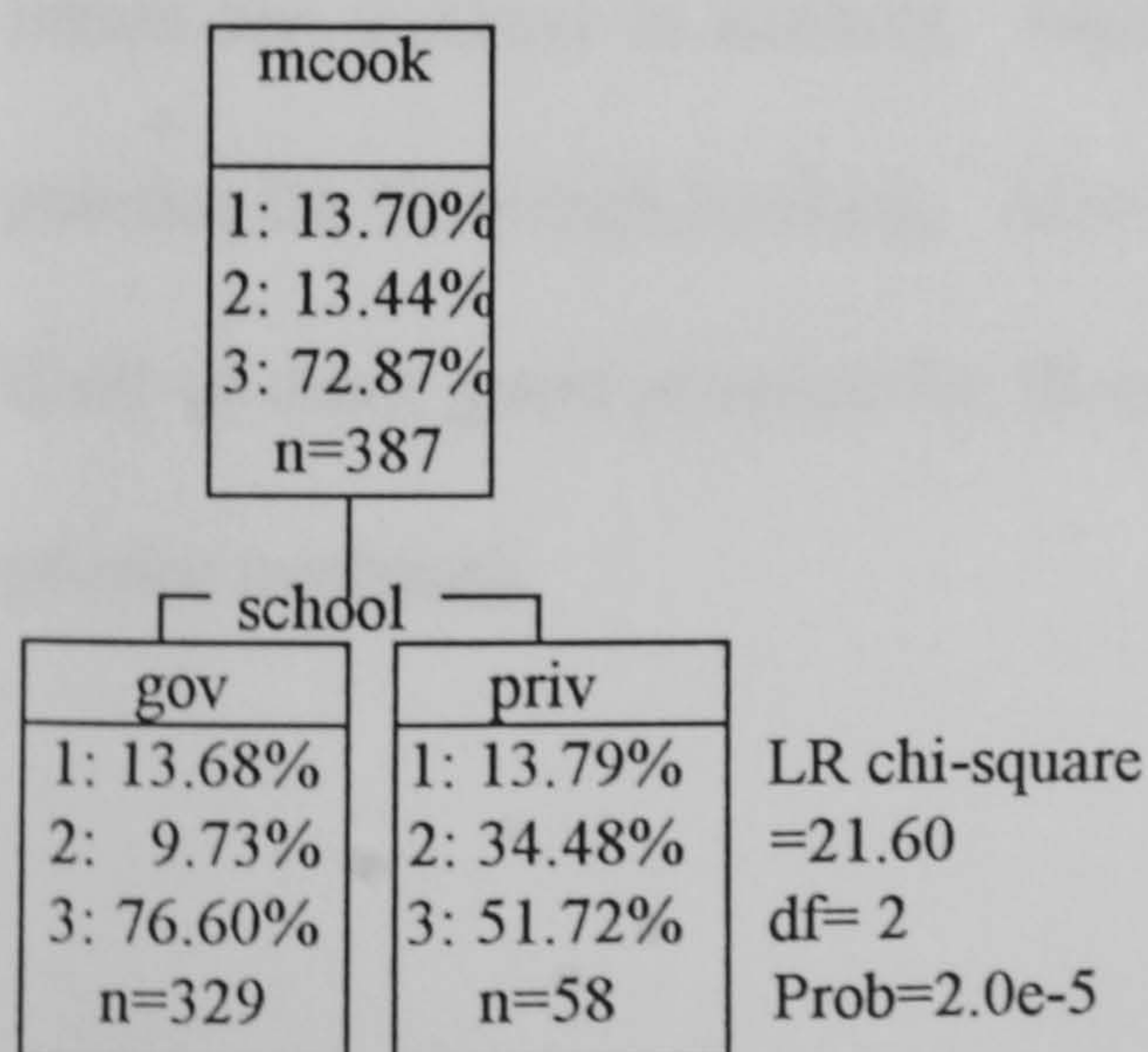


Figure 6.44 A: Cooked foods are sources of food contamination (students).

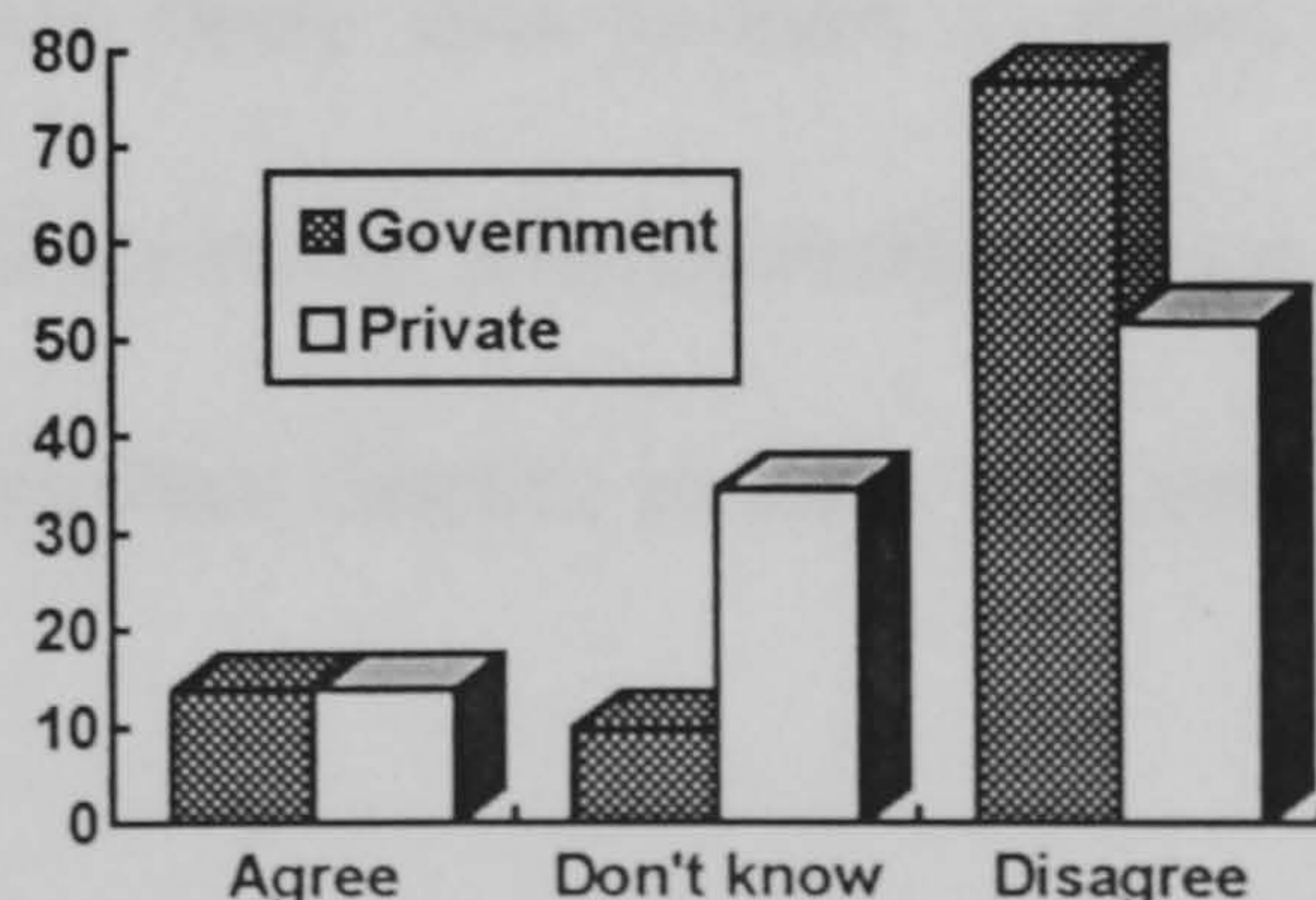


Figure 6.44 B: Cooked foods are sources of food contamination (students).

**Environment is the source of food contamination.**

Statistically significant differences emerged among male and female students. Female students were more prone to agree that the environment is an important contributor to contamination of foods (Figure 6.45 A&B).

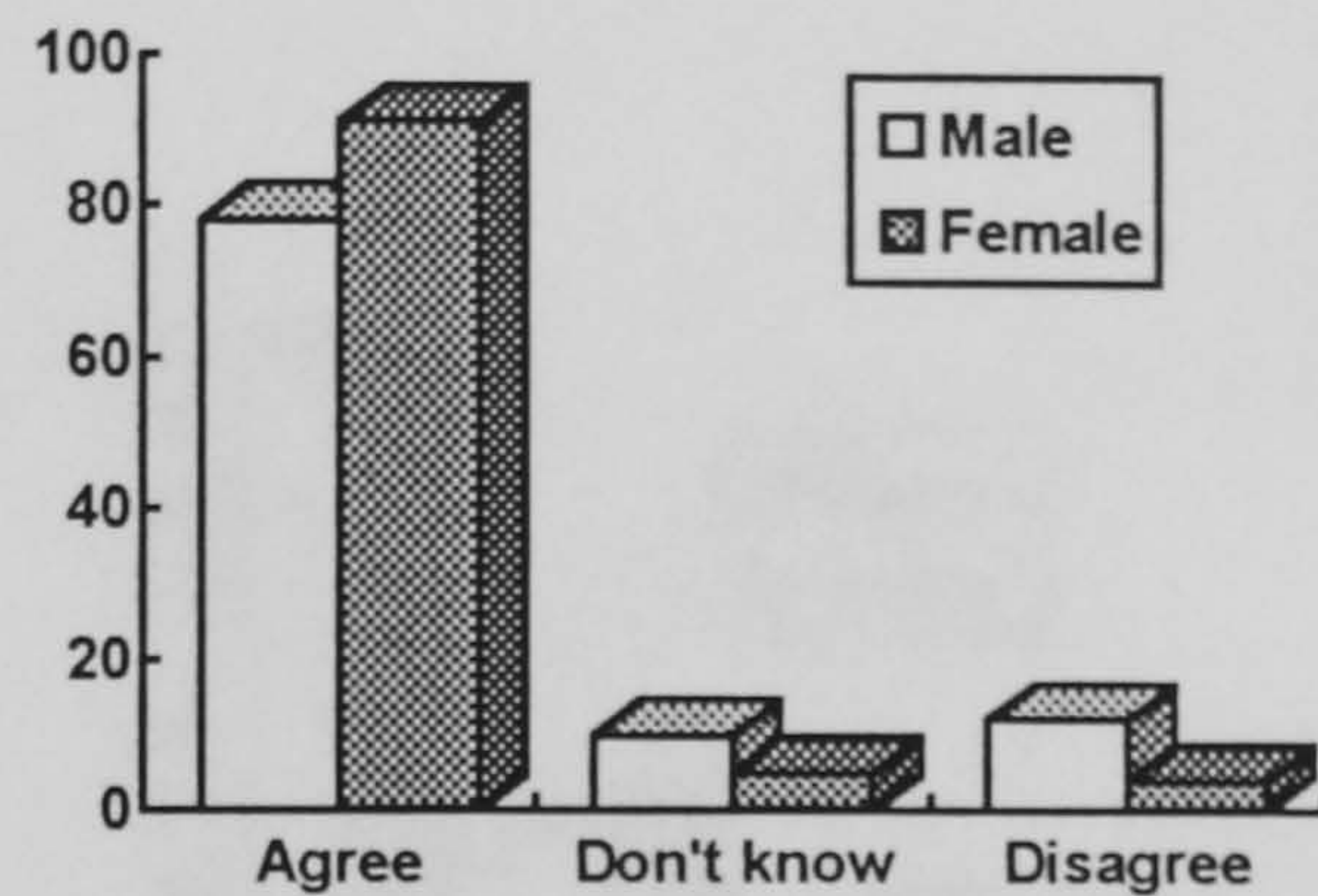
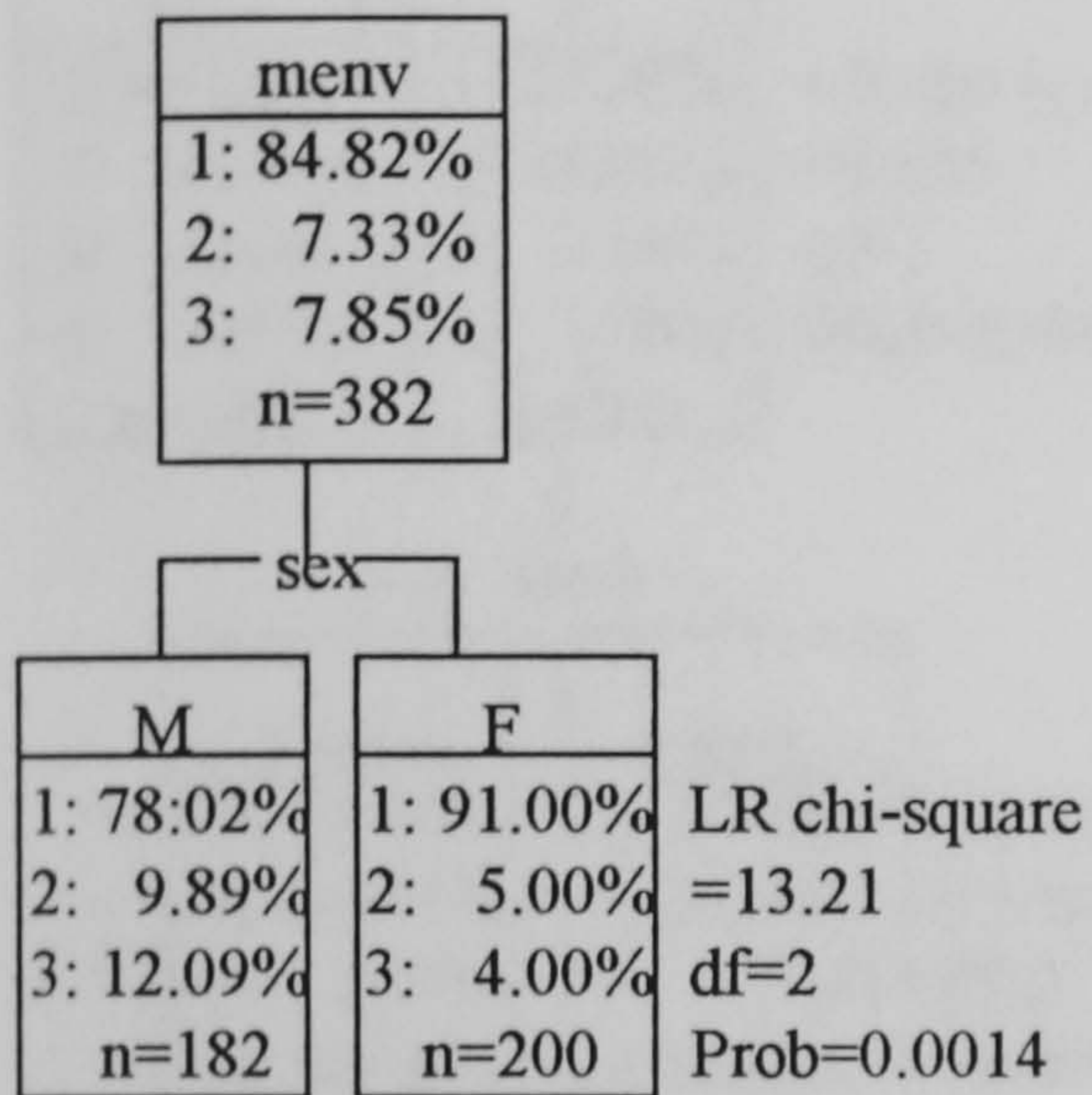


Figure 6.45 B: Environment is the source of contamination (students).

Figure 6.45 A: Environment is the source of contamination (students).

**C. Factors that contribute to outbreaks:**

**Cooking foods thoroughly (until well done).**

Figures 6.46 A&B showed significant differences between male and female students within the sections in schools. Males were more likely than females to select good practice for thorough cooking. Also female students in the science sections were more likely to mark good practice for thorough cooking than females in other sections (non-science sections).

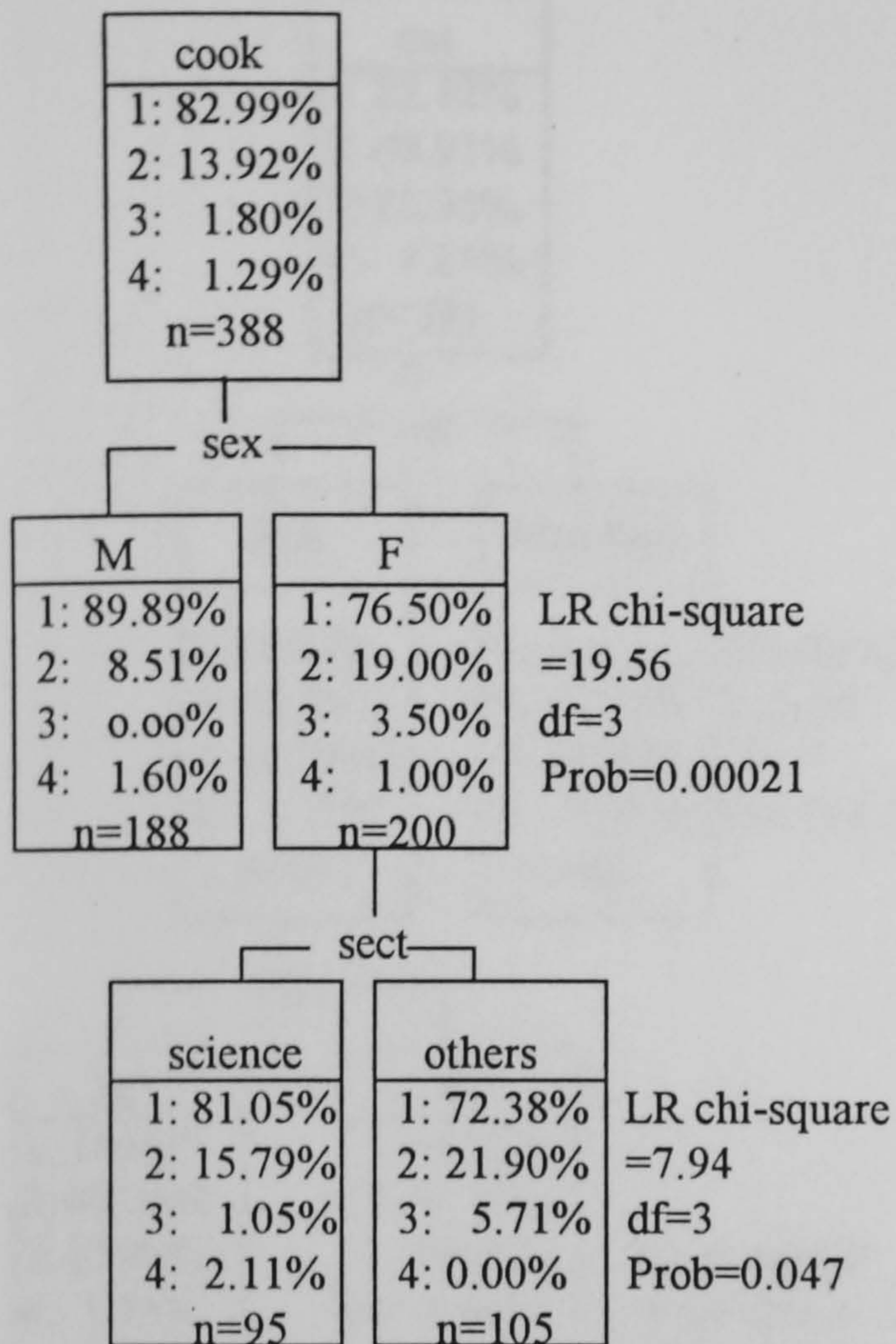
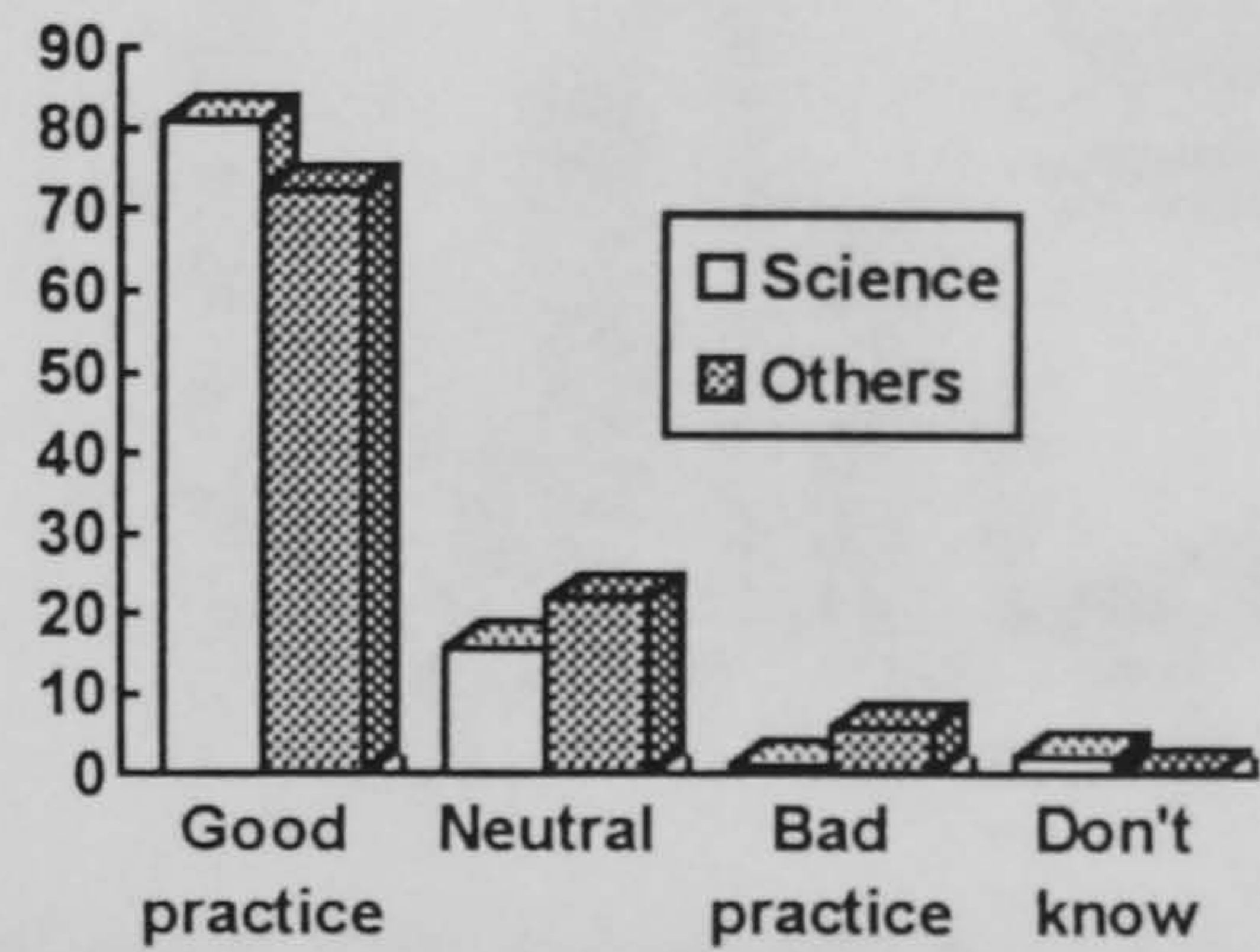
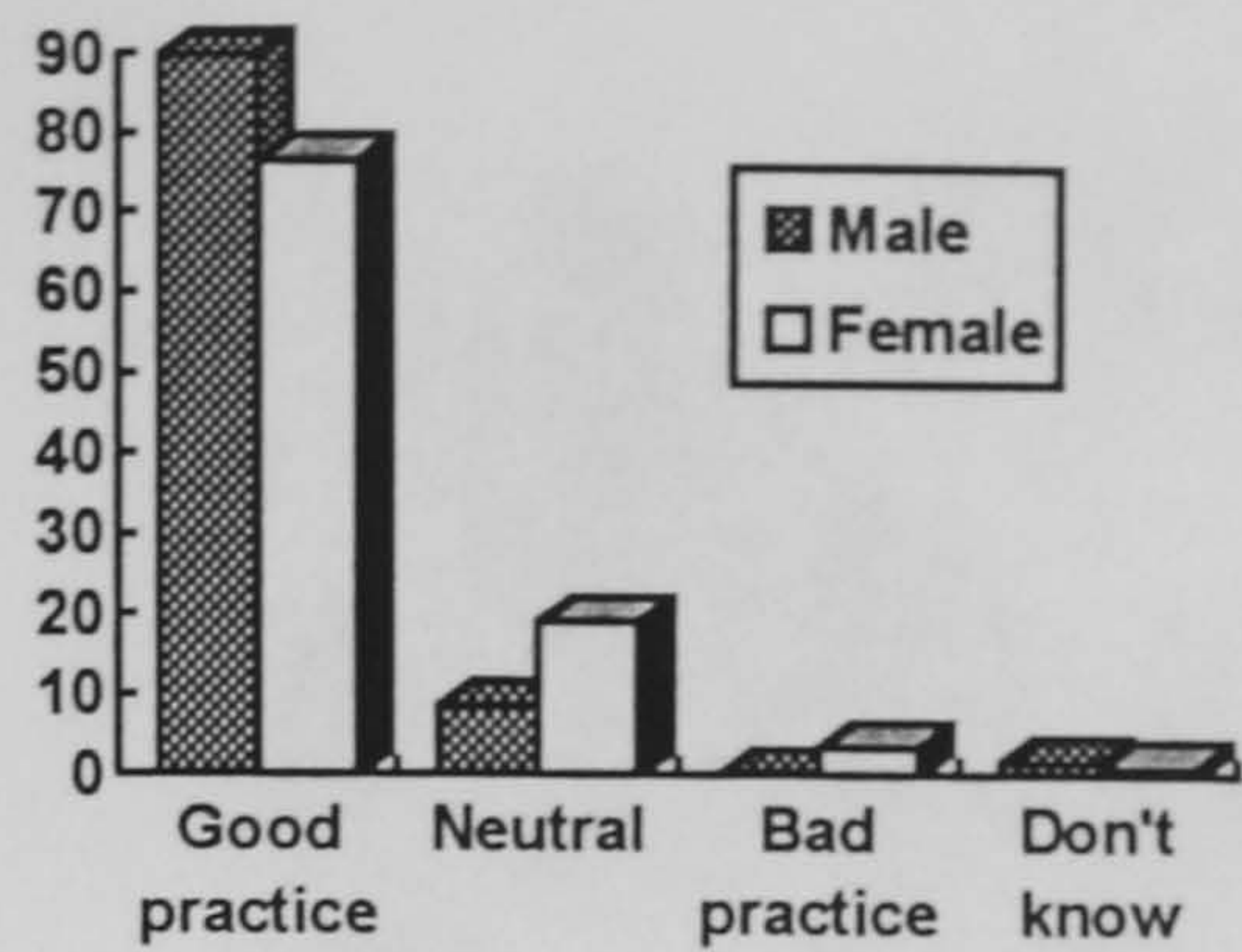


Figure 6.46 A: Opinions to thorough cooking of foods (students).



Figures 6.46 B: Opinions to thorough cooking of foods (students).

**Eating foods immediately while hot and not waiting long to become cold.**

Figures 6.47 A&B showed that “good practice” response has been selected more by Non-Bahraini students ( 40.24%) whereas “neutral” has been more chosen by Bahraini students for the above statement. Also in the last branch of Figure 6.47 A, female and male Bahrainis were more likely to select “neutral” option. Also in the same branch, male students were more likely to select “bad practice” (35.09%) than females (19.20%).

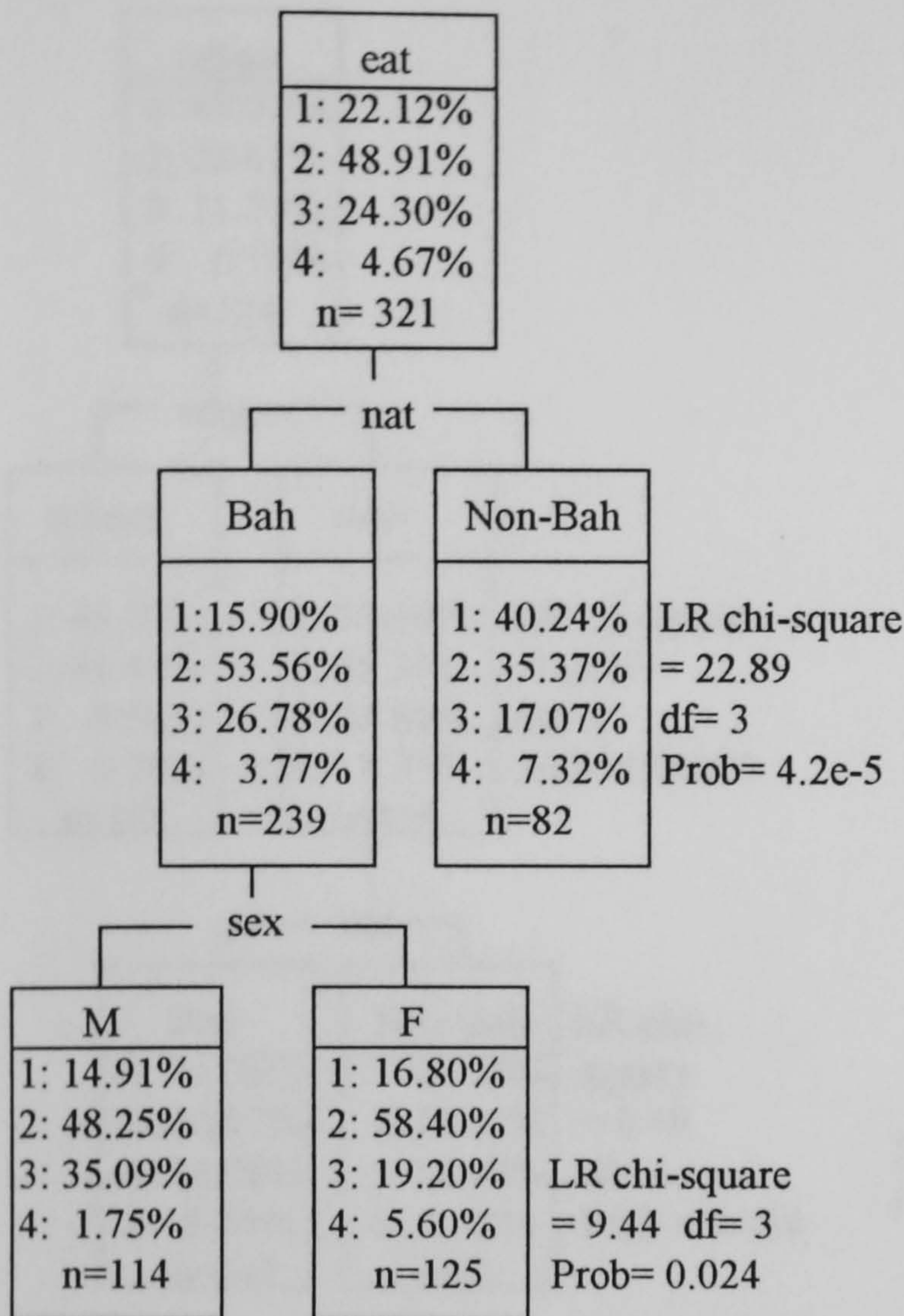
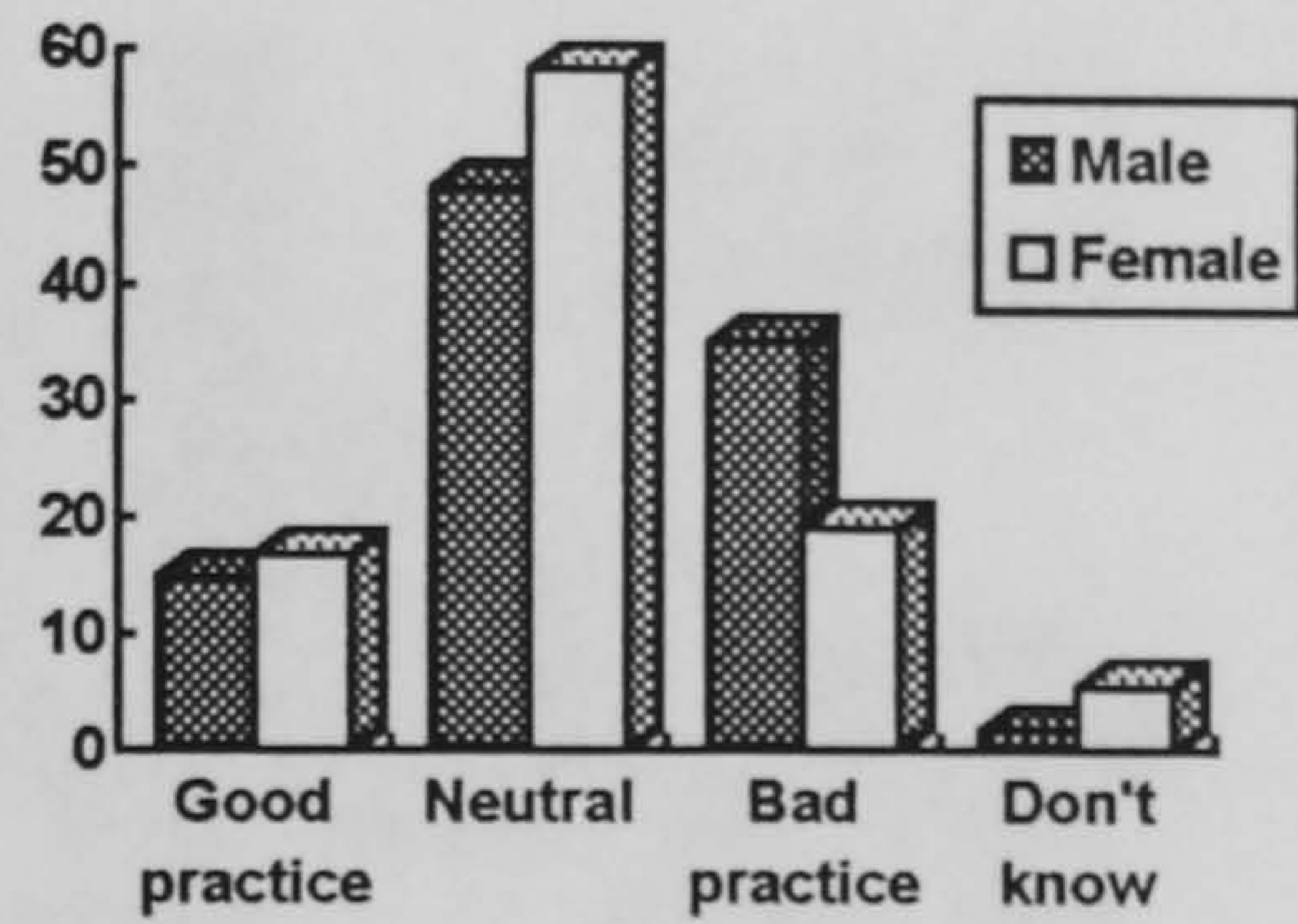
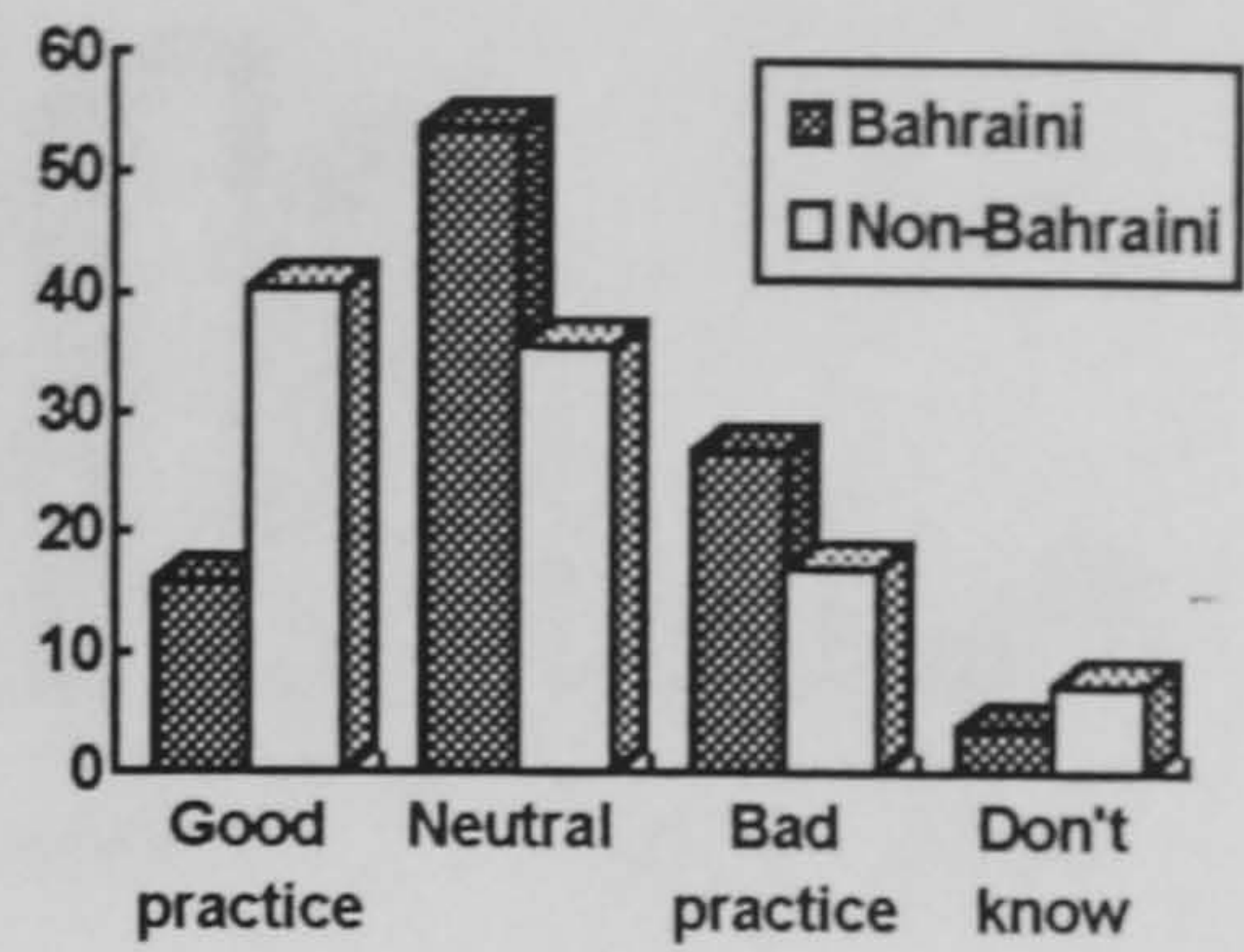


Figure 6.47 A: Eating food as it is hot and not keeping it long to become cold (teachers).

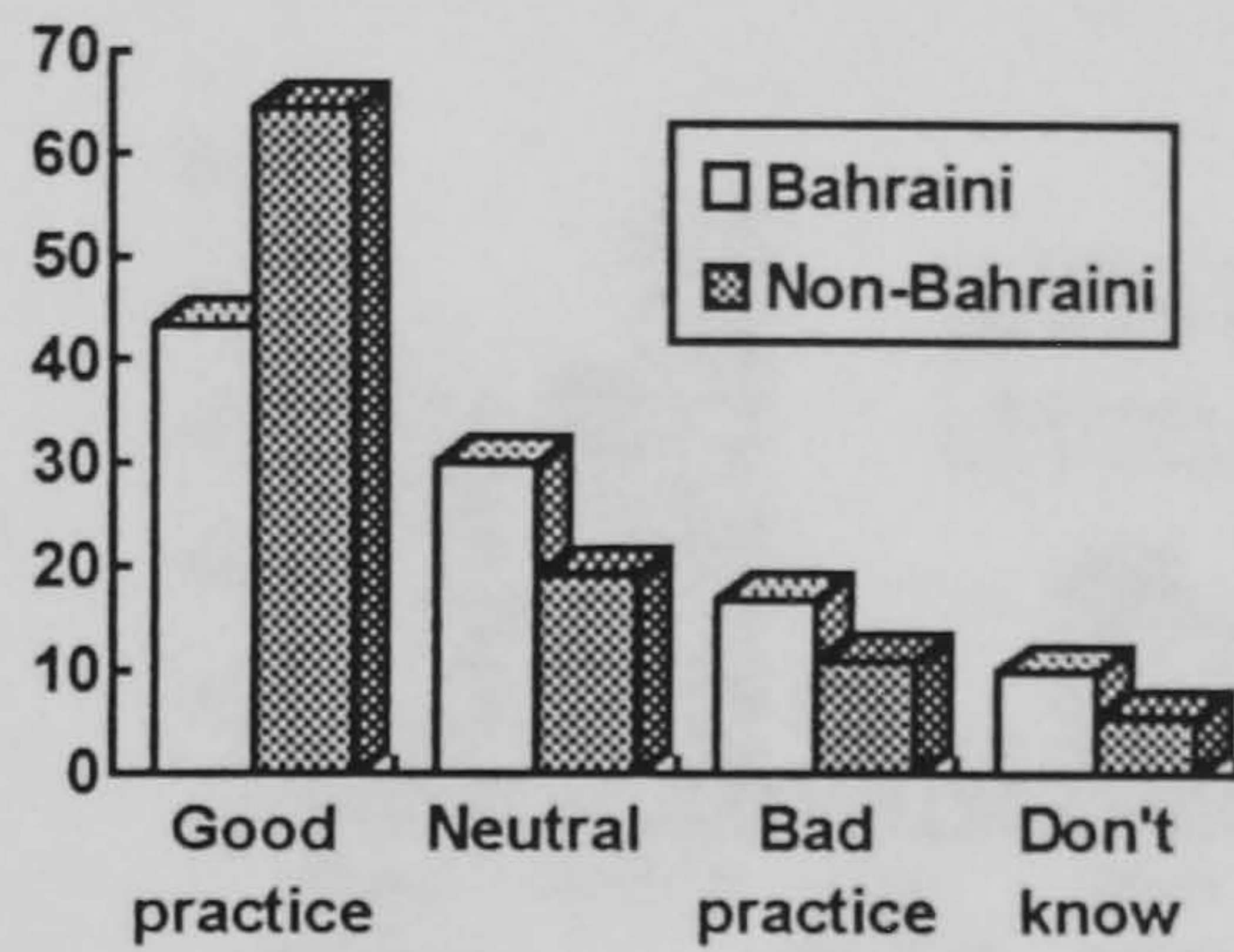
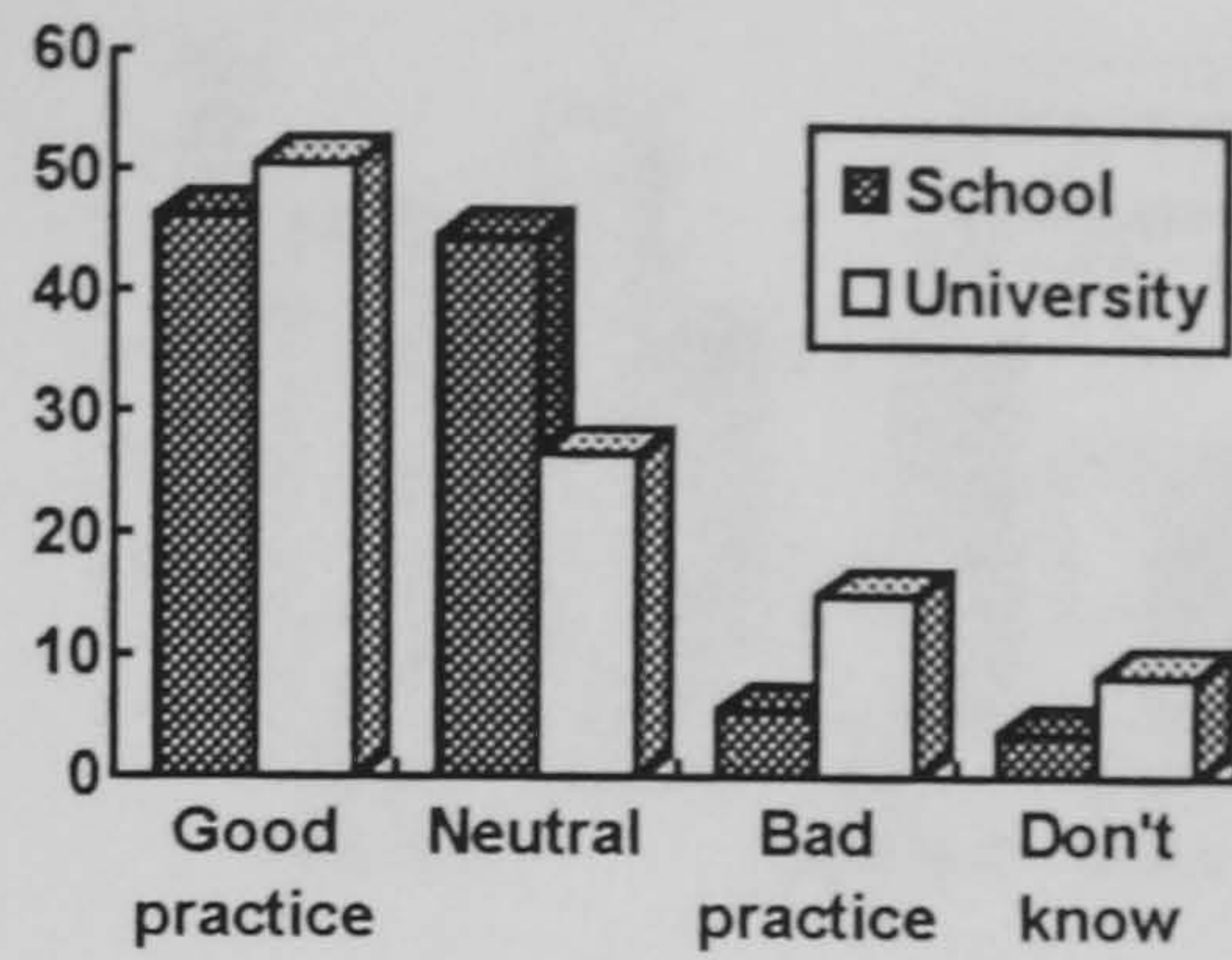
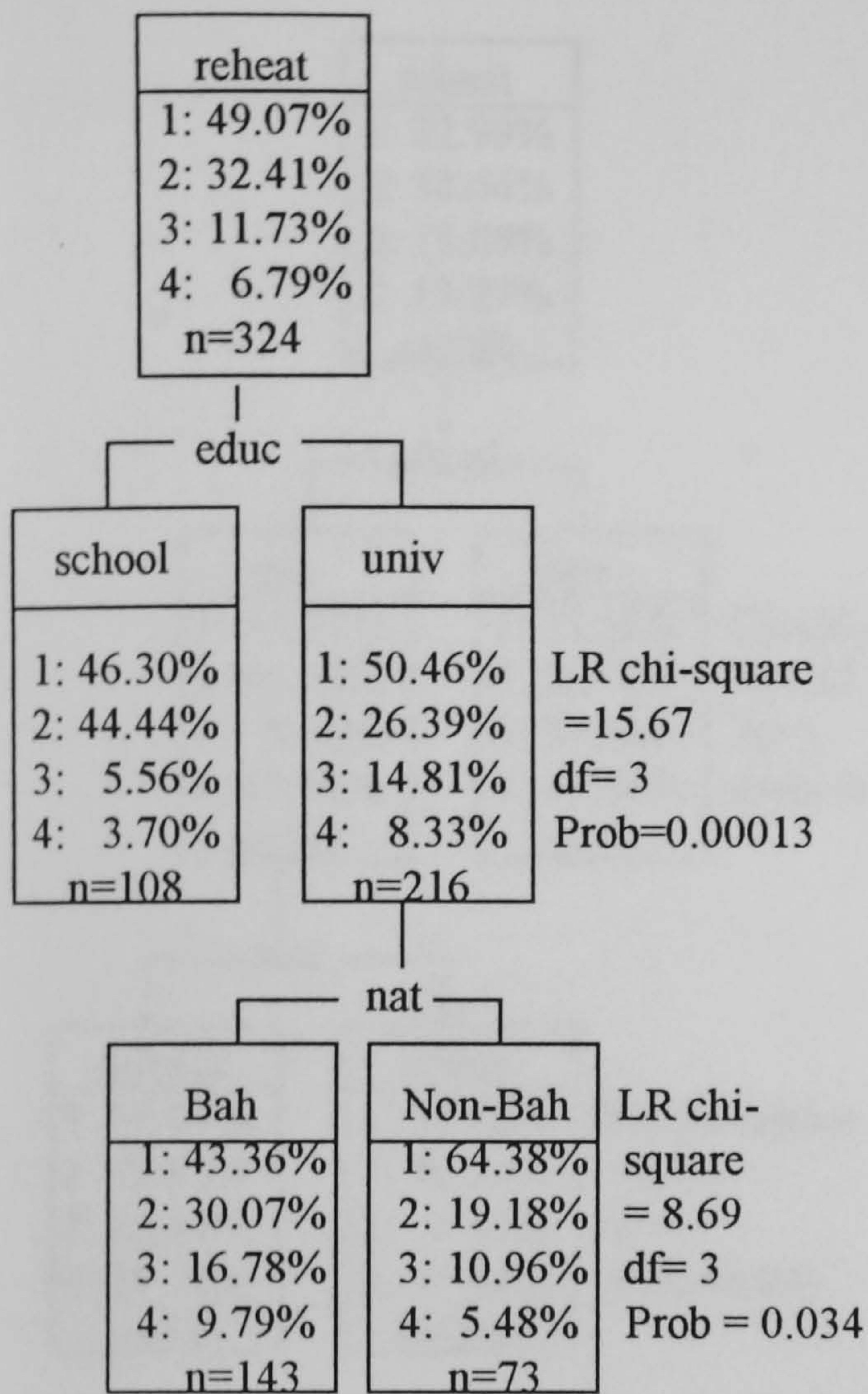


Figures 6.47 B: Eating food as it is hot and not keeping it long to become cold (teachers).

### Re-heating of pre-cooked foods.

As revealed in Figures 6.48 A&B, both teachers who had school and those who had university levels of education considered re-heating of pre-cooked foods as good practice. However, compared to those with school levels of education, teachers who had university qualification were more likely to select “good practice” for the above statement. Note also that high proportion of teachers with school levels of education selected “neutral” option (44.44%) compared to those had university qualification (26.39%). In the third branch of the Figure, nationality was also picked by CHAID as a significant variable. It was reported that Non-Bahraini teachers were more likely to select “good practice” than Bahraini (Figures 6.48 A&B).

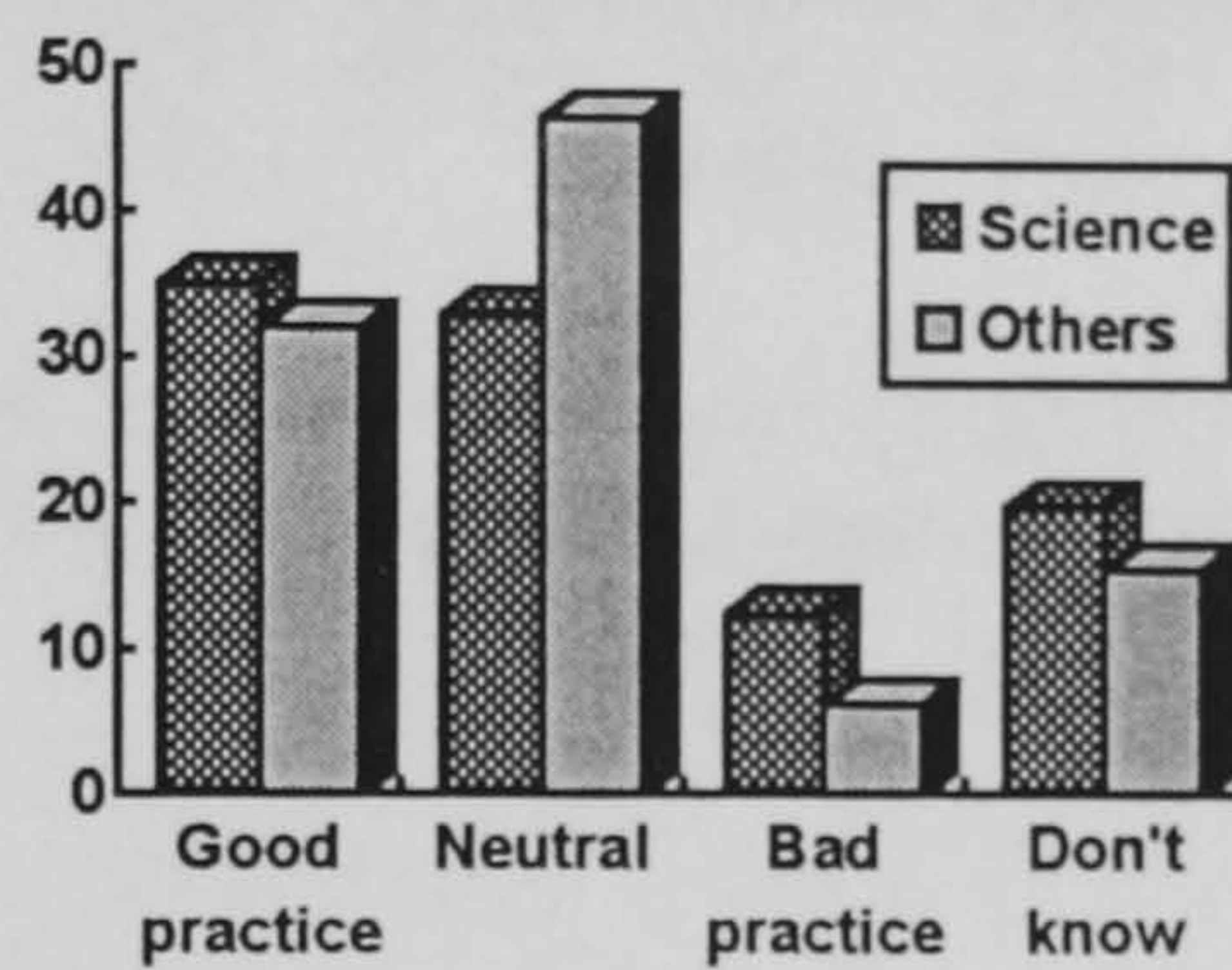
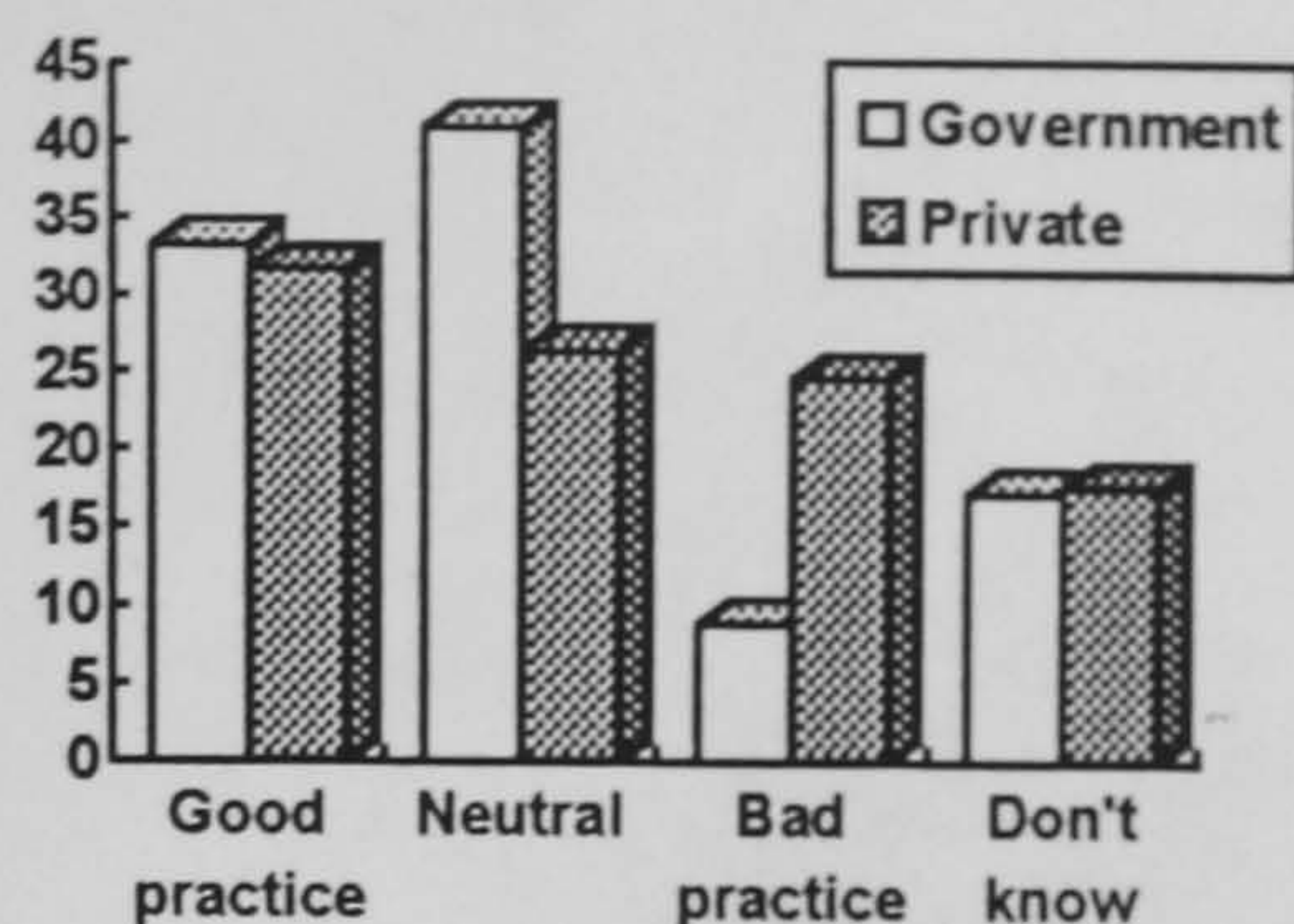
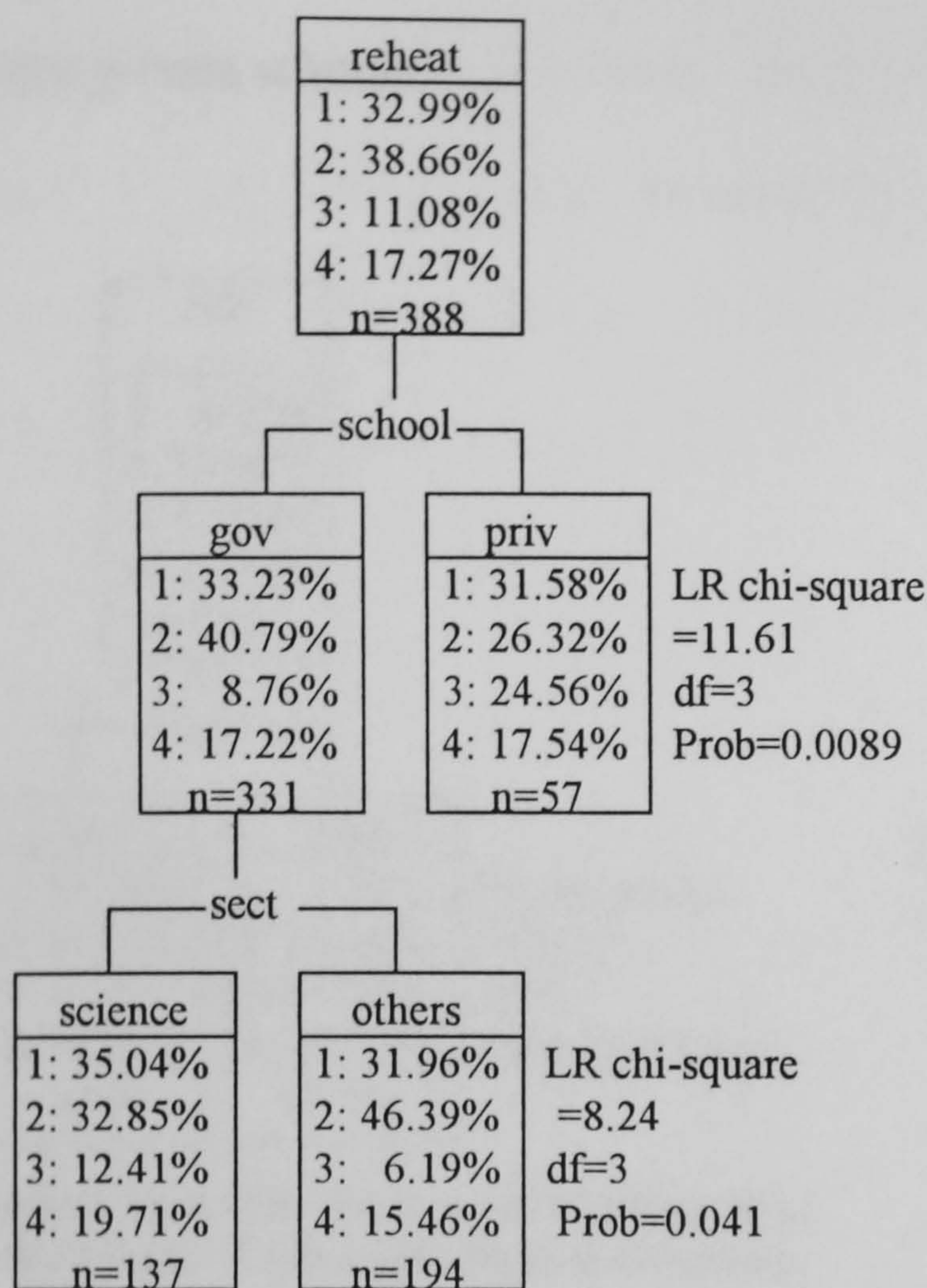




Figures 6.48 B: Re-heat pre-cooked food until it is hot before eating (teachers).

Figure 6.48 A: Re-heat pre-cooked food until it is hot before eating (teachers).

Figures 6.49 A&B reported response of students to the same statement above. Note that students in the government schools were more likely to select “neutral” whereas students in the private schools had more preference to “good practice” option. CHAID also detected significant differences between the sections of the governmental schools. It was found that students in the science sections were more inclined to select “good practice” whereas those in other sections were more likely to select “neutral”.



Figures 6.49 B: Re-heat pre-cooked food until it is hot before eating (students).

Figure 6.49 A: Re-heat pre-cooked food until it is hot before eating (students).

**Raw foods come in contact with cooked foods (cross-contamination).**

Note that the response rate of both teachers teaching in primary level and those teaching in the intermediate and other levels was higher for “bad practice”. However, teachers teaching the intermediate and other levels were more likely to select this option. Also there were higher rates of teachers in the primary level who selected “good practice” option (11.70%) compared to (1.78%) of teachers in the intermediate and other sections (Figures 6.50 A&B). Figures 6.51 A&B, also showed similar results by the students. Students in the government and private schools selected “bad practice”. However, students in the private schools were more likely to select this option. Furthermore, students who selected “good practice” and “neutral” were more likely to be those in the private schools. Also, much higher rates of students in the

government schools selected “do not know” option. (34.65%) compared to (18.97%) in the private schools.

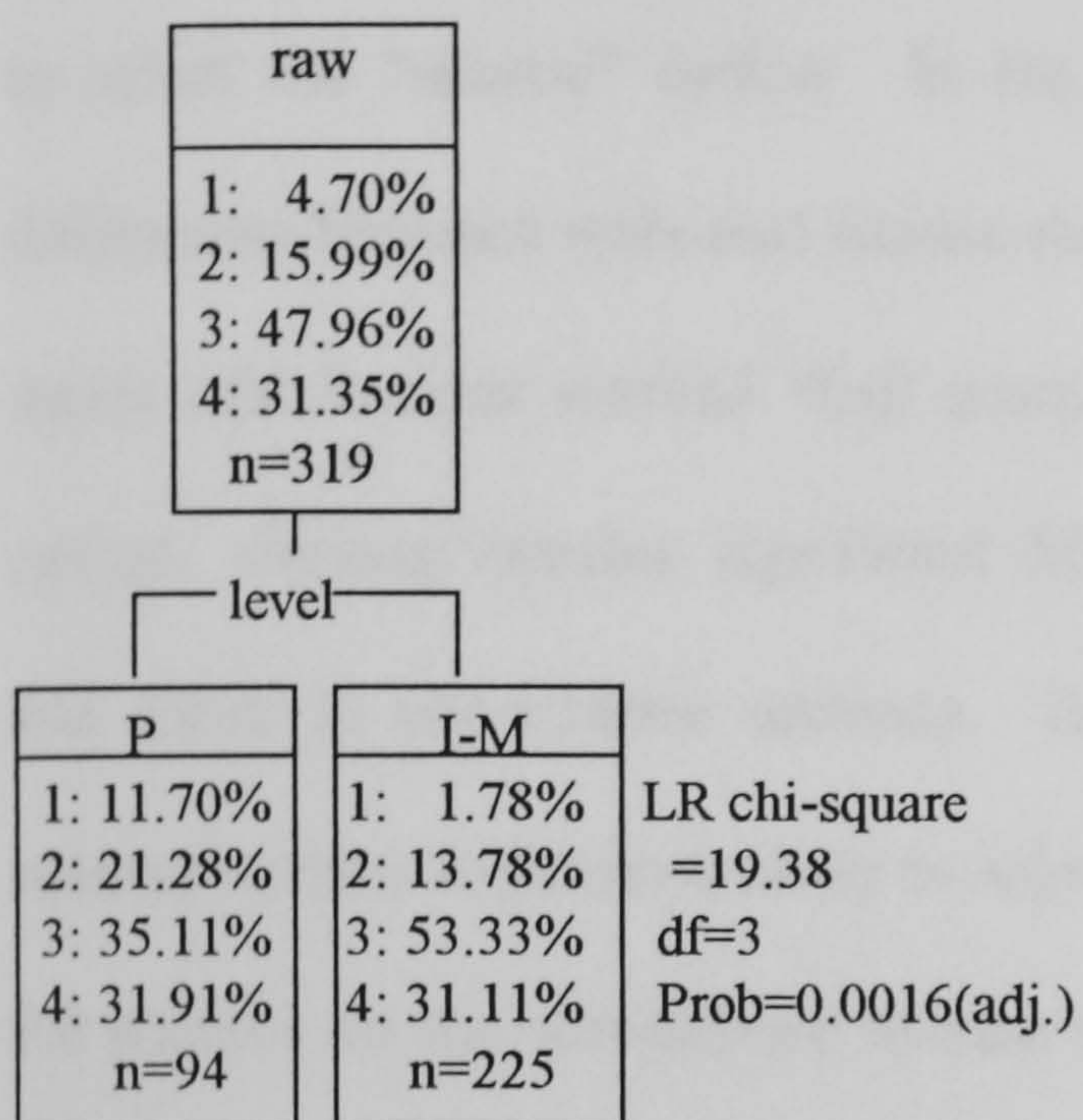


Figure 6.50 A: Raw foods come in contact with cooked foods. Cross-contamination (teachers).

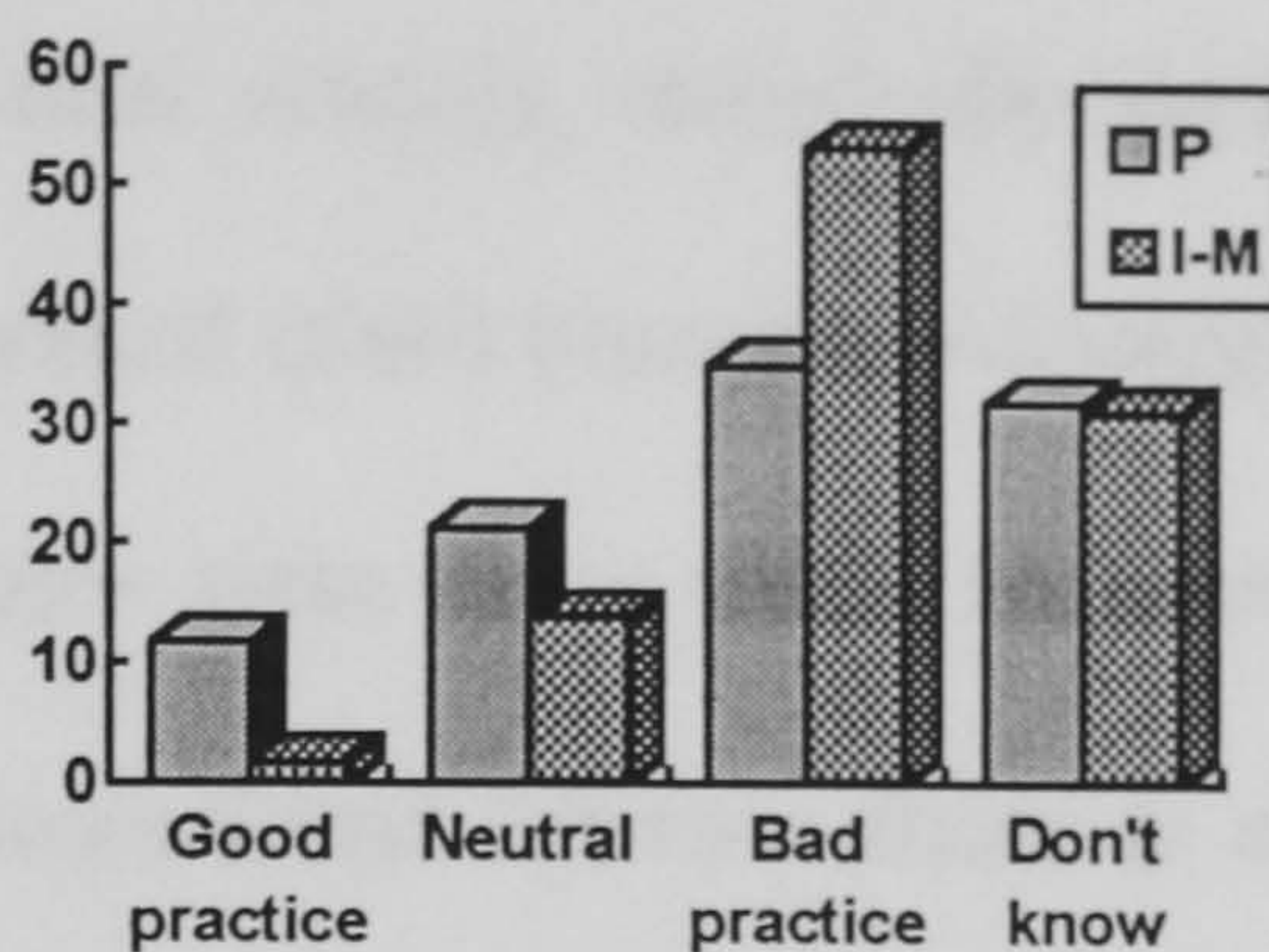


Figure 6.50 B: Raw foods come in contact with cooked foods. Cross-contamination (teachers).

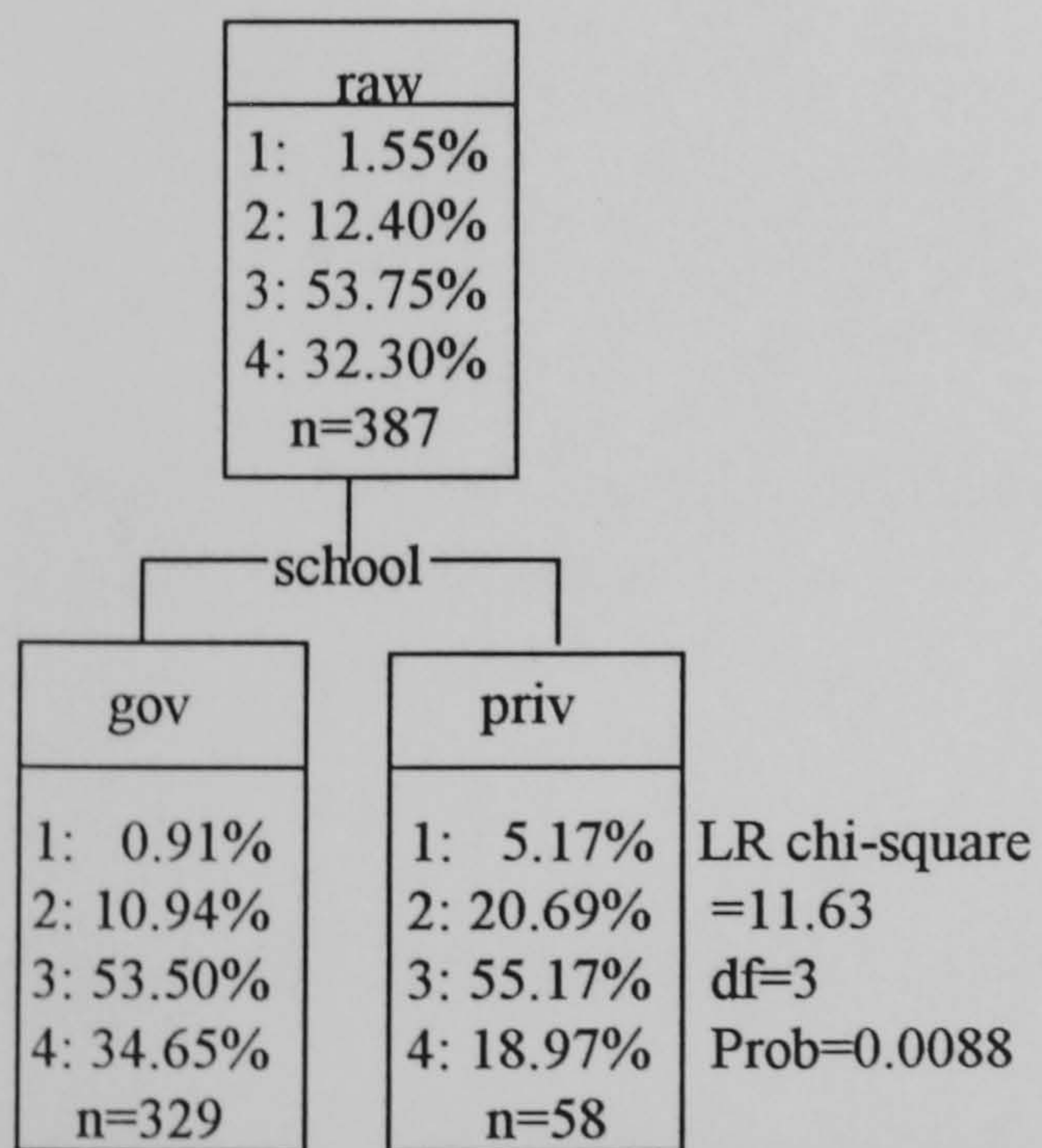


Figure 6.51 A: Raw foods come in contact with cooked foods. Cross-contamination (students)



Figure 6.51 B: Raw foods come in contact with cooked foods. Cross-contamination (students).

### Storing cooked foods in refrigerators overnight or longer.

CHAID has detected statistically significant differences in the responses of students and parents for the above statement (Figures 6.52 A&B and 6.53 A&B). In the

second branch of Figure 6.52 A, significant differences were noticed between governmental and private schools. Students in the governmental schools were more likely to select “bad practice”, however, those in the private schools were more likely to select the “neutral” option. In the governmental schools, statistically significant differences between male and female students emerged (third branch). Although both males and females marked “bad practice”, females were more likely to select this option. Among females, significant differences were found between those in science and those in non-science sections. Both selected “bad practice” but those in the science section were more likely to select this option. Also note that the response rate for students in the non-science section who selected “do not know” option was higher than those in the science section.

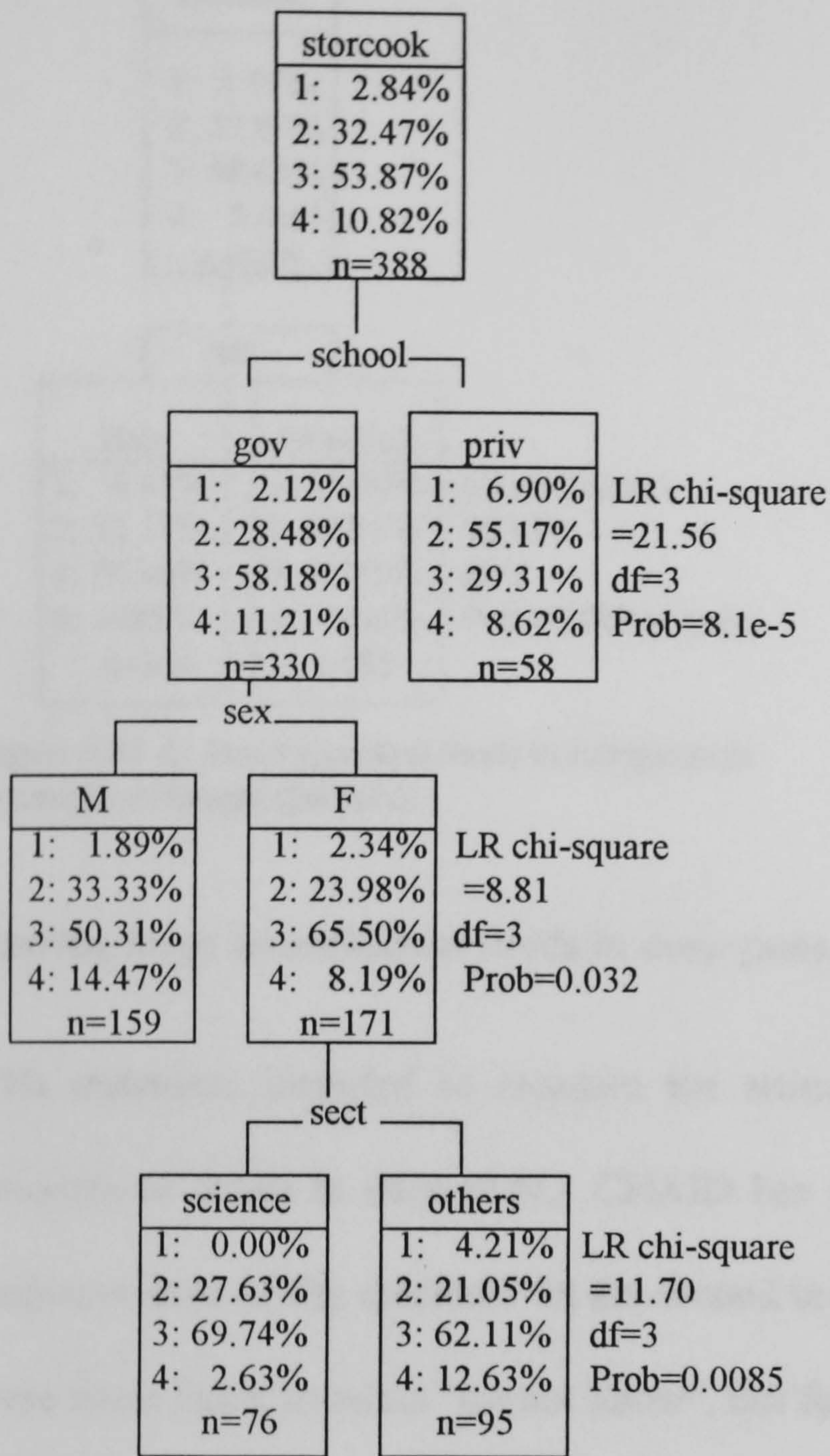
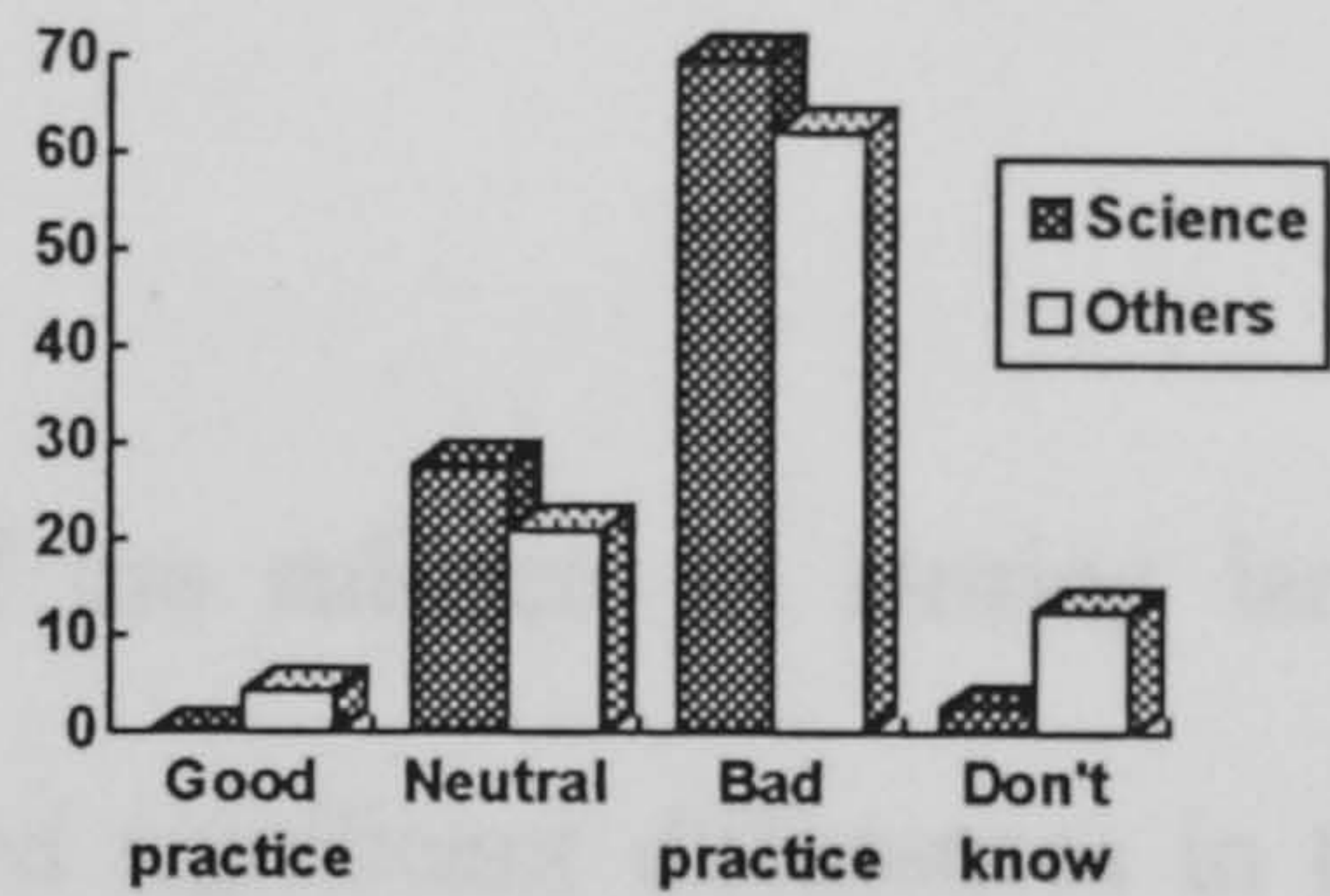
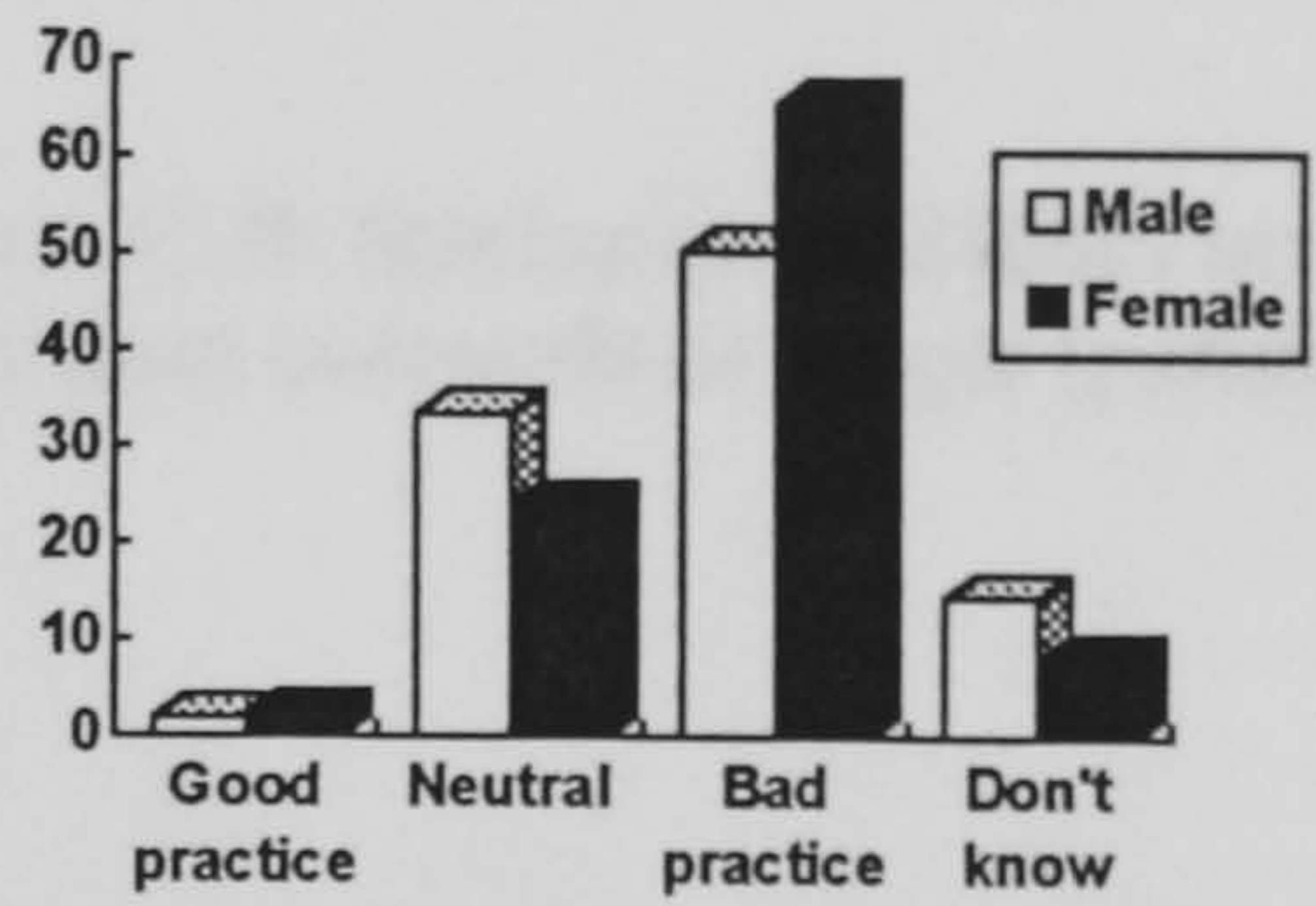
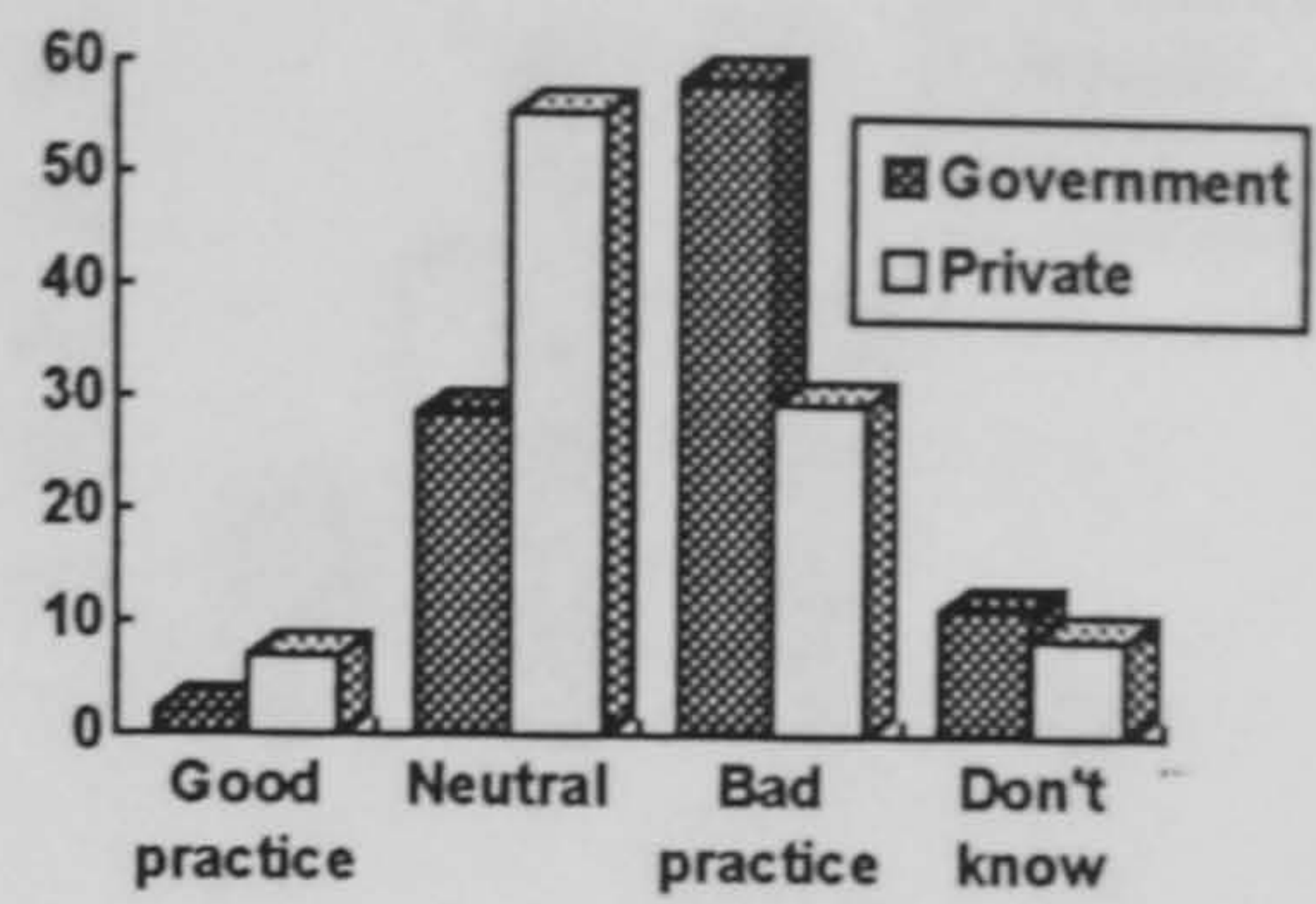


Figure 6.52 A: Storing cooked foods in refrigerator overnight or longer (students).



Figures 6.52 B: Storing cooked foods in refrigerator overnight or longer (students).

Figures 6.53 A&B showed the response rates for parents. Statistically significant differences emerged between Bahraini and Non-Bahraini parents with respect to the above statement. Note that Bahraini were more inclined to choose “bad practice” whereas Non-Bahraini tend to select “neutral” option.

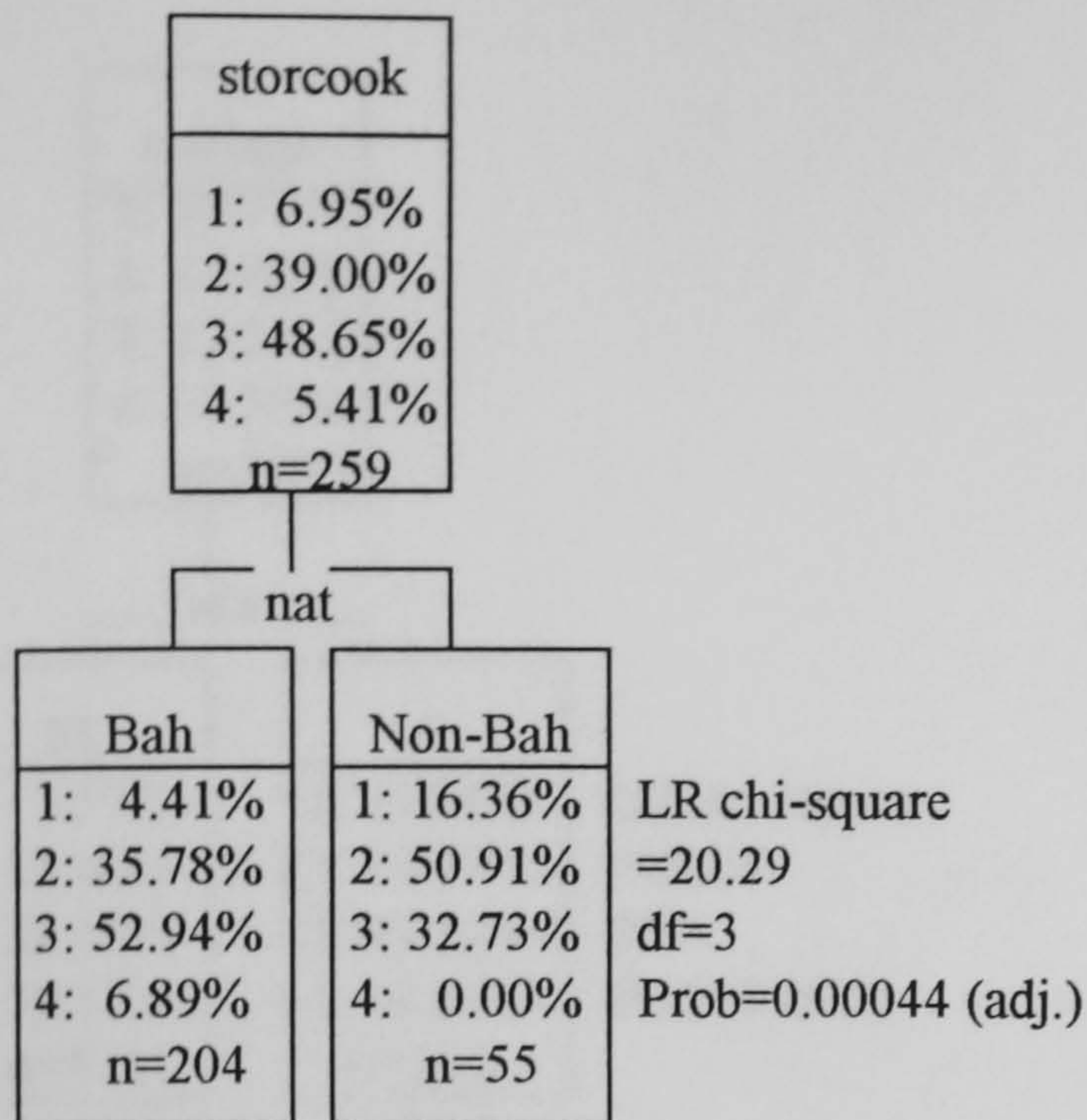


Figure 6.53 A: Storing cooked foods in refrigerators overnight or longer (parents).

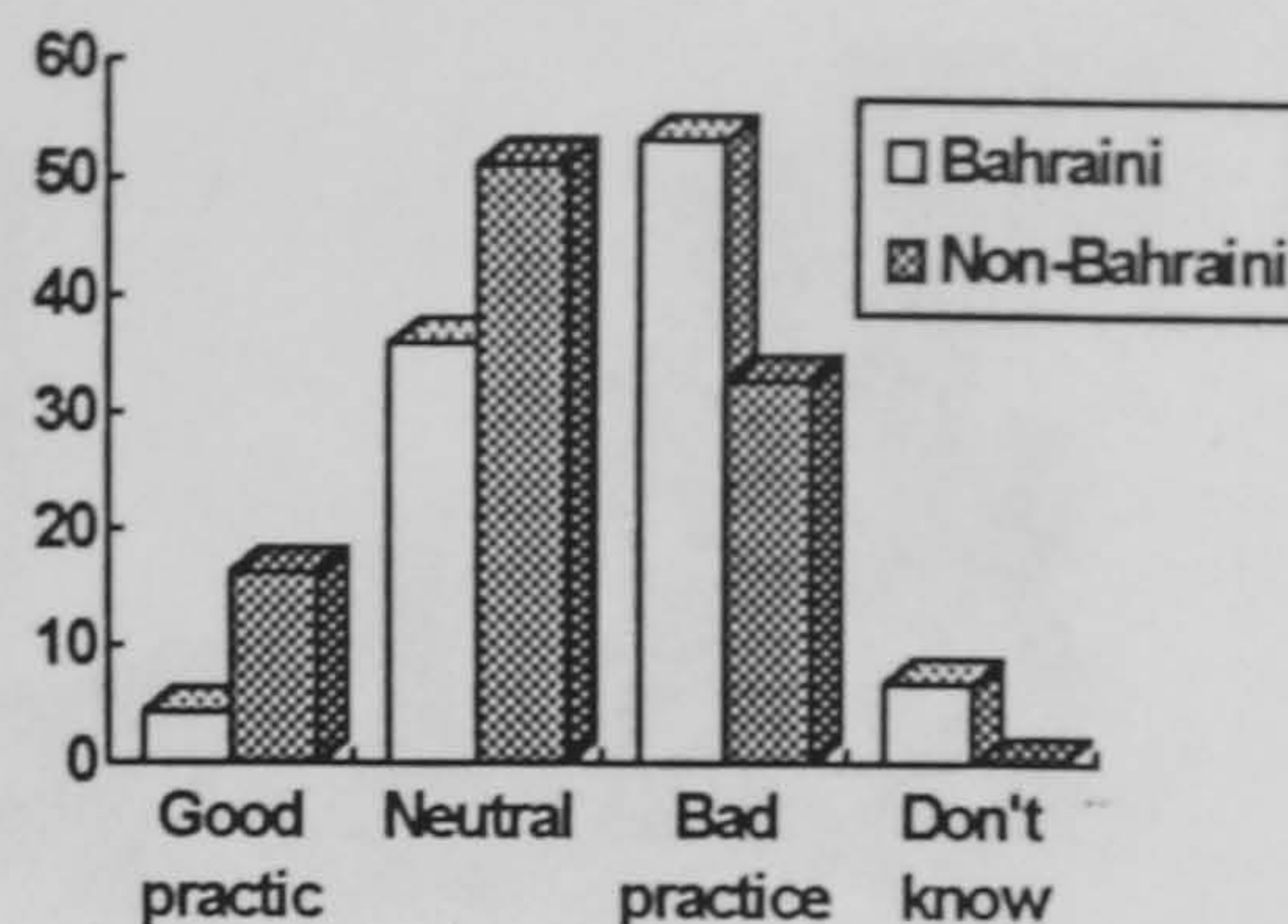


Figure 6.53 B: Storing cooked foods in refrigerators overnight or longer (parents).

### Storing large quantities of foods in deep pans.

This statement intended to measure the attitudes of the subjects to storing large amounts of foods in deep pans. CHAID has detected significant differences in the response rates of the students. In the second branch of Figures 6.54 A, male students were more likely to select “do not know”, but females were more prone to chose “bad practice”. However, in the third branch among females, both those in science and those in non-science sections selected “bad practice”, yet those in the science section were more likely to select this option.

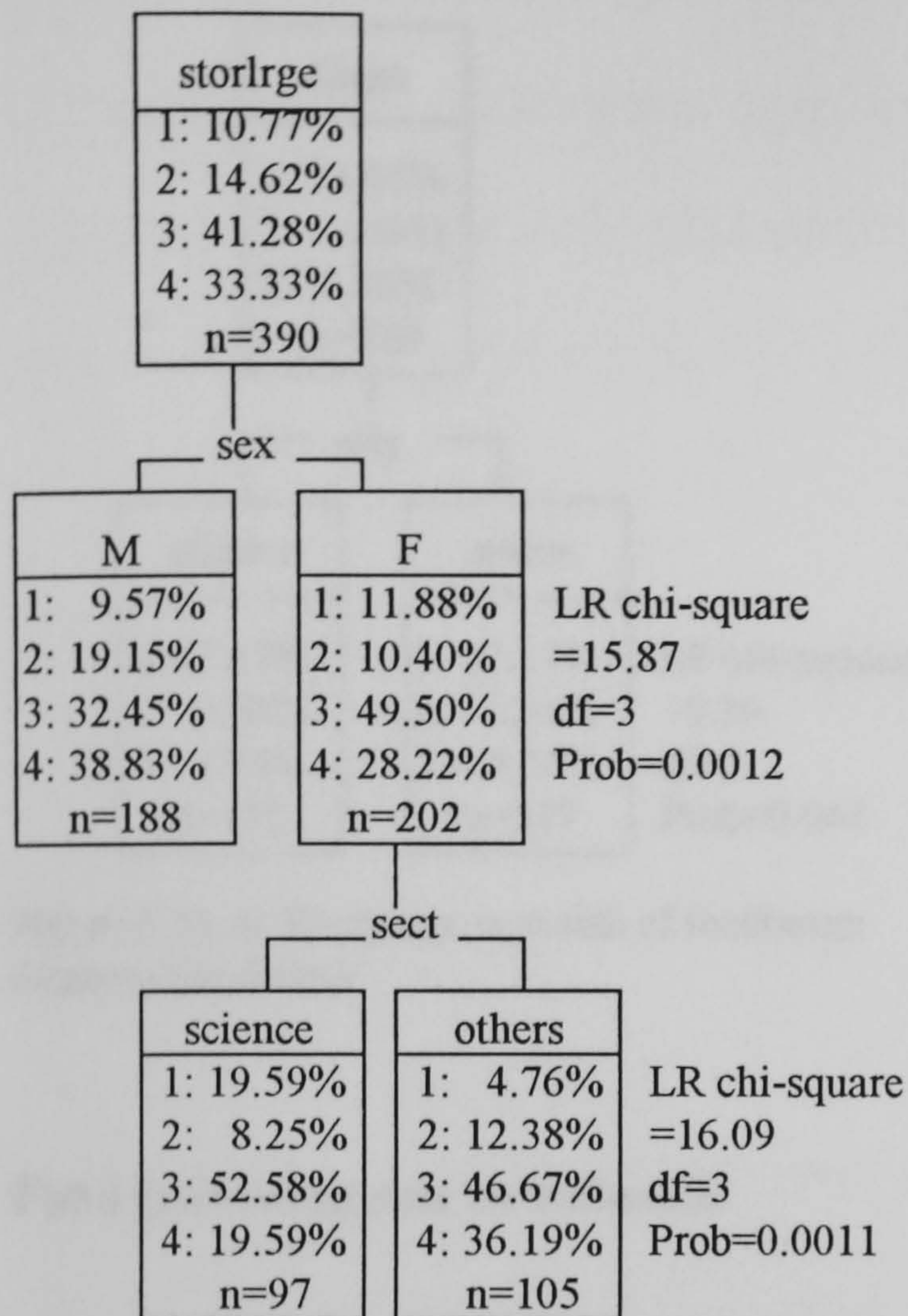
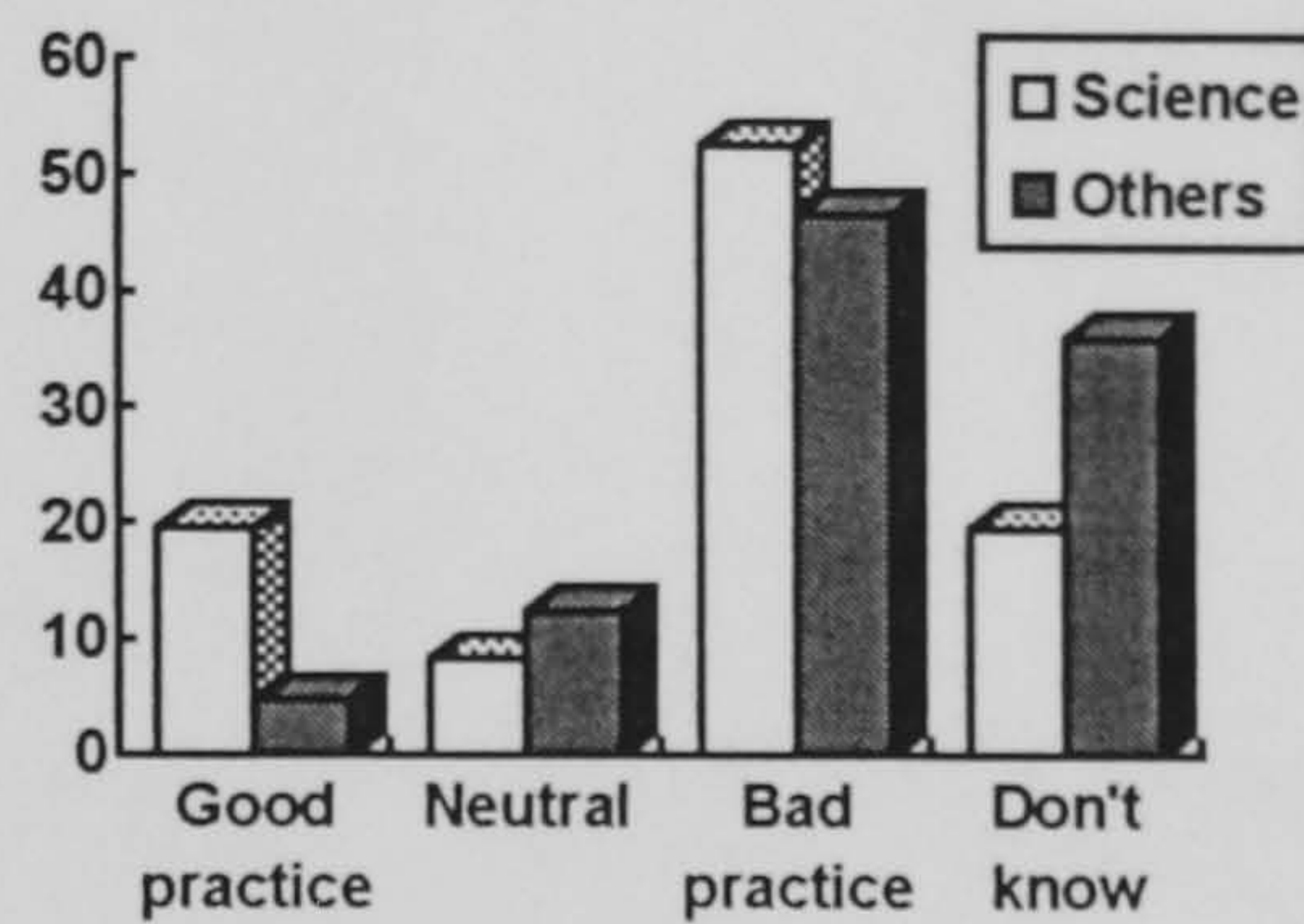
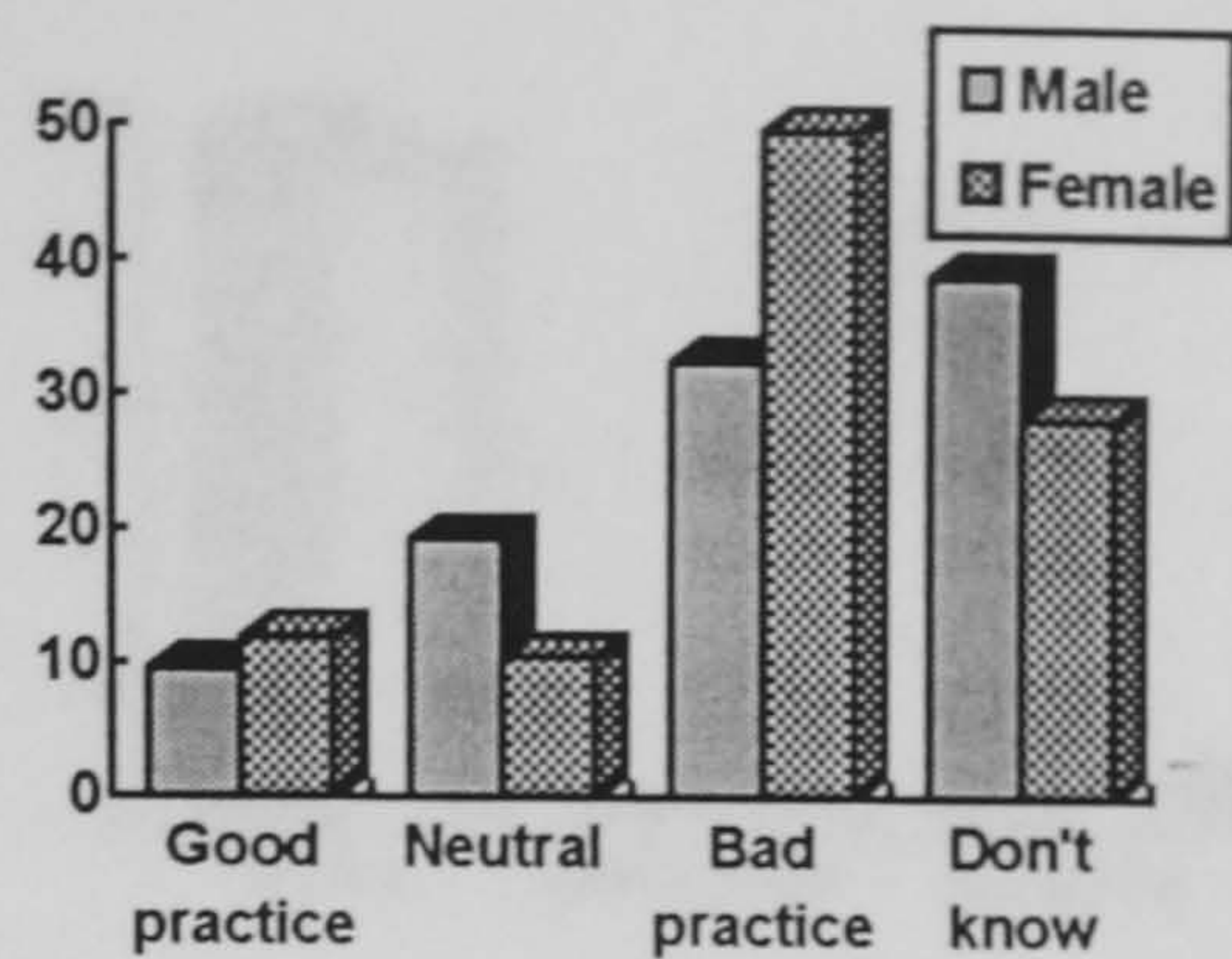


Figure 6.54 A: Storing large quantities of food in deep pans (students).



Figures 6.54 B: Storing large quantities of food in deep pans (students).

**D. Questions based on the HBM:**

Figures 6.55 A&B through Figures 6.59 A&B dealt with responses on food safety which were based on the principles of the HBM.

**Food poisoning happens at any age.**

All the subjects agreed that food poisoning affect any age. However, statistically significant differences were noticed among students in different sections of their speciality. It was found that students in the science section were more likely to agree that everybody is at risk irrespective of their age (Figures 6.55 A&B).

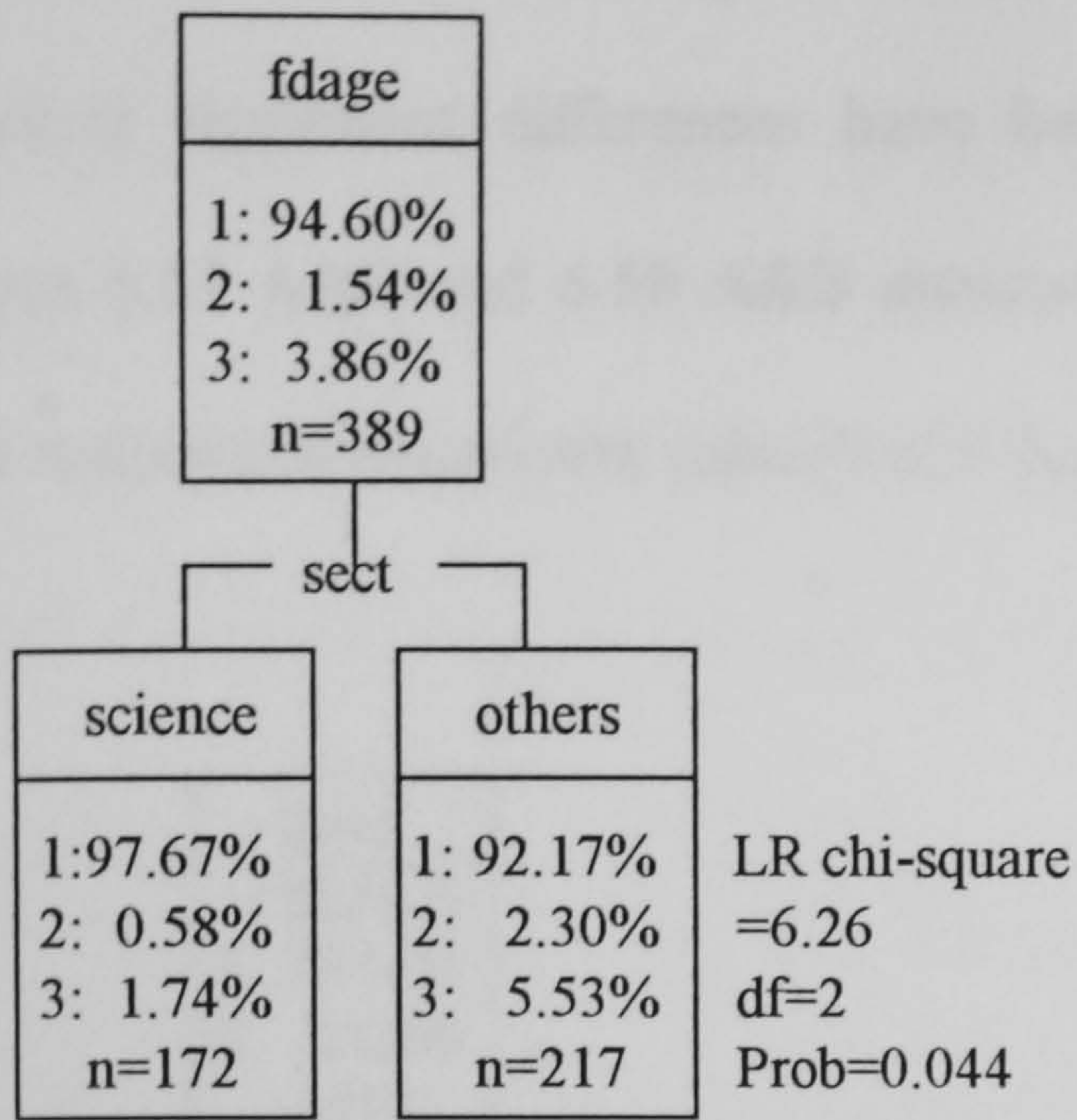


Figure 6.55 A: Every age is at risk of foodborne illnesses (students).

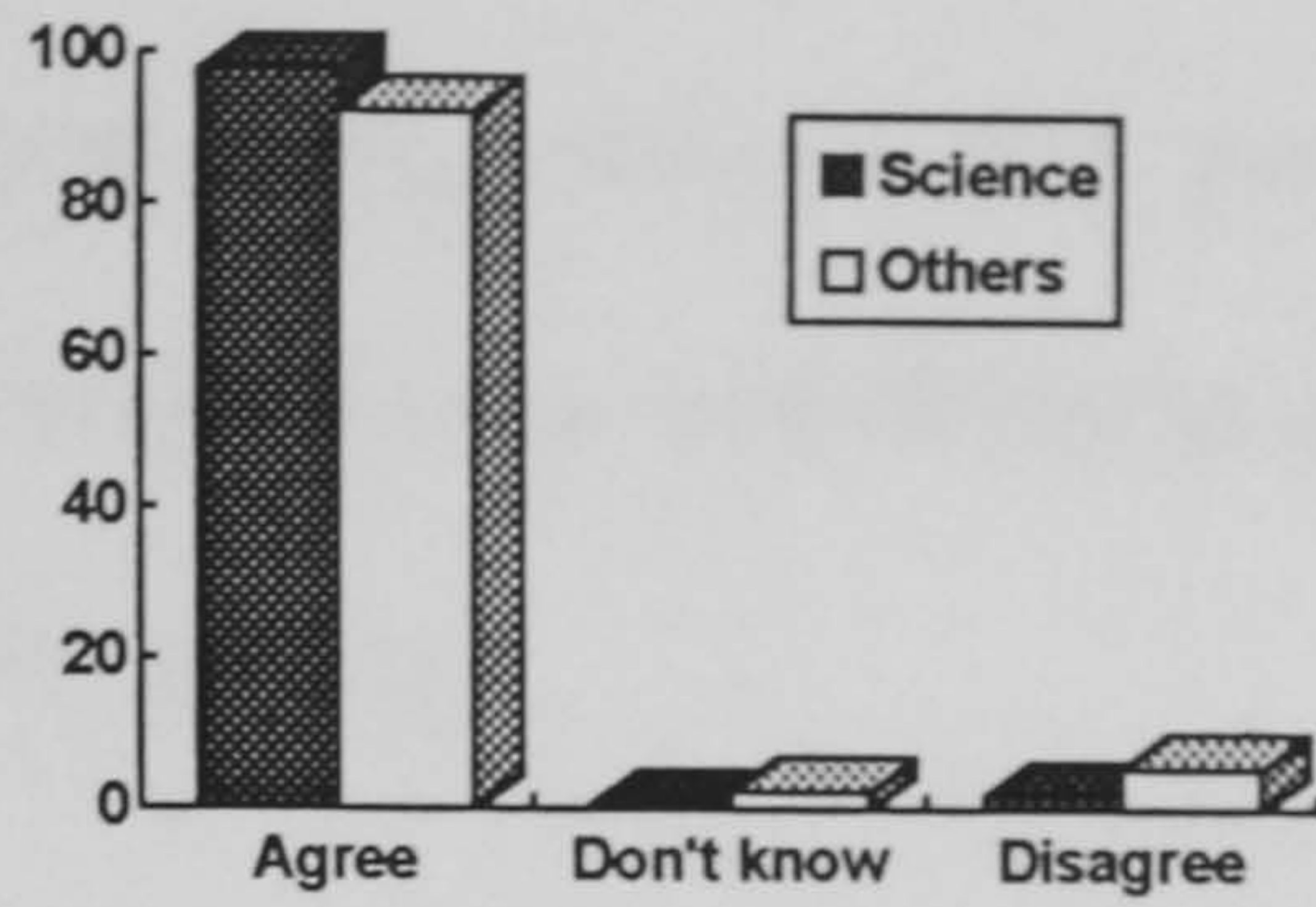


Figure 6.55 B: Every age is at risk of foodborne illnesses (students).

**Food poisoning can be reduced.**

All the respondents agreed that food poisoning can be reduced. However, statistically significant differences emerged (Figures 6.56 A&B). Teachers who had university qualifications were more likely to agree than those with lower level of education.

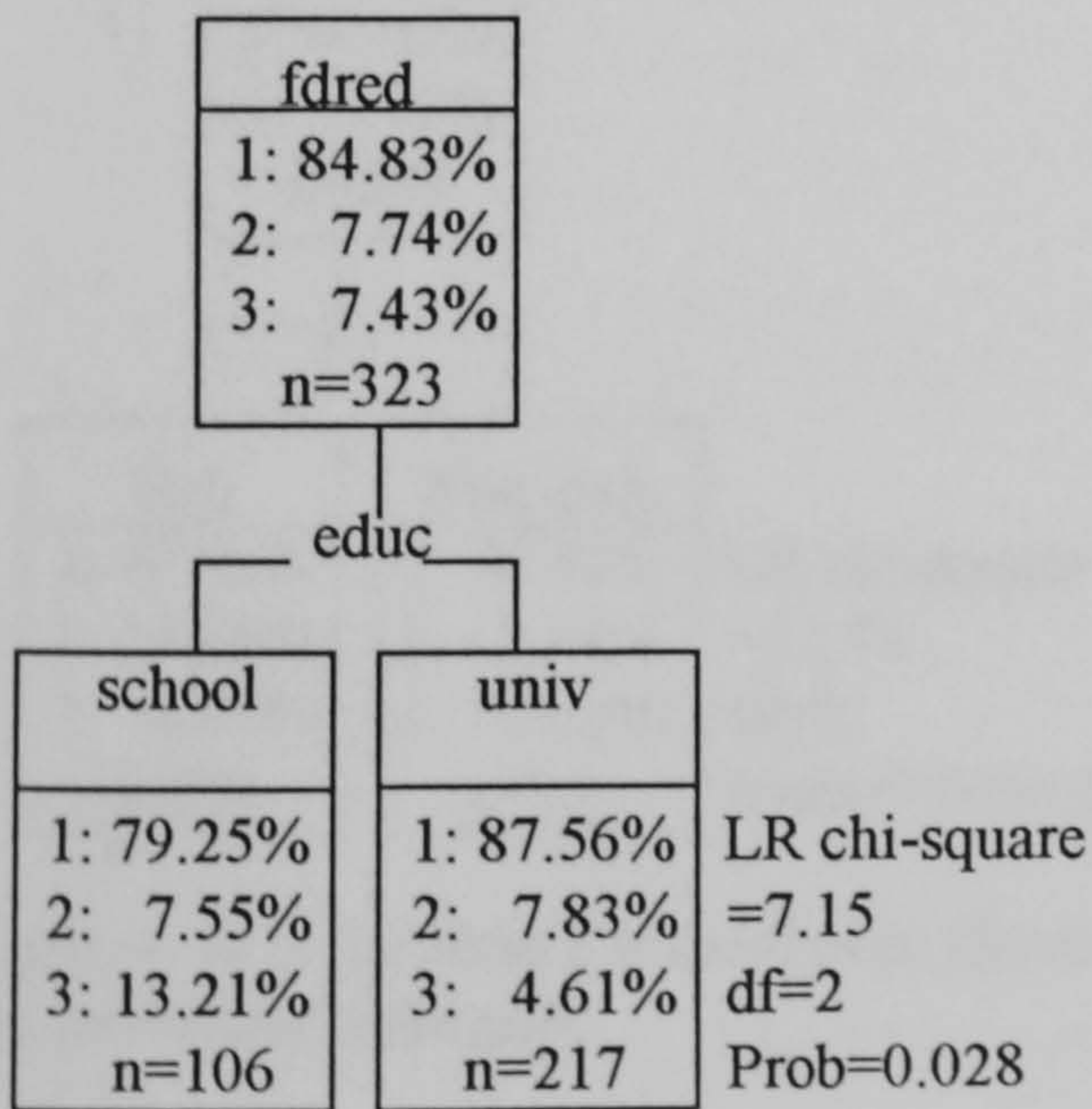


Figure 6.56 A: Incidence of foodborne illnesses can be reduced (teachers).

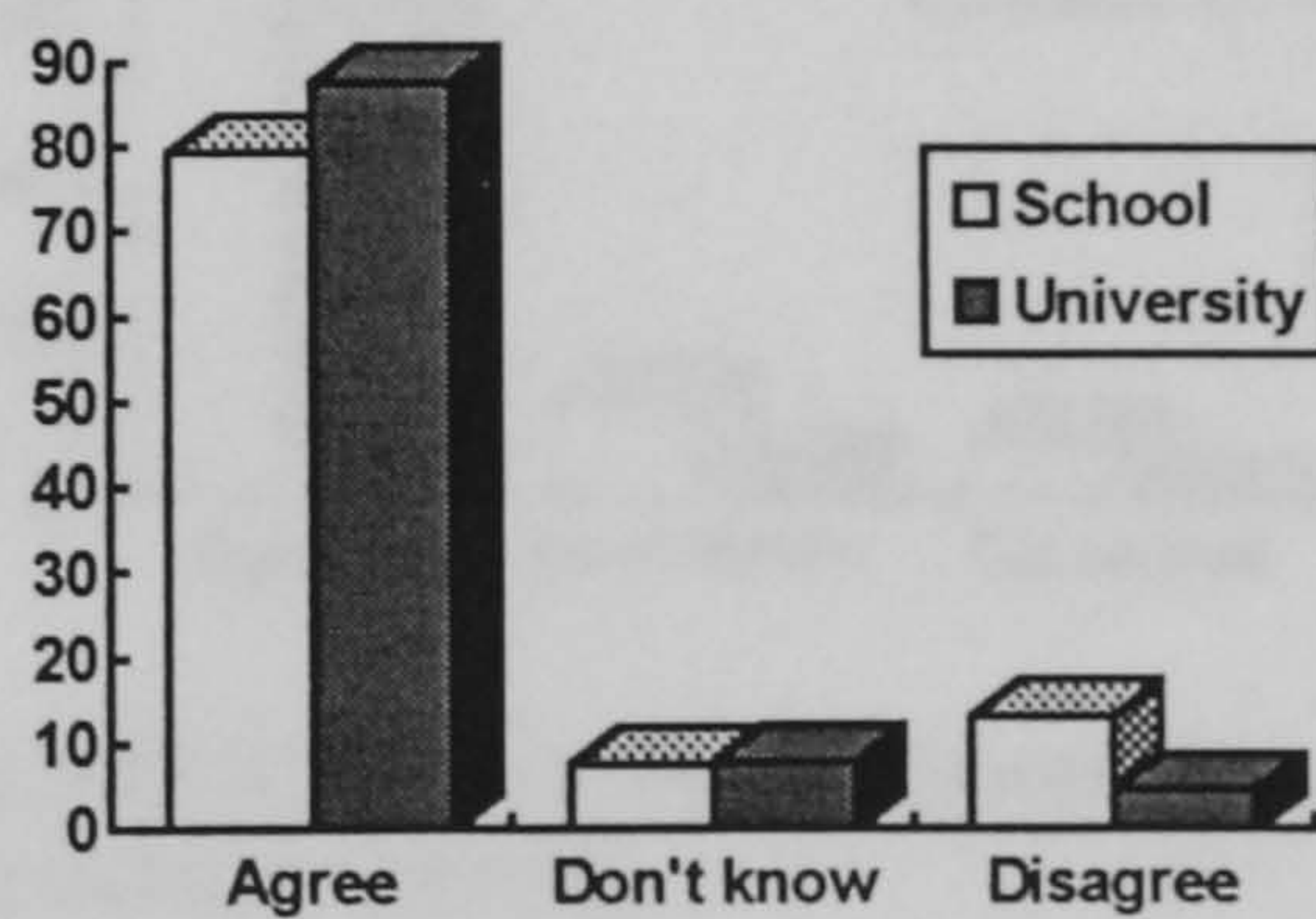


Figure 6.56 B: Incidence of foodborne illnesses can be reduced (teachers).



Students and parents also agreed that food poisoning can be reduced. However, statistical significant differences have been detected among students and parents. Figures 6.57 A&B and 6.58 A&B showed that those who were more likely to agree were students in the private schools and Non-Bahraini parents.

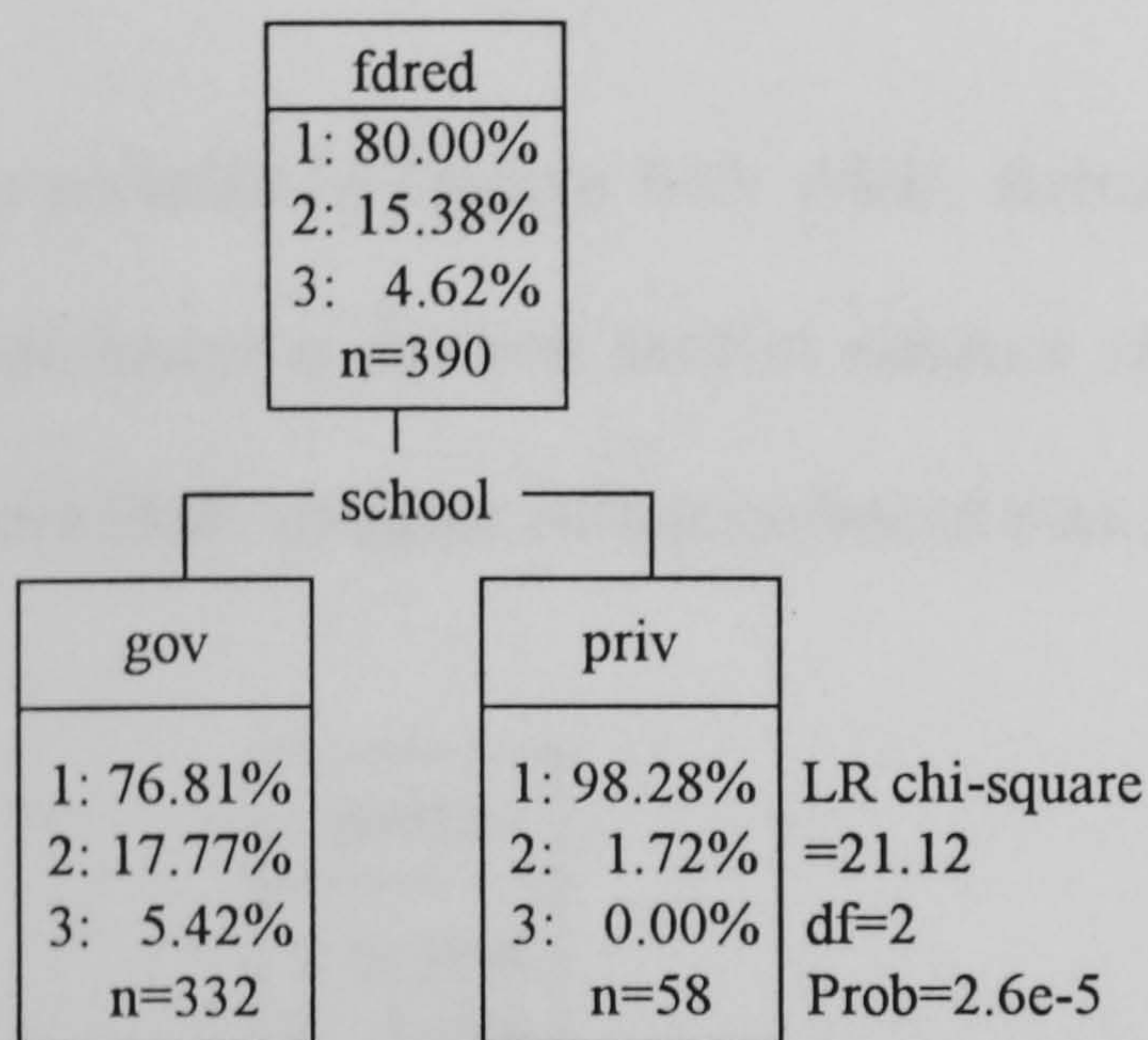


Figure 6.57 A: Incidence of foodborne illnesses can be reduced (students).

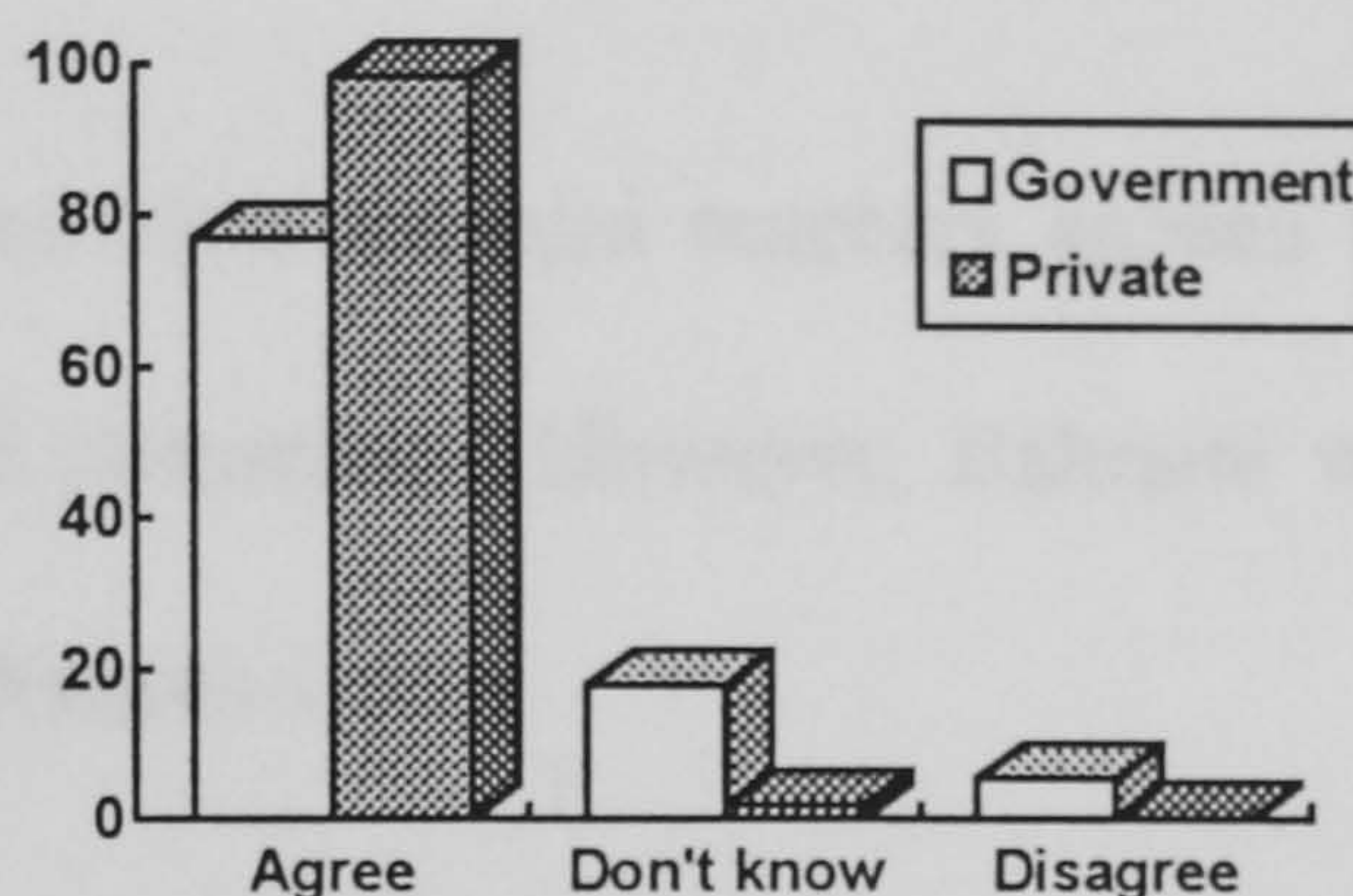


Figure 6.57 B: Incidence of foodborne illnesses can be reduced (students).

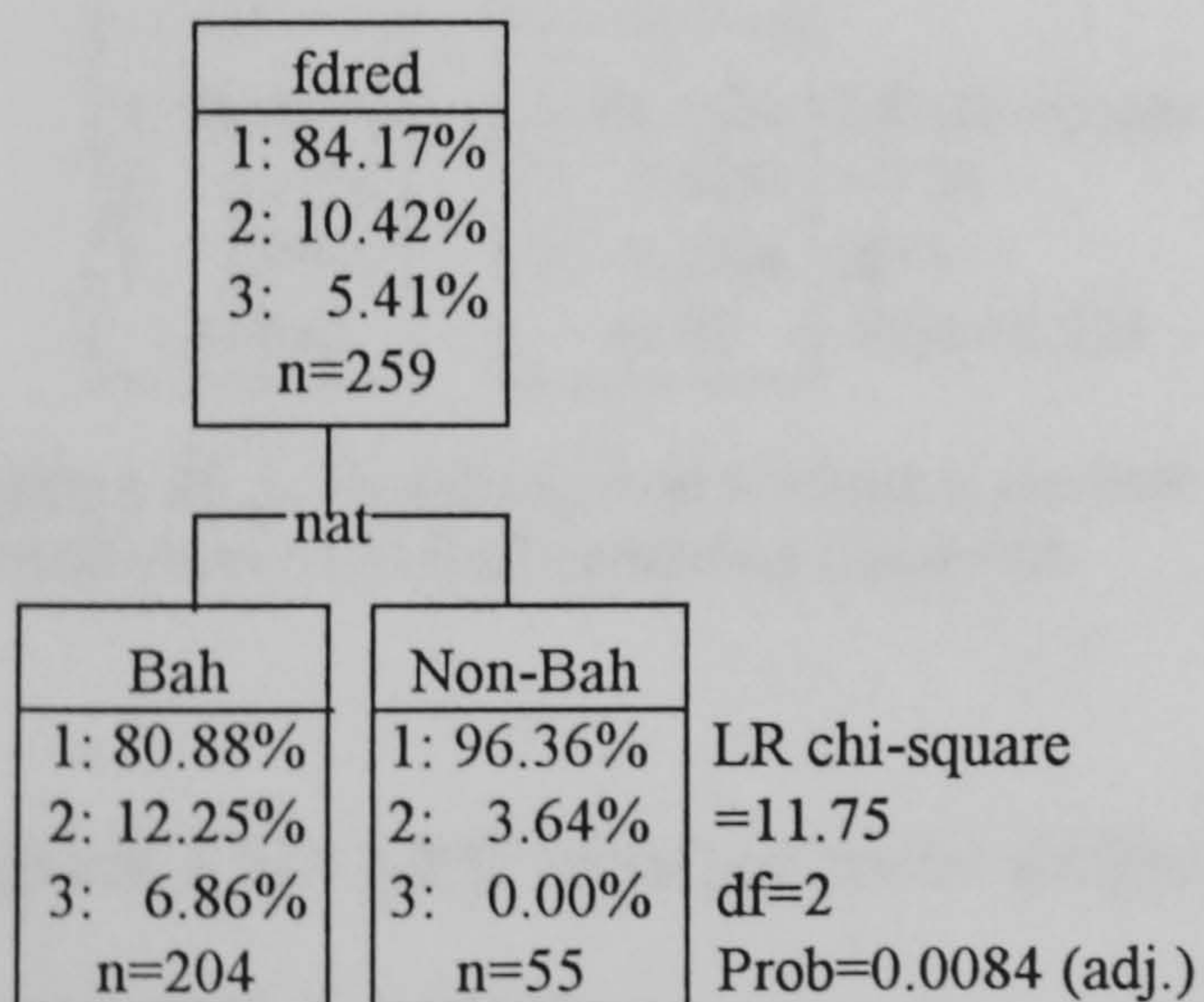


Figure 6.58 A: Incidence of foodborne illnesses can be reduced (parents).

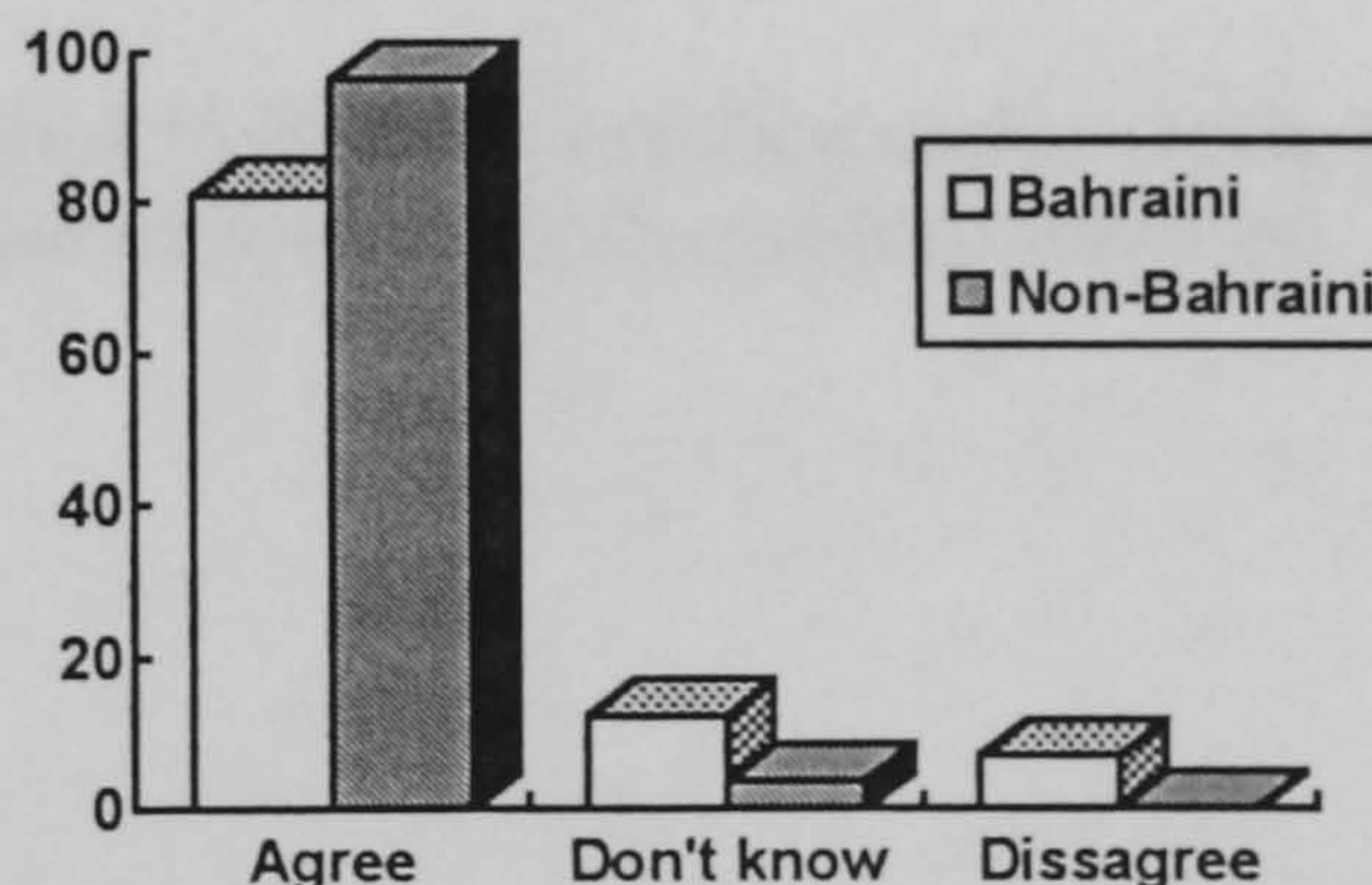


Figure 6.58 B: Incidence of foodborne illnesses can be reduced (parents).

**E. Control measures:**

Punishment and education were included in this section. The following results have emerged:

**Punishing food workers is the best control measure.**

As revealed in Figures 6.59 A&B, Bahraini and Non-Bahraini teachers agreed that punishment is the best control measure of food poisoning. However, Bahraini were more likely to agree with punishment than Non-Bahraini.

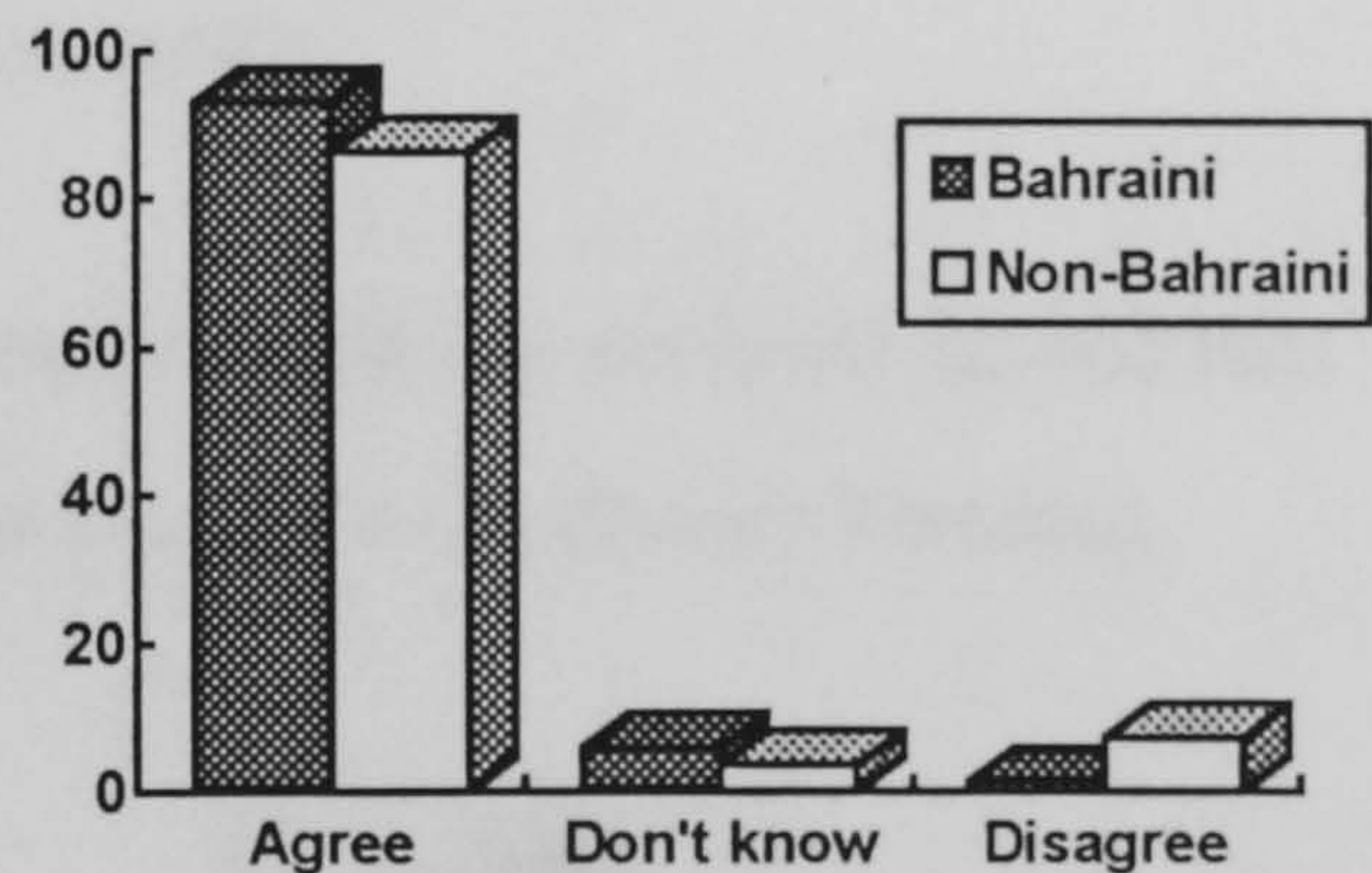
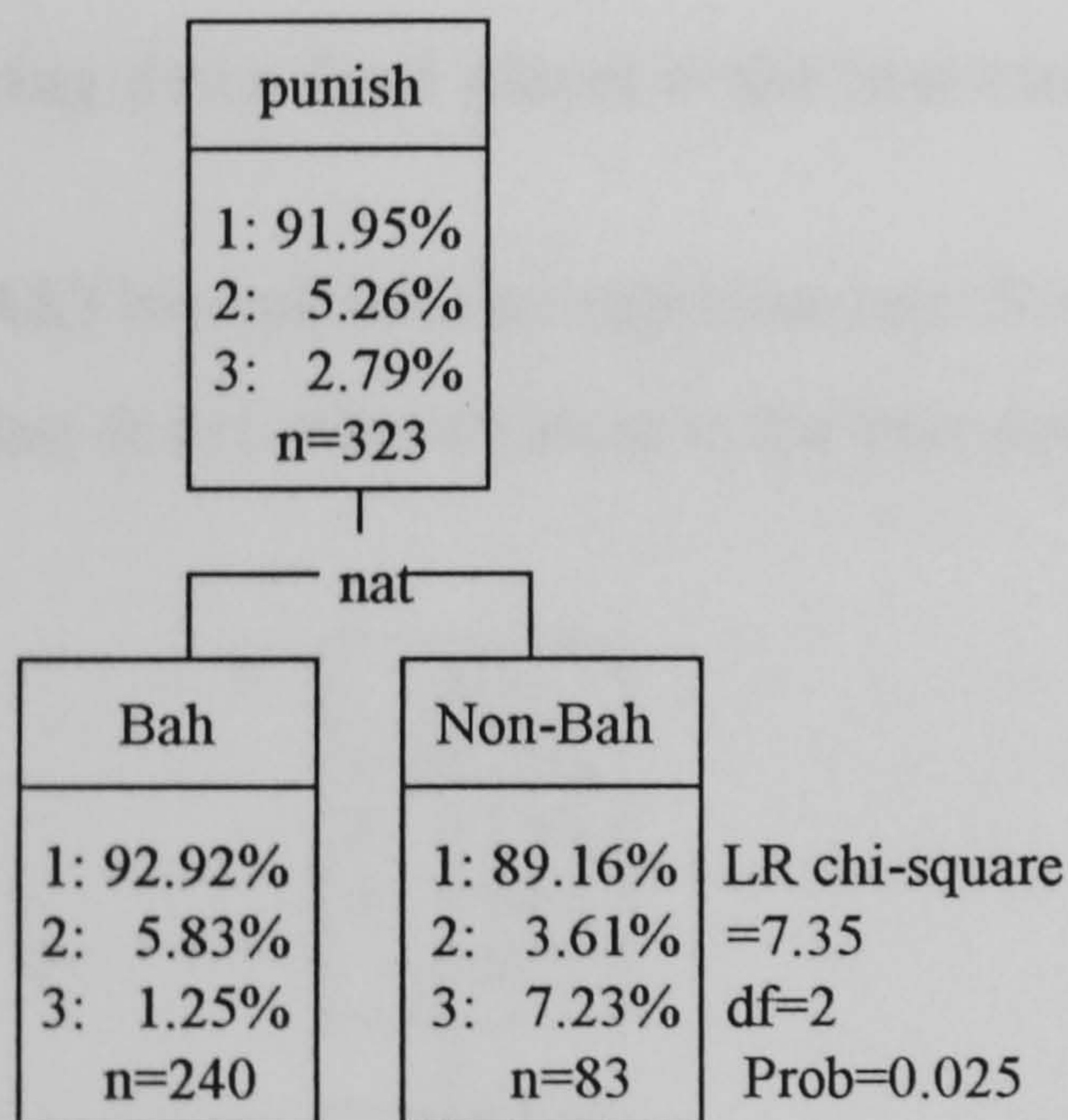


Figure 6.59 B: Punishing food workers is the best control measure of food poisoning (teachers).

Figure 6.59 A: Punishing food workers is the best control measure of food poisoning (teachers).

Figures 6.60 A&B reported some similar results to Figure 6.59A. All the students agreed with punishment but students in the governmental schools were more inclined to agree with punishment compared to those in the private schools.

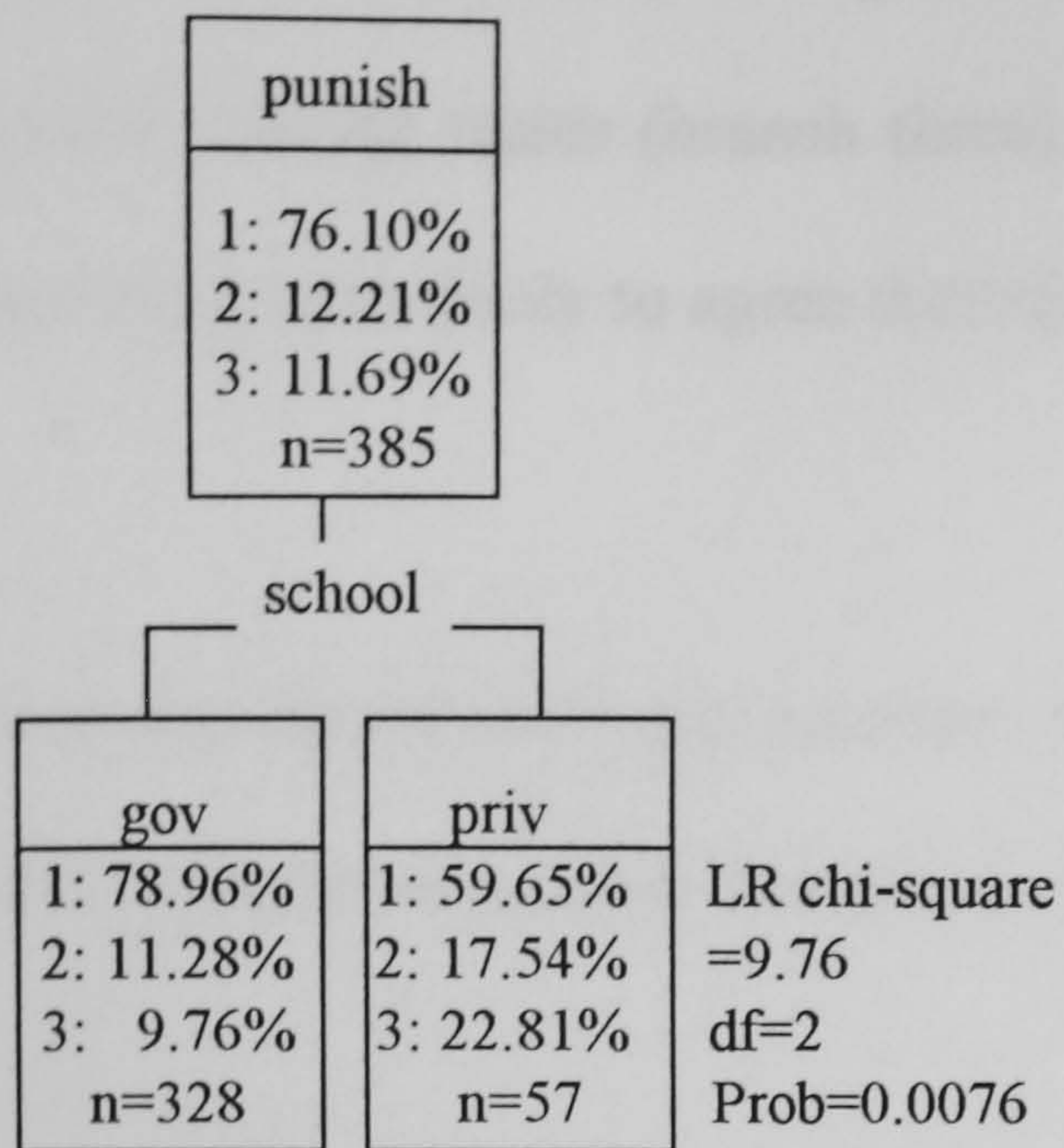


Figure 6.60 A: Punishing food workers is the best control measure of food poisoning (students).

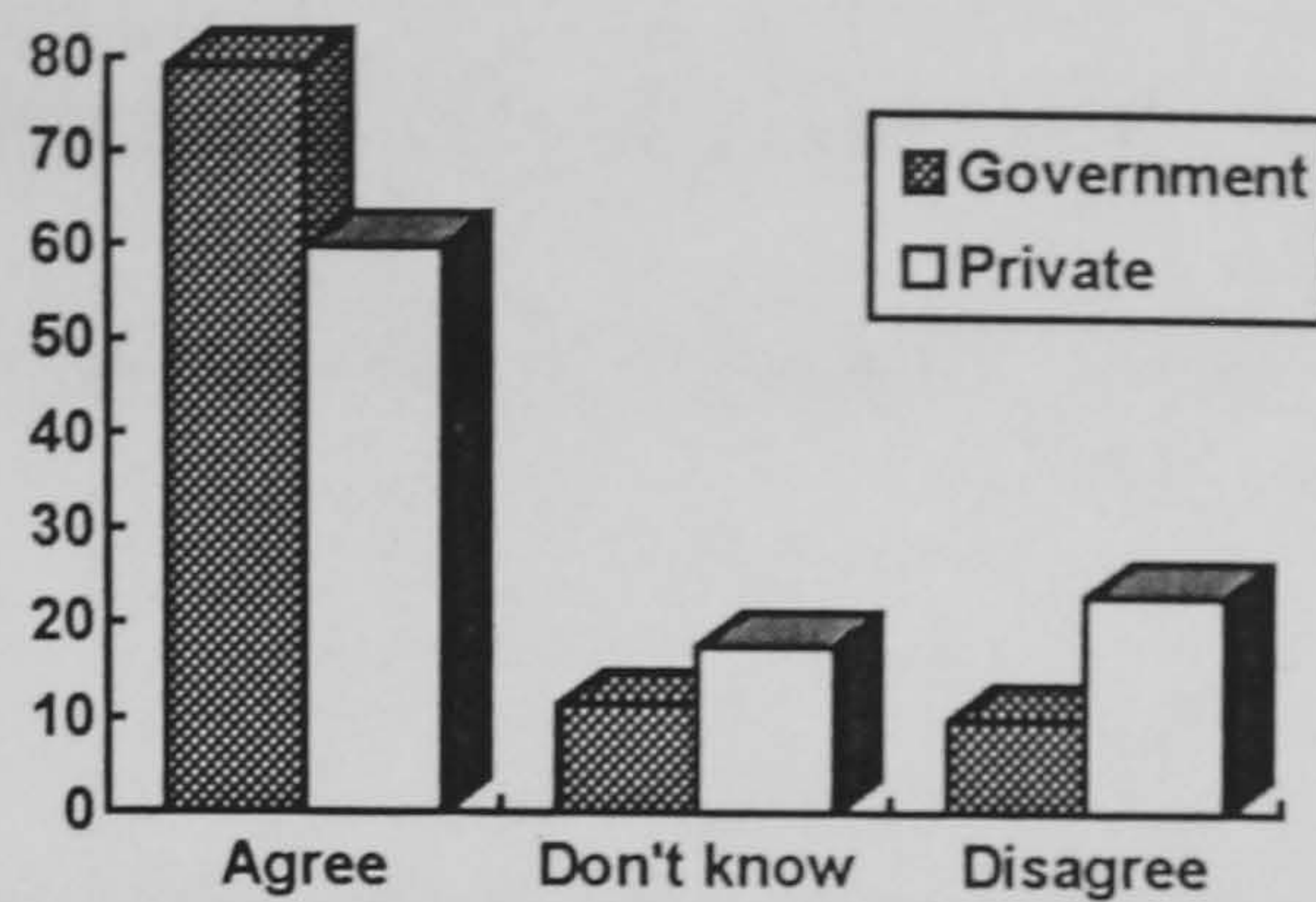


Figure 6.60 B: Punishing food workers is the best control measure of food poisoning (students).

**Closing down food places is the best control measure.**

CHAID has splitted the responses into three branches. All the students agreed that closing down of food places is the best control measure to foodborne illnesses.

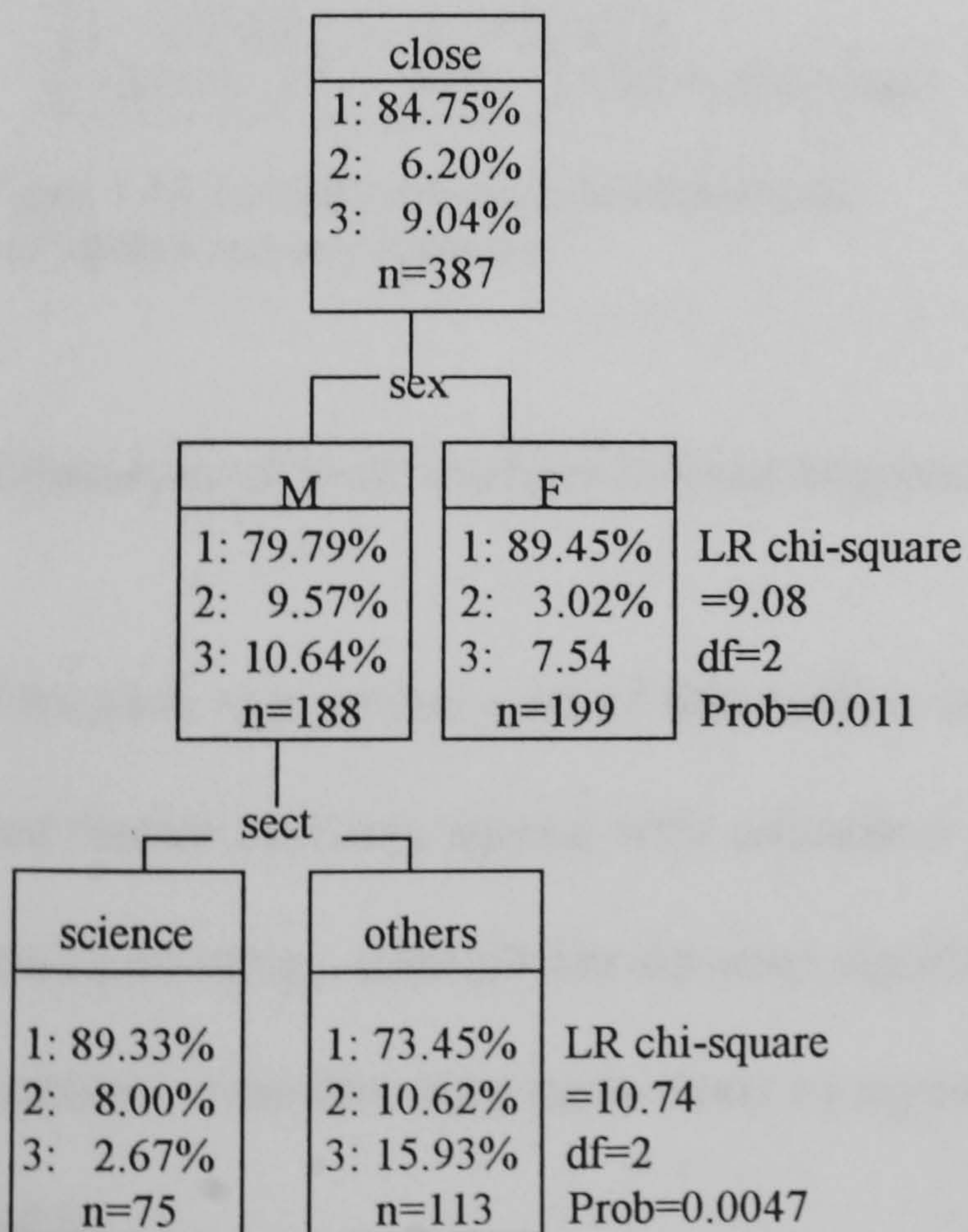
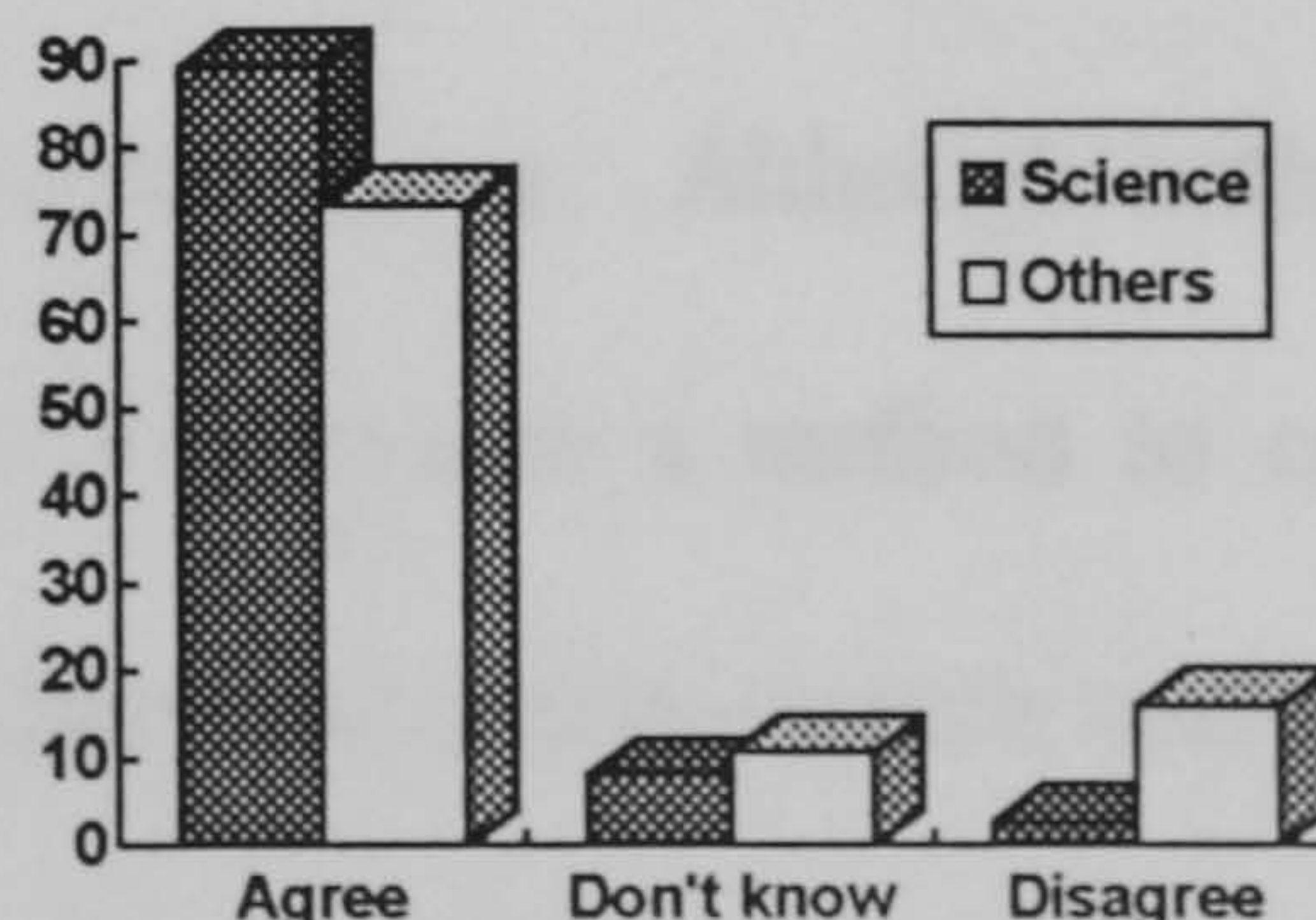
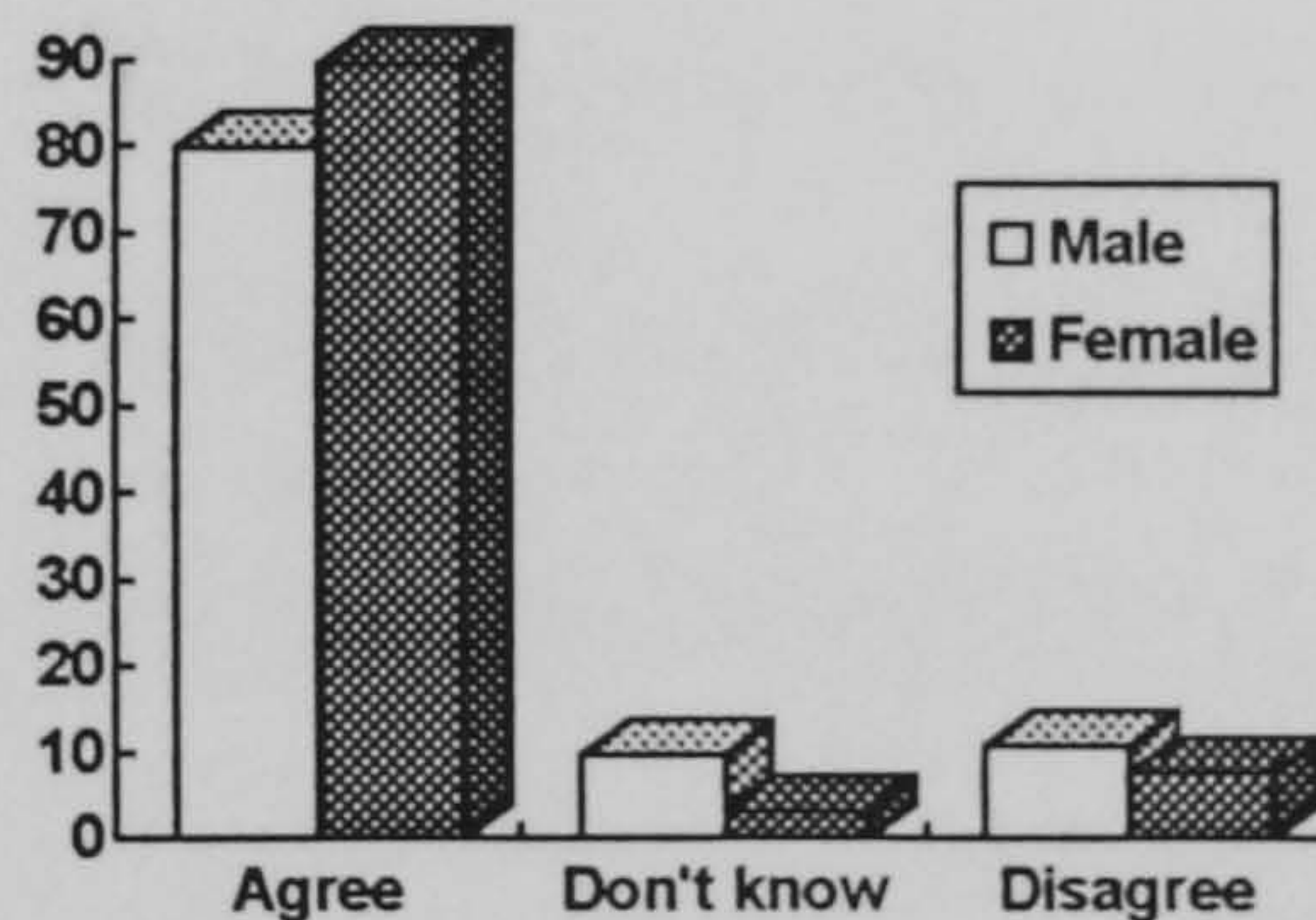


Figure 6.61 A: Closing down food places is the best control measure (students).



Figures 6.61 B: Closing down food places is the best control measure (students).

Females were more likely to agree with the statement than males (branch two). Moreover, among males (branch three), it was revealed that students in the science section were more likely to agree than those in other sections (Figures 6.61 A&B).

Parents also agreed with the statement (Figures 6.62 A&B). However, the response rate for Bahraini were much higher than Non-Bahraini parents.

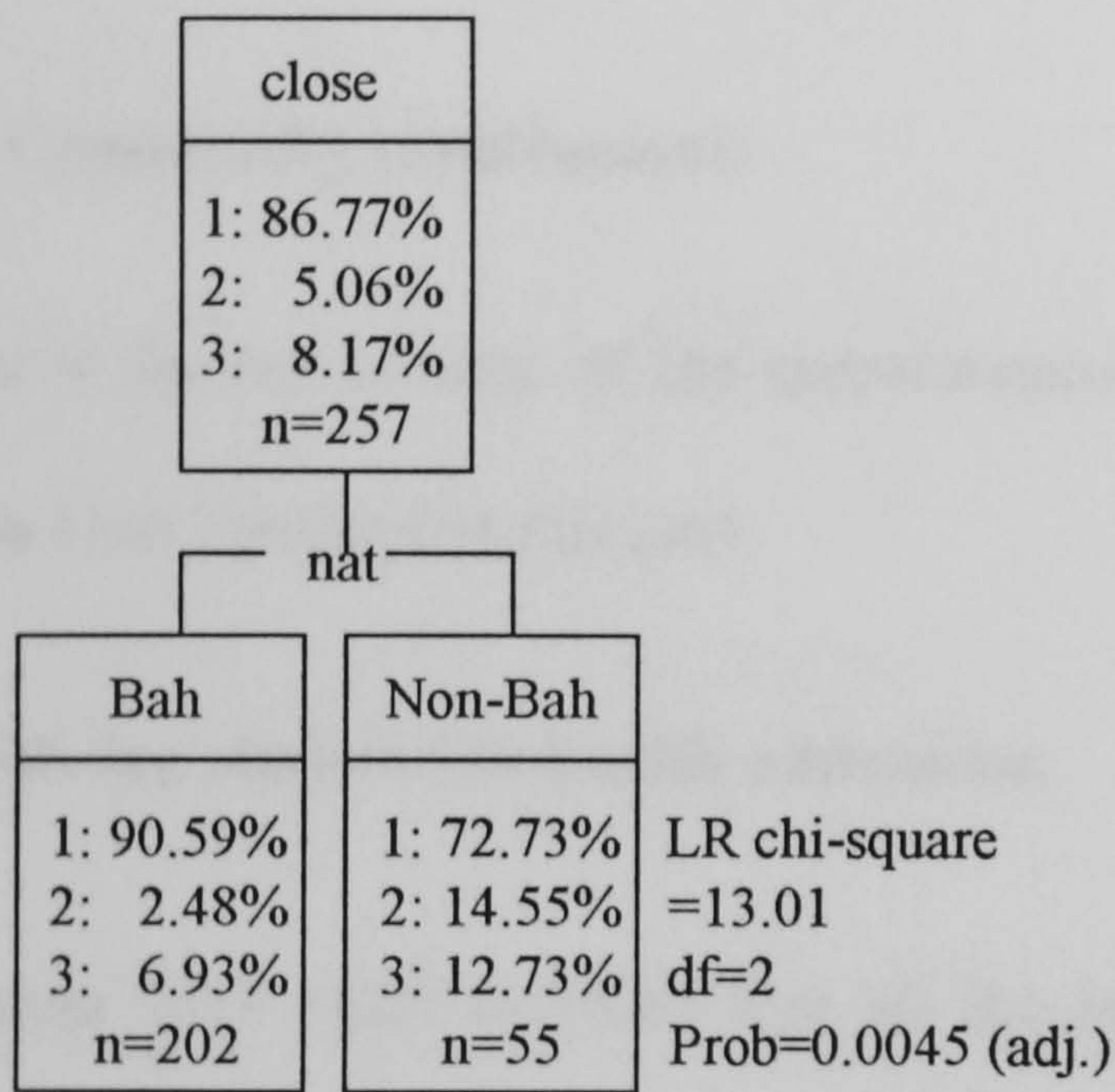


Figure 6.62 A: Closing down food places is the best control measure (parents).

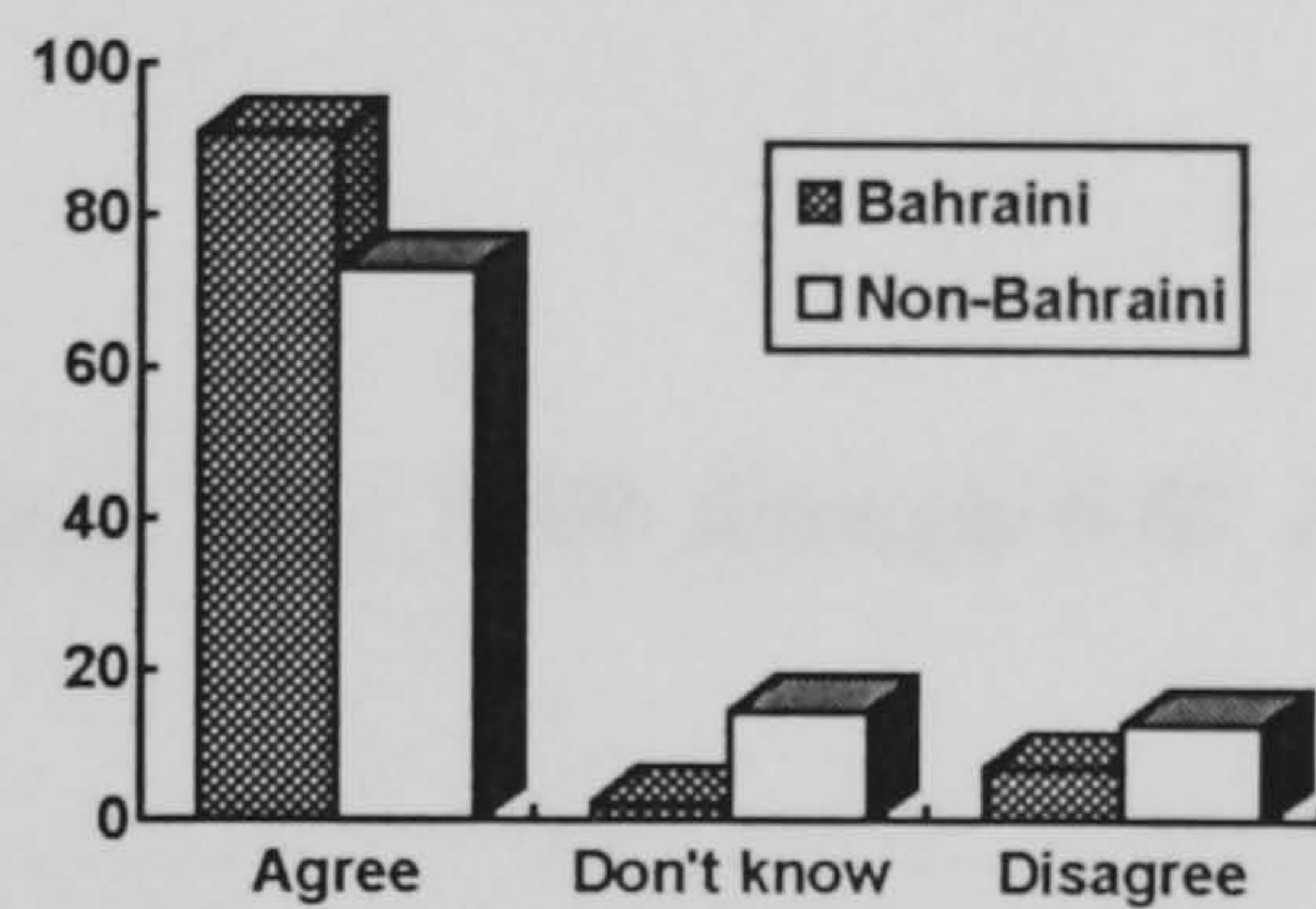


Figure 6.62 B: Closing down food places is the best control measure (parents).

### Education of food workers in food hygiene.

Education is a second part of this section of control measures. Although both male and female teachers agreed with education of food workers as a method to control food poisoning. CHAID has detected significant differences between male and female teachers. Females were more likely to agree with education than males (Figures 6.63 A&B).

edhand	
1: 96.91%	
2: 1.85%	
3: 1.23%	
n=324	

sex	
M	F
1: 94.77%	1: 99.34%
2: 2.91%	2: 0.66%
3: 2.33%	3: 0.00%
n=172	n=152

LR chi-square =7.68  
df=2  
Prob=0.021

Figure 6.63 A: Education of food workers in food safety (teachers).

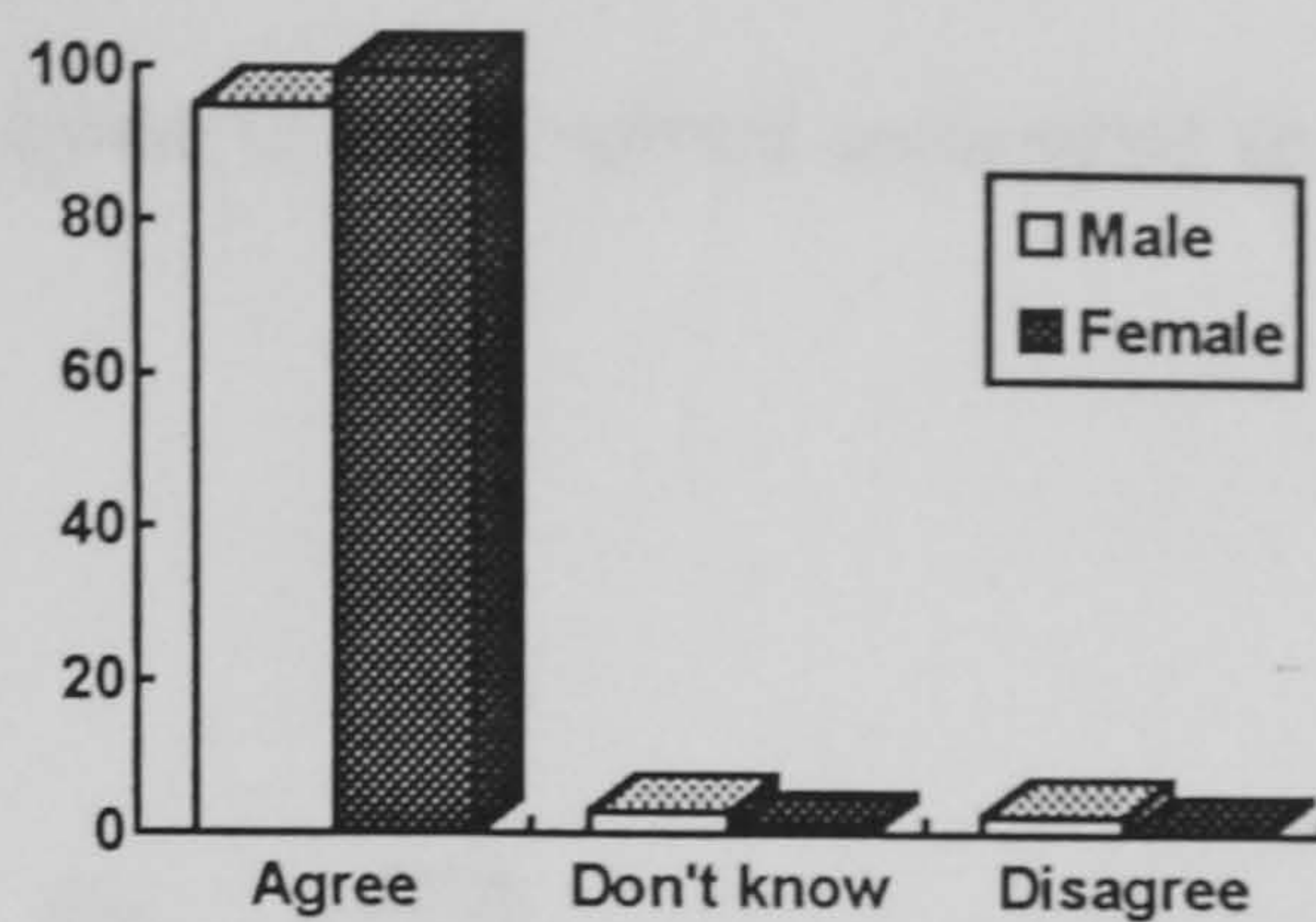


Figure 6.63 B: Education of food workers in food safety (teachers).

### F. Community involvement:

This is the last section of the questionnaire. Figures 6.64 A&B through 6.67 A&B have been involved in this part.

#### Involving students in health education.

Figures 6.64 A&B revealed that all the teachers agreed with involving students in health education. Note that teachers with university qualifications were more likely to agree with involving the students than teachers with lower levels of education.

cstud	
1: 90.34%	
2: 4.36%	
3: 5.30%	
n=321	

educ	
school	univ
1: 87.85%	1: 91.59%
2: 1.87%	2: 5.61%
3: 10.28%	3: 2.80%
n=107	n=214

LR chi-square =9.71  
df=2  
Prob=0.0078

Figure 6.64 A: Involving of students in health education (teachers).

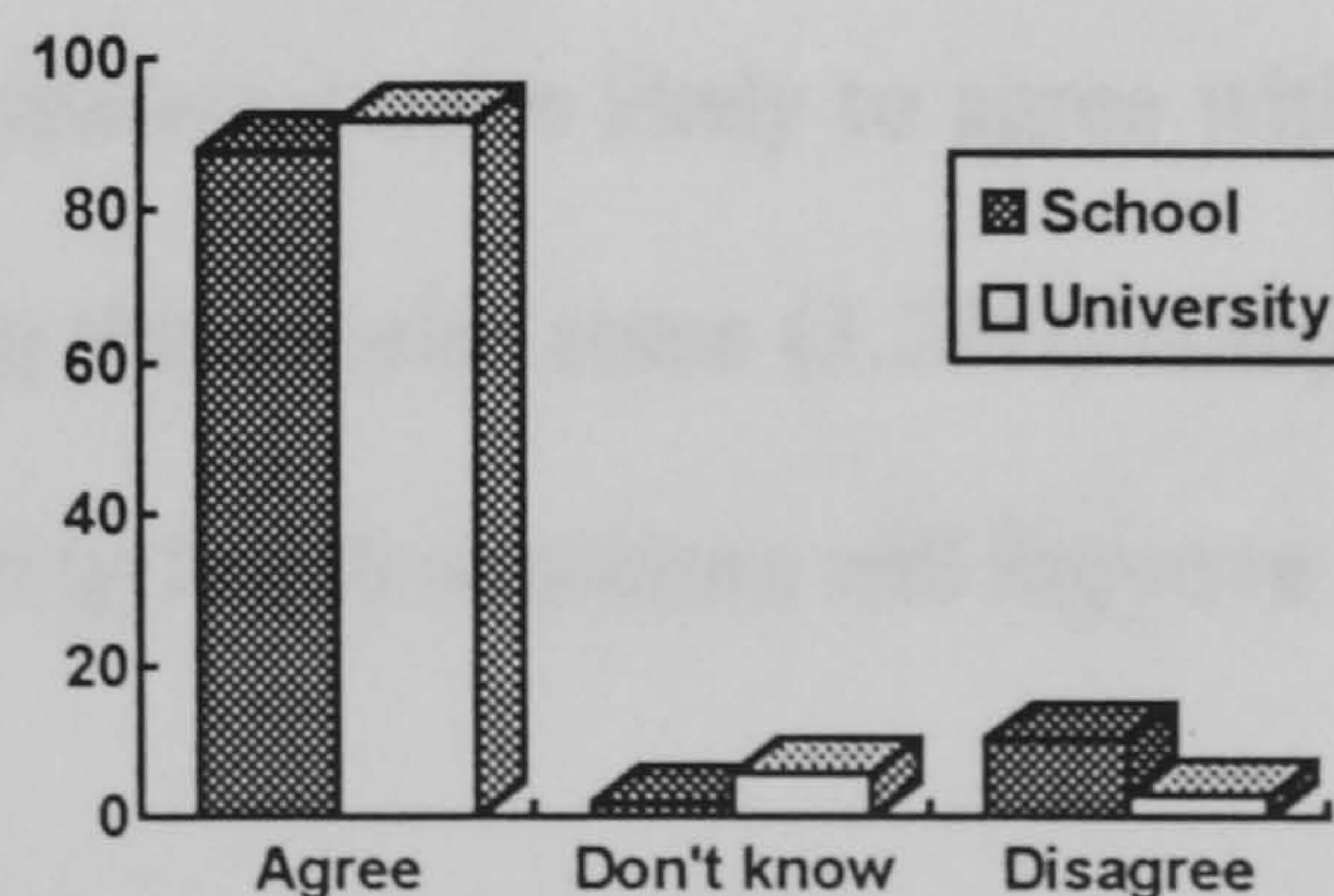


Figure 6.64 B: Involving of students in health education (teachers).

Students also agreed to be involved in health education (Figures 6.65 A&B). It was shown that female students were more likely to agree to be involved compared to male students.

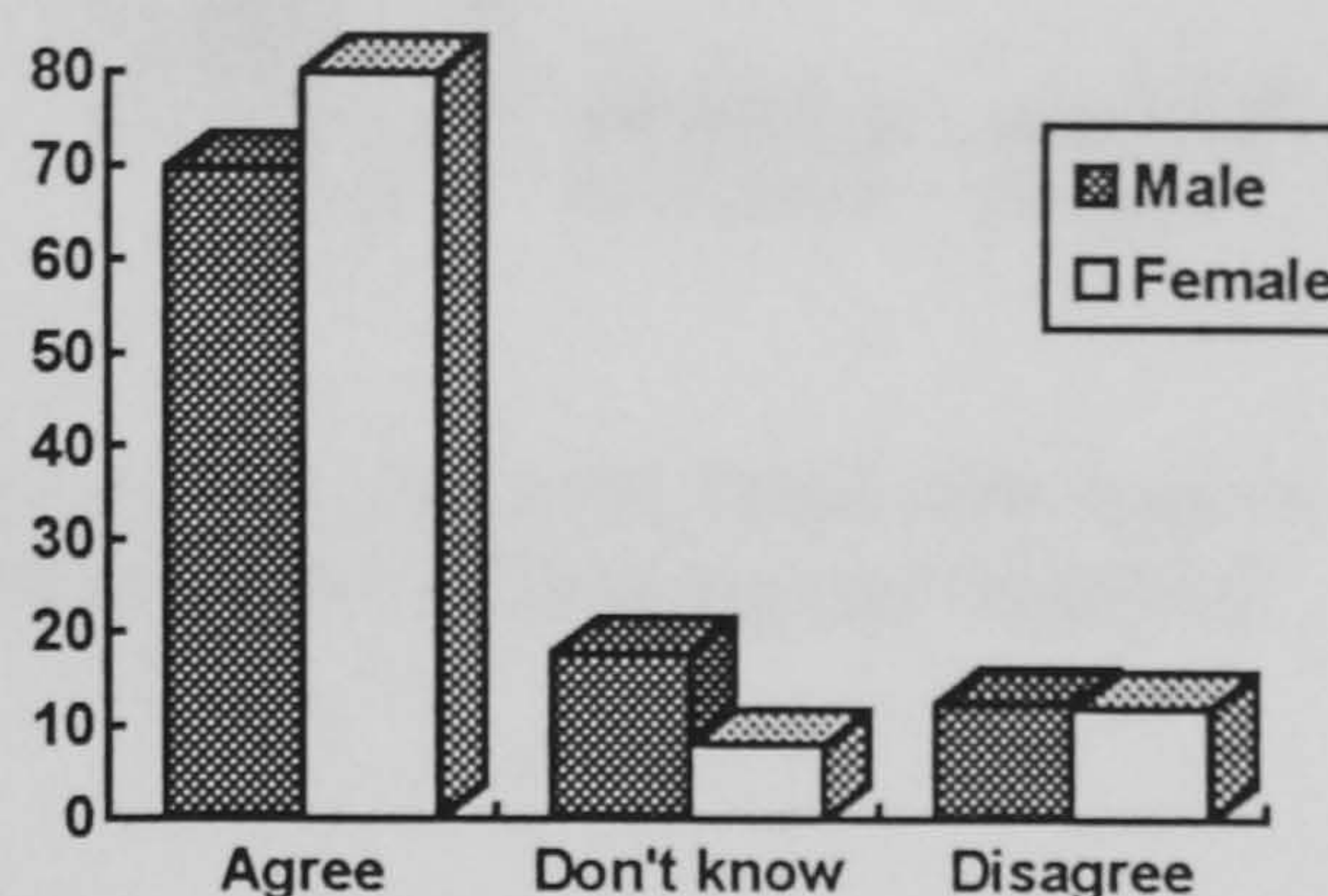
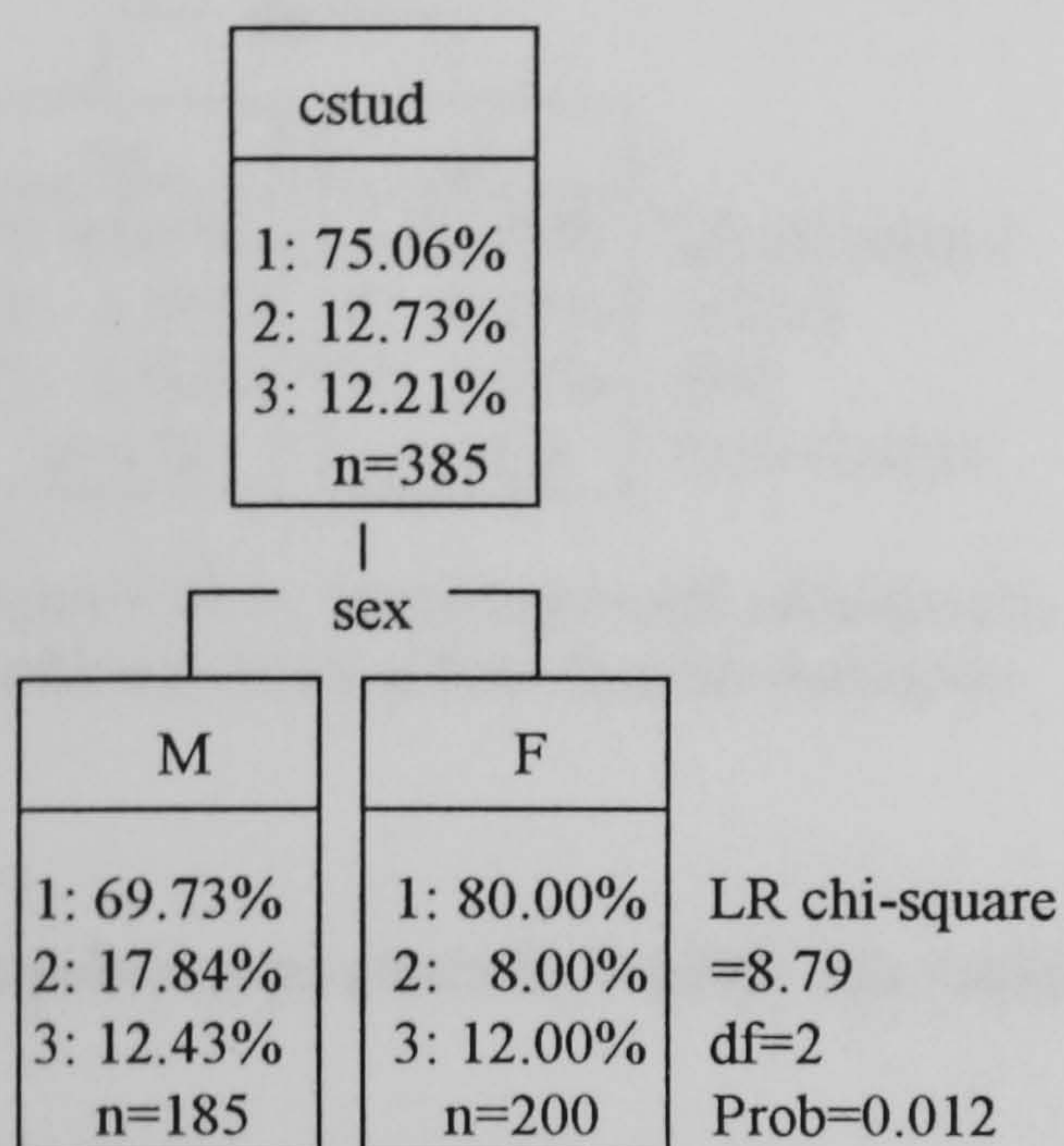


Figure 6.65 B: Involvement of students in health education (students).

Figure 6.65 A: Involvement of students in health education (students).

### Involving health educators in health education in food safety.

Figures 6.66 A&B revealed that teachers agreed that involving of health educators would improve food safety. Note that statistically significant differences have been noticed between male and female teachers. Males were more likely to agree with the statement than females. Also there were among the females some (3.27%) compared to (0.00%) of males who did not know if involving health educators will improve food safety.

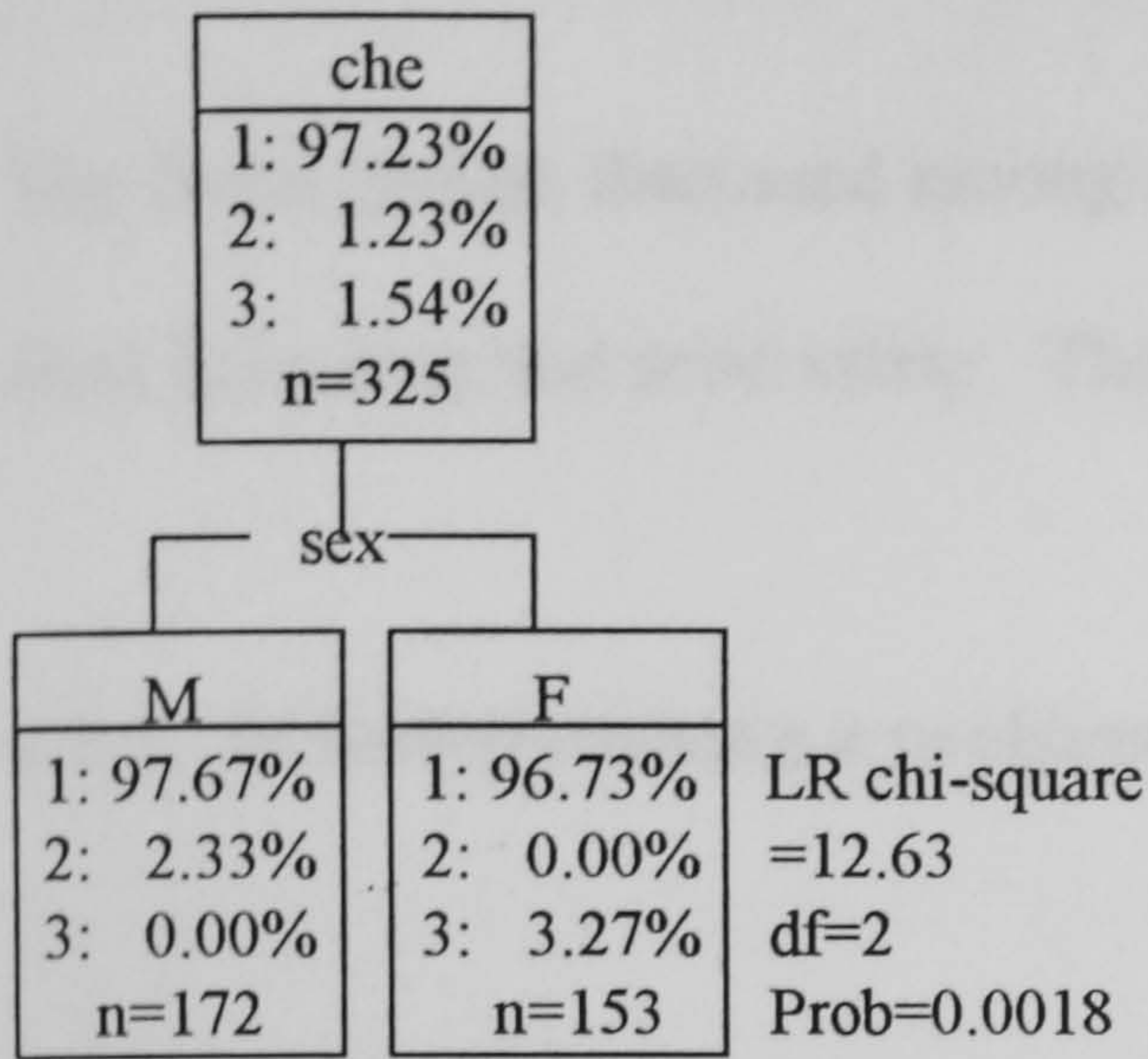


Figure 6.66 A: Involving health educators in health education of food hygiene (teachers).

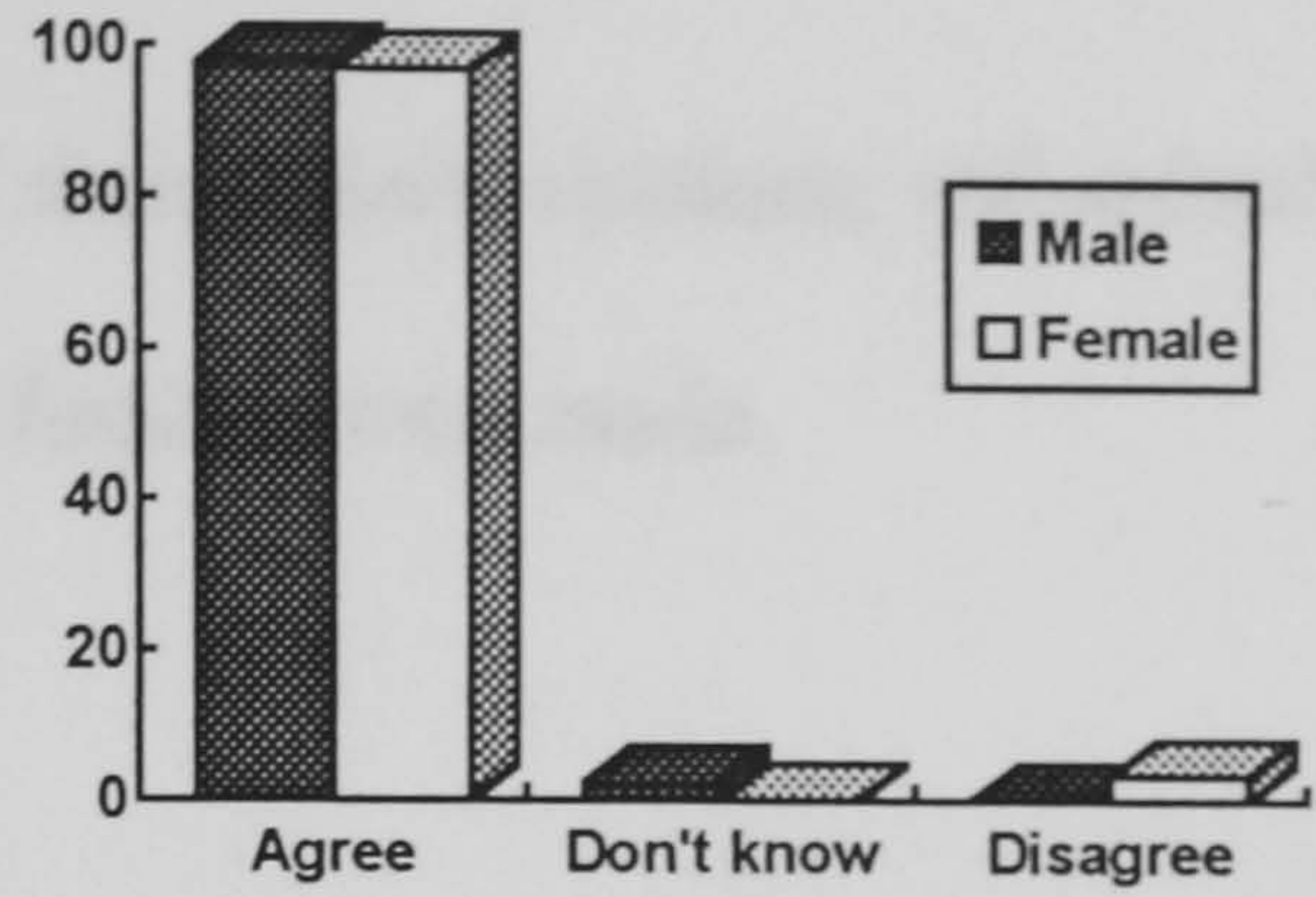


Figure 6.66 B: Involving health educators in health education of food hygiene (teachers).

### Involving parents in health education to control food poisoning.

Note that in Figures 6.67 A&B, all the students agreed that involving parents in health education would improve food safety. However, students in the governmental schools were more inclined to agree with the statement compared to students in the private schools.

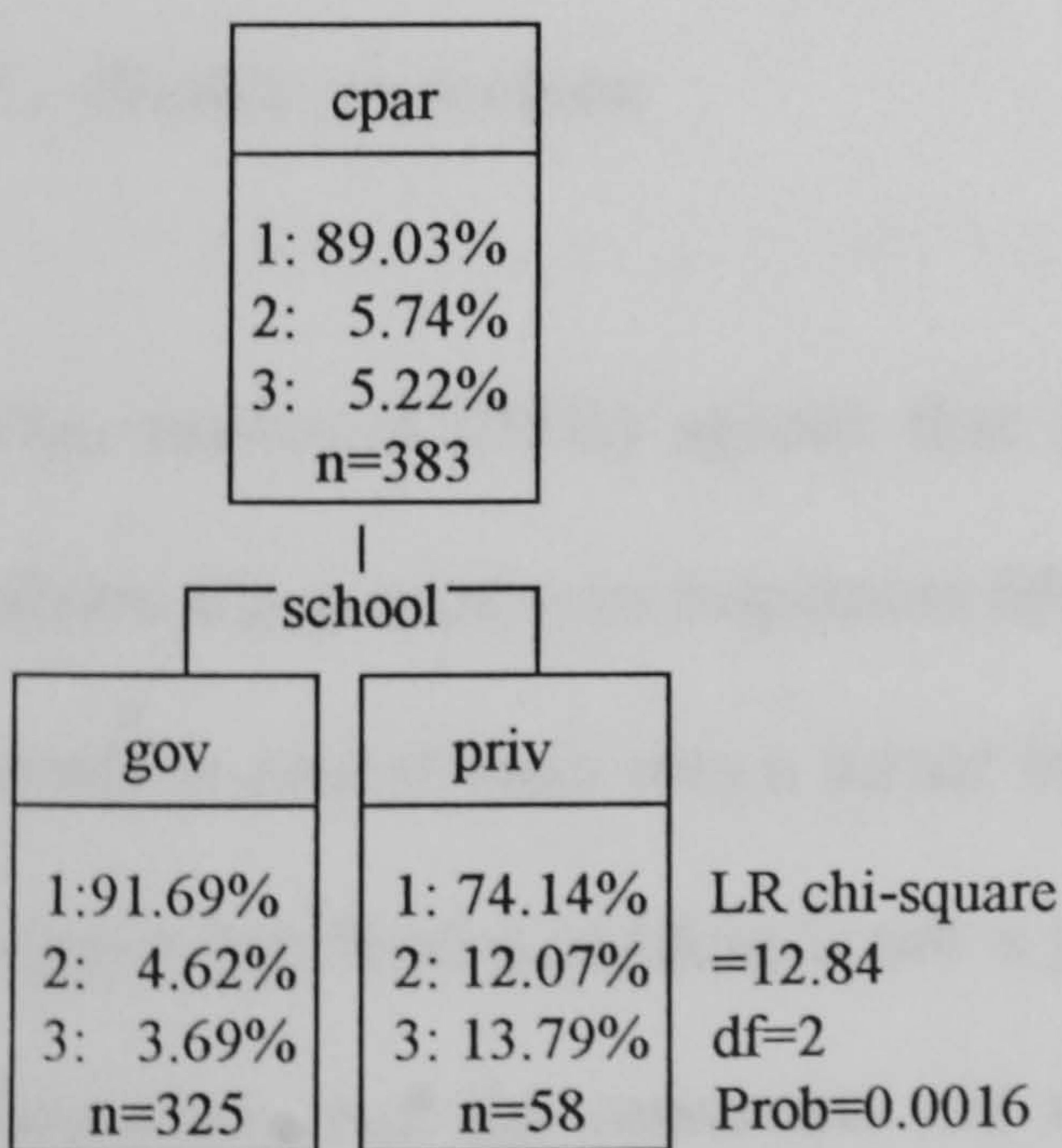


Figure 6.67 A: Involving parents in health education (students).

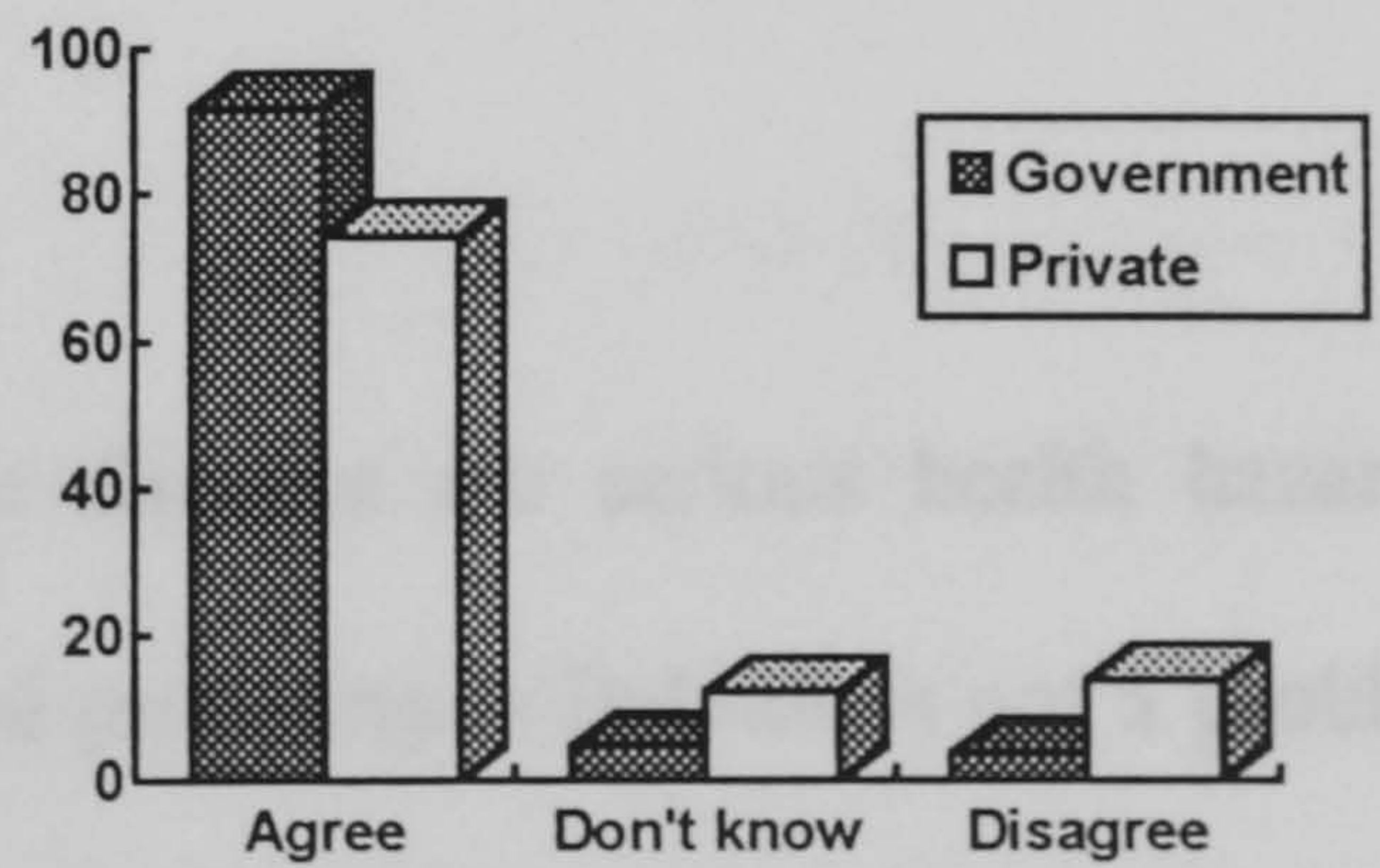


Figure 6.67 B: Involving parents in health education (students).

## **6.2. Results of focus group interviews:**

The focus groups discussed among themselves their beliefs, opinions, and attitudes to food poisoning and food safety. The following findings were made.

### **6.2.1. Is food poisoning a problem?**

#### **A. Teachers:**

All the teachers felt that foodborne illnesses are a problem.

#### **B. Students:**

All the students in the public schools said “Yes”. Whereas in the private schools only 50% of the participants stated that food poisoning is a problem.

#### **C. Health promoters:**

The inspectors (95%) agreed that foodborne illnesses are serious health hazards. Within the groups, two inspectors felt that food poisoning in Bahrain is not a problem in which one of them was a senior inspector. The argument of those inspectors who believe that food poisoning is not a problem in Bahrain is based on the fact that they themselves and the researcher did not get food poisoning. They kept asking the researcher how often he got food poisoning and when was the last time since he had



food poisoning?. One senior inspector stated “ some people eat too much peppers (spices) and get diarrhoea. “This is not poisoning”. He added “ someone might have eaten too much thus got food poisoning”. This is a common believe in Bahrain that eating too much foods lead to poisoning.

“Food poisoning occurs everywhere but there is no prompt reporting of incidence because of carelessness and neglect. Also, there is no accurate information communicated to the inspectors. Doctors do not report food poisoning to us”.

One participant expressed his anger at poor reporting and the fact that the inspectors were not being kept informed. He stated “In one of the five star hotels, one who dined there got food poisoning (vomiting). We were informed but it was late. The victim had a cake which was found to be contaminated with *Staphylococci*. Food workers were found to carry the same pathogens. Another became sick after eating sausages which were found to be contaminated with *Staphylococci*”. “most cases of food poisoning in Bahrain were due to *Staphylococci*”.

The HBM (Becker, 1974; Becker & Maiman, 1975) would postulate that subjects who believed that food poisoning is a problem and that the problem could be solved will be more likely to participate in health activities and adopt healthy behaviour.

### **6.2.2. How foodborne illnesses occur:**

#### **A. Teachers:**

Science teachers stated that “Bacteria or their toxins from canned foods which are not well stored”. Whereas English teachers stated “Lack of cleanliness and lack of education, food adulteration, hot weather, and bad storage of food”.

#### **B. Students:**

Students in public school had the following opinion “Carelessness in which foods are left for a long time until they spoil, workers and the house-maids from the Indian-Subcontinent are not clean. They bring diseases with them from their countries. Sometimes food is forgotten outside and if someone eats it, he will become sick. They should wrap it in aluminium foil and keep it in the oven or in the refrigerator”. However, those in private schools said “Waste goes into the field and reaches food”, “microbes will damage foods if foods are kept for a long time and cooked properly”, “If refrigeration is not proper”, “Reheating of pre-cooked food is bad, we should not re-heat again and again”, and “chemical reaction due to refrigeration and storage. If food is kept for a long time in the refrigerator, microbes will attack food”. In one group students said “Over eating of different types makes stomach unable to cope. This leads to food poisoning”.

### **C. Health promoters:**

All the groups stated that most of food poisoning is due to lack of personal hygiene. They were very confident that workers from the Indian Subcontinent are to blame. Participants stated “expatriate food workers do not know how to store foods. Moreover, they cook foods in the morning and sell them at night”. “In hotels left-over foods are given to the workers”. Furthermore, some participants expressed their anger at the poor storage of foods.

### **6.2.3. Who get the disease:**

#### **A. Teachers:**

Science teachers “Those who eat outside, teenagers, and adolescents”. English teachers said “Children because they do not have education, they buy from food vendors”.

#### **B. Students:**

Students in public schools felt “Children because they don’t know much”. Whereas some students in private schools believed that only people who do not care. One student said that anybody can get food poisoning.

### **C. Health promoters:**

The participants felt that all ages are at risk, but children, adolescents and the elderly are more vulnerable.

#### **6.2.4. Where the microbes come from:**

##### **A. Teachers:**

Science teachers said ‘Environment, flies and insects, carriers, and from expatriates especially ignorant food workers. Foods which are not properly preserved may become contaminated. Proper storage is in refrigerators. Long freezing causes contamination. When you take food out to thaw, contamination occurs’. However, some of the English teachers said “Rotten foods”, One said “It is a scientific thing, we do not know, but it could be dirt, spontaneous generation, from within”. A teacher gave a proverb which is “Worm of a peach is from within” which means that the worm does not come from outside but it is formed inside (spontaneous generation).

##### **B. Students:**

Participants in the public schools stated ‘Environment, industries, and from expatriates (food workers)’. Whereas the statements which were mentioned by participants in the private schools were ‘The environment, waste near food, rotten vegetables’.

“Microbes exist in the air, they produce toxin and contamination occur in refrigerators if we keep food for a long time”.

### **C. Health promoters:**

Participants stated that the sources of contamination are man, food and the environment.

#### **6.2.5. How microbes get into food:**

##### **A. Teachers:**

Science teachers said “The environment, insects, and carriers”. Whereas English teachers stated “From air, hands, and chopping boards”.

##### **B. Students:**

“By careless and ignorant food workers and from the environment” said students in the public schools. Students in the private schools stated that “Air current, by unwashed hands, utensils, and finger nails”.

##### **C. Health promoters:**

Through air, the environment and food handlers.

### **6.2.6. foods most dangerous:**

#### **A. Teachers:**

Science teachers said “Meat, fish, and milk products”. Whereas English teachers said “Perishable foods, fish, and milk products”. However, “Exposing meat to high heat, such as cooking, kills bacteria”.

#### **B. Students:**

Participants in the public schools said “Meat, bread, sweets, soft drinks, additives, canned foods” whereas some participants in private schools (around 50 % ) stated “Sugar. If we keep sugar for long time, it will change to alcohol”. “If we mix yoghurt and hot rice and then we store them in refrigerator, there will be a chance of food poisoning”. Some students disagreed and said that yoghurt has acid which prevents food poisoning. Some participants argued that “Some canned foods are critical but not all of them, vegetables if not properly washed, meat which is not transported in hygienic conditions are bad for health. Meat should be covered during transporting”, are all comments given by the subjects in the private schools.

### **C. Health Promoters:**

Meat, poultry, fish, eggs, shawarma, barbecued chicken. They also believed that food poisoning is from cold meat. There was a controversy among health promoters on canned foods as being a possible source of food poisoning in Bahrain. Some participants (around 30%) felt that canned foods are important sources of contamination, whereas the others felt that canned foods are not. Those who felt that canned food were not sources of food poisoning said that this is true because people do not eat cold canned foods.

#### **6.2.7. Control of foodborne illnesses:**

##### **A. Teachers:**

Participants in the science section said “Control of foodborne illnesses is difficult”, “Inspection could reduce the hazards, however improper storage of foods in stores lead to bulging of tins and subsequent poisoning”. Whereas teachers in the English section said “Foodborne illnesses can be controlled by inspection, educating families, mass media, cleaning cesspools, cleaning roads, refuse must be collected before sunrise”.

##### **B. Students:**

Participants from public schools agreed that foodborne illnesses are controllable. They suggested the following control measures: “Authorities must use television and the

press to educate people”. However, in private schools, a number of suggestions were put forward by the students to improve food safety. These included “increase the concentration of salt and vinegar, buy fresh foods, take care in washing and cooking, clean kitchen and hands, food workers must use caps because hair which fell into foods can cause food poisoning”. They also suggested the following “Cook as much as one needs to avoid storage, “Temperature must be maintained for each type of food and sterilise food by heat”. Some participants suggested that the government must launch a public awareness campaign, similar to the seat belt campaign. The seat belt campaign has been widely covered and promoted by the Traffic Directorate. Seat belt users have been motivated and awarded incentives by the Traffic Directorate and by private insurance companies. It is believed that health promotion to use seat belt in Bahrain was successful. Thus, students felt that similar activities will be fruitful. Students in another private school felt that foodborne illnesses are controllable. They suggested the following: “preserve food properly, make sure foods do not get in contact with microbes, educate food workers and the public, avoid over-eating and regularly inspect restaurants”.

### **C. Health promoters:**

One group stated that “we can reduce the incidence of food poisoning if resources are available to us. It should be compulsory that workers are knowledgeable in health”. Some participants were dissatisfied with their work. They said that “Inspectors are not police”. “How can we educate someone who is higher than us in position?”. All the participants felt that they were under-paid. They stated “promotion and incentives to



the inspectors are extremely important. Food shops have increased in numbers, whereas the number of inspectors has not changed. Wages have not increased. Equipment is not available. The cars that we use are not good. Food stores do not have facilities i.e. refrigerators are full of meat and soft drinks”.

#### **6.6.8. Teaching/learning materials:**

##### **A. Teachers:**

“There are no teaching/ learning materials in food safety”, “only titles are given but not enough information”. “There is information about other diseases”. “There are films related to health but they are very old. In the Ministry of Information there are new and scientific films, but they are difficult to obtain. We tried to copy some films but we could not. They did not give them to us. We do have some co-operation with the MoH but not with the Ministry of Information”. Teachers in the English section said “Teaching/learning materials have no information on food safety”.

##### **B. Students:**

Students in the literary and commerce sections stated: “With regard to food poisoning and diseases, no TLMs exist”. However, students in the science section stated that they learn little about food safety in cultural studies textbooks. Students in the private schools mentioned: “Teaching/ learning materials do not contain information on food

hygiene. They have little information on the environment. We are not aware of any other sources of information”.

### **C. Health promoters:**

The following are some important statements noted by the participants: “Teaching/ learning materials are not available”, “We depend on ourselves”, “ We do not have time to go to libraries”, “Why should we go without incentives?”.

### **6.6.9. What you think of health promotion:**

#### **A. Teachers:**

Science teachers mentioned “We do not have health promotion, but health education is given in the courses at all levels. In the primary level, health education is better covered”. “There is no special health education course available”. Teachers in the English section said “We heard about health promotion. It is good if adopted”. “The best way is for it to be offered as a course in primary schools. Also write health messages on exercise books”.

#### **B. Students:**

Participants in the public schools stated “ Although health promotion is important, it does not exist in school. Health education programmes are given on television, but

they are very few. Health education should be given as a taught course in primary, intermediate, and secondary levels”.

Participants in the public schools said “We do not know anything about health promotion. We have not been informed”.

### **C. Health promoters:**

Health inspectors felt that there is no health promotion in food hygiene. They stated “Health education is good. We would like to be trained in health education, but there is no training and there are no incentives”. According to the health promoters working in the health education section, health education appeared to be provided inconsistently and irregularly at different settings.

#### **6.2.10. What do you want to know?:**

Science teachers suggested that health officials should bring specimens from laboratory, such as cultured bacteria, so that they can see. They also suggested educating food workers in food safety. They said: “There must be one local worker who should carry the responsibility of health inspection over the food workers. He should know the language of the workers in order to be able to educate them”. Teachers in the English section felt that they needed more health education training. However, students in private schools felt that small booklets would help them a lot to learn about food safety. Participants in public schools wanted to learn more about:

“Causes of diseases, all health matters, but in a brief format, problems related to our country”. They expressed their willingness to know more. They stated “Students must be given the opportunity to know more about the problem. We should be taught. Arrangements should be made to involve us. Articles, mass media (videos) should be provided”. Health inspectors were asked if they wanted to know something or if they wanted a particular form of training. Some said “We do not want any training without incentives”, “We do not need certificates without incentives”. Some others suggested short courses. It was noticed that trust in the supervisors was low.

#### **6.2.11. Community protection from foodborne illnesses:**

##### **A. Teachers:**

“Use the mass media”, “health education”, “cover foods”. However, “mass media should play a bigger role”. English teachers suggested that central markets should be air conditioned.

##### **B. Students:**

The most important points noted by the subjects in the private schools were: “Clean air and disposal of waste. Waste from industries should not be disposed of in the open. Improve sewage disposal, and do not use old fish (which are stored for 3 days). They can cause poisoning”. All media should be involved. People might not be interested in films on food hygiene but through drama, pamphlets, circulars, and notes. Keep TLMs

in post offices, give them to the Gulf Daily News (local newspaper) to put them in the newspaper, put them on notice boards in schools and at bus stations. Food handlers should be given information. There should be a place allocated for the TLMs where it can be accessed by the public”. They kept saying “Teach people. Start at schools with primary, intermediate and secondary levels. To some extent, not all will be interested. Parents may be more interested. Small children will be interested if given in a cartoon form”.

### **C. Health promoters:**

Health promoters thought that food storage facilities should be improved in restaurants. They also suggested better communication within the MoH and that they should be informed when there is a food poisoning outbreak and involved in health promotion programmes.

### **6.2.12. Availability of resources:**

Students in public schools were happy with the resources available to them. The majority of the participants in private schools stated: “We have enough resources but we need awareness”,. One participant said “I do not know about resources, but media coverage of food safety is not enough, we need more”. Participants in another private school were happy with the resources. They said: “Resources are available. They are not a problem”. However, teachers said “In the MoE, resources are not available but

they are available in the MoH'. Health promoters were dissatisfied with the resources available to them to ensure food safety.

#### **6.2.13. Food quality, health promotion and TLMs at schools:**

Regarding food quality in schools, students in public schools complained of the poor quality and un-hygienic standards of the foods. Students also felt that food contractors use lower grade food materials. Some even stated that some of the contractors go to neighbouring countries during the week-end to buy food materials in bulk quantities and bring them in open vans. However, all participants in the private schools were satisfied with the foods sold in their schools.

Discussing health promotion, the students had the following views: "We do not know anything about health promotion" "we do not have a health educator in our school and we do not have a health education course" also "We are not given information related to health issues".

Regarding TLMs students and non-science teaching teachers felt that teaching and learning materials do not contain information on food safety. Teachers in the science section felt that little information on food safety is given in the textbooks.

#### **6.2.14. Conclusions:**

Food poisoning was regarded by all the participants as an important health issue. All students and teachers in the public schools believed that foods which are sold in schools are dangerous to human health because of lack of proper supervision. Food is prepared by un-clean people and because sellers value profit more than health. Other frequently-made comments were: ‘Carelessness, neglect and ignorance of food workers’, ‘Lack of health educators in schools’, ‘Inadequate supervision of school canteens and inadequate monitoring of food workers’.

Within the groups different levels of knowledge were noticed. For example, some of students showed confusion on the sources and methods of contamination. Also most of the participants were confused and had some misconceptions about the requirements for microbial growth. Compared to inspectors in the food hygiene section, inspectors in other sections showed more confusion with regard to food safety.

There was a general consensus of opinion about methods that would help to reduce foodborne illnesses and protect their health: ‘health education of food workers’, ‘personal hygiene of food operators’ and ‘environmental sanitation’ emerged as the most important suggestions. The most popular statement with all groups was that workers from the Indian Subcontinent were putting peoples’ health at risk of foodborne hazards.

While students and teachers expressed their concern about the quality of foods and lack of proper supervision of canteens, head teachers were less concerned and were more satisfied, but requested health education and monitoring of food workers. Both teachers and students felt that school and health authorities do not have an interest in food safety. They felt that school officials are only interested in profit making.

Some other key findings were:

- most teachers and students considered that they were knowledgeable in food safety, interested in health promotion and felt that they were ignored in planning activity.
- temperature and hygiene were seen as a useful way of reducing foodborne hazards.
- most health promoters felt that incentives were lacking and were dissatisfied. They complained that administrators do not listen to their problems. In addition most of the inspectors felt that their needs are not met and that nobody cares about them.
- all participants displayed positive attitudes towards health.
- science teachers believed that they were aware of health education and indirectly involved in health education. However, they felt that they need further training in health promotion.

The majority of teachers reported that they knew health promotion first through the materials which were provided to them by different sources and second from the press. Such resources need to present the actual needs and the future requirements of society. Interestingly enough, students, teachers, and health promoters showed a willingness to become involved in any health promotion projects.



### **6.3. Results of canteens assessment:**

#### **6.3.1. Description of the canteens environment:**

Every school in Bahrain had a canteen or a cafeteria which were mainly constructed of cement and bricks. Only one school had a wooden canteen. Foods in schools were sold to students, educational staff and administrators. Gas was used as cooking fuel. Tap water, for cleaning and hand washing was available inside the canteens, but toilets were not available as a part of the canteen environment except in one school. Workers use students' or teachers' toilets which in most cases did not contain warm water and soap. Cooking and hot holding facilities were not available in the canteens. Refrigerators were available, but were used for cold drinks and ice creams only. The description of canteens' structure is shown in Table 6.26. The average number of workers in each canteen was 3, of whom 32.3 % were Arabs (most were locals, only two were Jordanians), 25.8% Bengalis, 6.5 % Sri Lankans, and 25.4 % Indians and 10% Pakistanis. The workers from the Indian Subcontinent had poor spoken and understanding of both Arabic and English.

Table 6.26: Description of school canteens.

Availability of items	Yes (%)	No (%)	Total	Comments
cold water	14 (87.5)	2 (12.5)	16	
hot water	6 (37.5)	10 (62.5)	16	
clean food contact surfaces	14 (87.5)	2 (12.5)	16	
clean floors	14 (87.5)	2 (12.5)	16	
cooking facilities	0	16 (100)	16	
refrigerators	16 (100)	0	16	for drinks and ice creams only
hot holding facilities	0	16 (100)	16	
food storage facilities	0	16 (100)	16	
toilets	1 (6.35)	15 (93.8)	16	
toilets were clean	6 (37.5)	10 (62.5)	16	
toilets had hot water	8 (50)	8 (50)	16	
toilets had cold water	16 (100)	0	16	
toilets with soap	6 (37.5)	10 (62.5)	16	
insects present (in the canteens)	4 (25)	12 (75)	16	flies were seen
refuse containers available	6 (37.5)	10 (62.5)	16	all schools had refuse containers outside canteen structure

### 6.3.2. Description of contractors:

Foods were prepared by six private contractors which provided the sixteen schools with foods. Places for food preparation were different with each contractor. Two contractors (Contractor A&B) prepared food in small shops. The kitchen in each shop was small ~2.5 by 3 meters containing a deep freezer, refrigerator and two gas stoves. The kitchen was used to (a) store raw foods, (b) prepare and cook meat and their

products, and (c) hold foods before transporting to schools. Two other contractors (Contractors C&D) prepared food in slightly bigger shops. They consisted of two rooms. One room was for storing raw foods, preparation, cooking and storing part of the cooked foods. The other room was used for storage of cooked foods and displaying other foods for sale to the public. Another contractor (Contractor E) prepared foods in a bakery. This place consisted of three rooms. One room was used for preparing and cooking foods. A second room was used for wrapping and holding foods before transporting to schools. Another room was used for displaying other cooked foods for sale to the public. Another contractor (Contractor F) prepared foods in a mechanical packaging food industry. This one was not assessed in this study as special permission was not obtained to make the assessment and it was known to be better equipped and have higher standards of hygiene. Contractors (A), (B), (C), (D) and (E) supplied foods to five, eight, thirteen, thirty eight and six schools respectively. Each school received around 180 to 690 food items.

### **6.3.3. Hazard analyses critical control points findings:**

Foods sold were similar in each schools. They consisted of sandwiches that contained: eggs, cheese, chicken, liver, minced beef, mutton balls (Kofteh) hamburgers, beef kebab. Salads which consisted of lettuce and tomatoes were put in the sandwiches in eight schools by (Contractors A&D) whereas mayonnaise were used in two schools by (Contractor A). One contractor (Contractor C) prepared beef macaroni and donuts. All schools sold confectioneries and soft and juice drinks. The type of foods prepared by each contractor are listed in Table 6.27.

Table 6.27. Types of food prepared/supplied by each contractor for schools.

Contractors	Types of foods
A, B, C, D and E	Eggs, cheese, chicken, liver, minced beef (sandwiches)
B	Mutton balls sandwiches
A	Hamburger and beef kebab and put mayonnaise in sandwiches
C	Macaroni and donuts
A and D	Used salads in the sandwiches.
All contractors	Supplied confectioneries and drinks

The time of preparation started between 09:00 p.m. and 12:00 a.m. for all contractors.

Cooking started between 04:00 and 05:30 a.m. for contractors (A), (B), (C), and (D).

For contractor (E), cooking started at 02:30 a.m. Table 6.28 shows the times of preparation, cooking, arrival and selling at six schools. Arrival and selling at the other schools were around the same times.

Table 6.28. Times of preparation, cooking, arrival at schools and selling by five contractors.

Contractors	Preparation	Cooking	Arrived at schools	Sold until
A	11:00 p.m.	05:00 a.m.	09:00 a.m.	05:30 p.m.
B	12:00 a.m.	05:30 a.m.	06:30 a.m.	10:40 a.m.
C	11:30 p.m.	04:00 a.m.	07:00 a.m.	10:40 a.m.
D	12:00 a.m.	04:30 a.m.	09:30 a.m.	10:20 a.m.
E	09:00 p.m.	02:30 a.m.	09:45 a.m.	09:50 a.m.

Foods were transported in vans or back of cars in cartons and plastic boxes or in plastic bags and arrived at schools between 07:00 to 09:45 a.m. The selling started at 09:50 a.m. during the break. Fourteen schools sold until 10:40 a.m., one school until 13:30 p.m. and the other until 17:00 p.m.

Deep frying was used to cook meat and liver in large frying pans. Meat was fried at 180°C and 205°C for 10 to 15 minutes. Liver was fried at the same temperatures but for 5 to 10 minutes. Hamburgers were fried on both sides on a hot plate at temperature of 285°C for 5 minutes. Cooking temperatures were high enough to inactivate vegetative microbes and spores (Hobbs & Roberts, 1993).

In the site of preparation, cooking and holding were critical control points. Touching breads and buns and filling of sandwiches with salads offered an opportunity for contamination. The environment of the canteens and the places where foods were prepared were found to be critical to food safety in which opportunities for recontamination and multiplication of microbes existed due to (a) the size of these shops for the amount of foods prepared, (b) handling and touching foods when filling sandwiches and (c) presence of favourable temperatures and humidity. Holding of foods at ambient temperatures was the most serious hazard noticed.

The operation process in the place of preparation and the environmental conditions are illustrated in Figure 6.68. This figure denotes places, hazards and critical control points.

Figure 6.68, illustrates the operation process in the site of preparation and the food condition before consumption. The Figure also shows the hazards and critical control points.

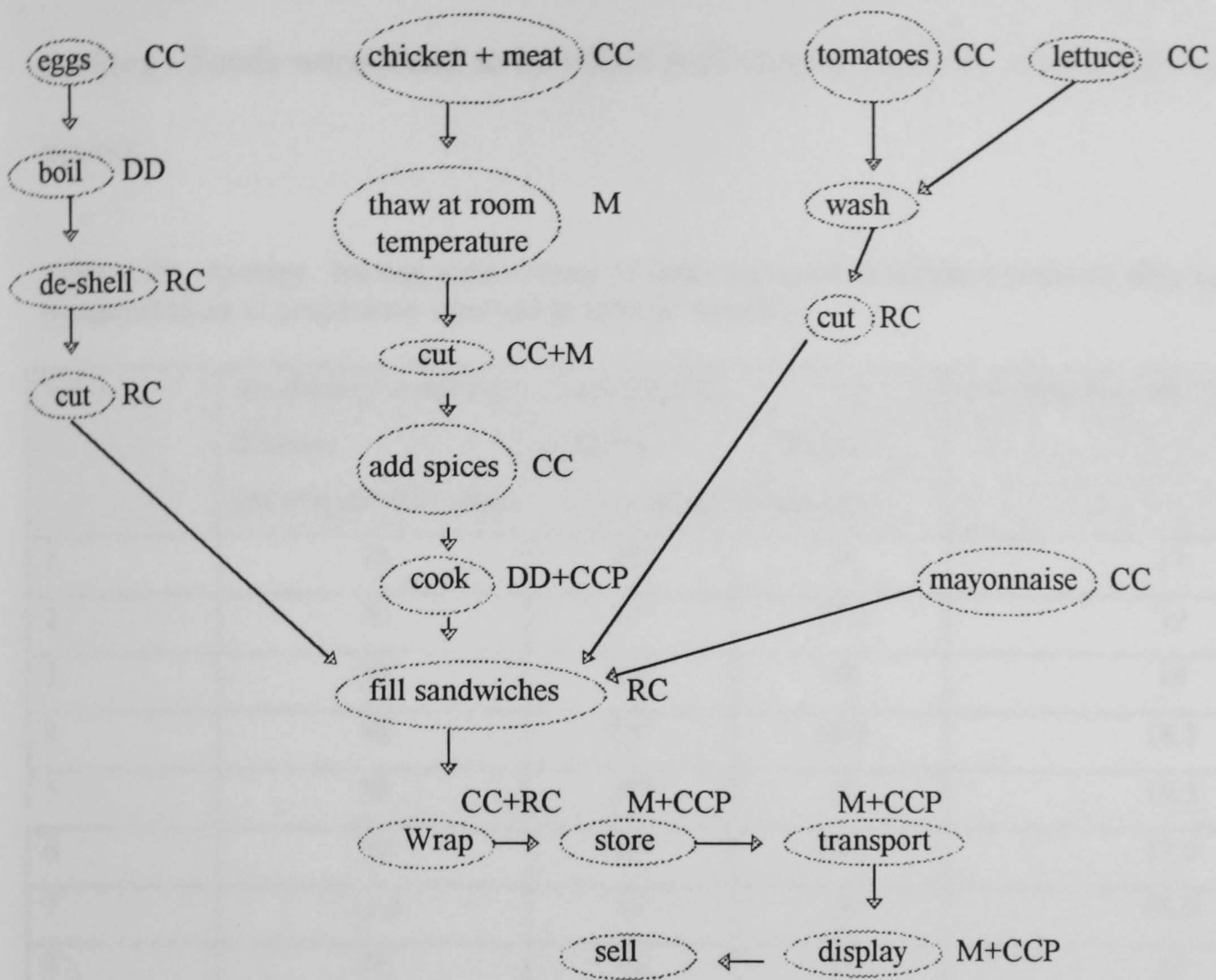


Figure 6.68. Flow diagram for preparation of sandwiches in schools and food preparation sites.

Symbols	Key
CC	contamination is likely to be present
RC	recontamination is likely to happen
DD	microbial destruction is likely to occur
M	microbial multiplication is likely to happen
CCP	critical control point

Figure 6.68. Flow diagram for preparation of sandwiches in schools.

At schools, sandwiches and donuts were displayed in carton boxes, plastic containers or plastic bags whereas macaroni were put in small plastic containers in carton boxes.

The minimum holding temperature measured for food was 17°C and the maximum was 41.5°C. The first holding temperature was taken ~ 2 hours after cooking. Three more temperatures were taken at ~ 4, 6 and ~8 hours after cooking. Four hours after cooking, food temperatures dropped to around room temperature. Table 6.29 shows

the average temperatures of food and air inside the canteens at 2, 4, 6 and 8 hours after cooking. Foods were found to be within such temperatures for several hours (2 to 10 hours).

Table 6.29: Average holding temperatures of foods measured at different intervals after cooking as compared to air in preparation sites and in schools' canteens.

Schools	Food temperature after cooking, °C			Air temperature, °C
	2 hours (at preparation sites)	4 hours (at school canteens)	6 hours	
1	32	18°	18	19
2	30	17°	17.5	19
3	33	18°	18	19
4	34	18°	18.5	18.5
5	38	19°	19	19.5
6	36	19°	19.5	19.5
7	33.5	18	18	18.5
8	36	19	19	19
9	39	19	19	19
10	not taken	not taken	not taken	19
11	not taken	not taken	not taken	19
12	40	21	20	21
13	41	24	23	24
14	39	19.5	19	20
15	41.5	27.5	27	28
16	41	22.3	19.5	21
Median temperature	37	19	19	19

Microbes tend to multiply rapidly in temperature range 20° C to 46° C and reach numbers sufficiently high to cause foodborne illness in 4 to 6 hours (Bryan et al., 1992d, Hobbs & Roberts, 1993). Foods were not reheated. Holding temperatures of foods at different intervals are illustrated in Figure 6.69.

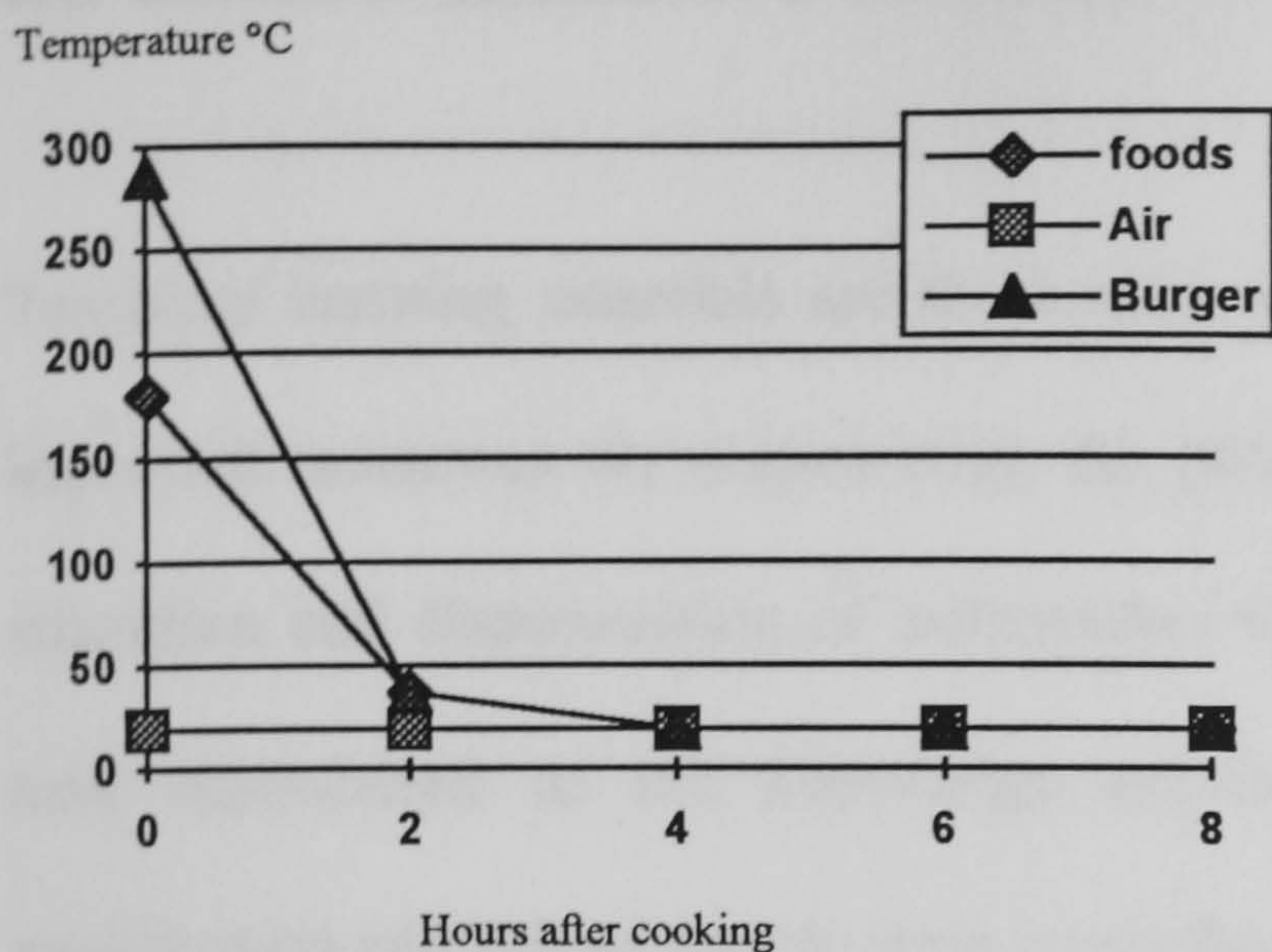


Figure 6.69. Cooking and holding temperatures of sandwiches and hamburgers in preparation sites and in school canteens.

Although the type of food which were sold in schools were acceptable by the consumers, yet students in all schools except in one were dissatisfied with the quality of foods and complained that foods sold in school canteens were unhygienic. Three students attributed bouts of diarrhoea to eating sandwiches in school. Teachers in one school were totally dissatisfied with the quality of food. In other schools, however, teachers were more concerned about the nutritional value of foods. Suggesting fresh juice and milk instead of drinks which they thought that such drinks contained artificial colouring agents. They also suggested more nutritional foods to replace confectioneries which they believed to contain artificial additives which might adversely affect the consumer's health. Besides being unhygienic, students also felt that foods sold to them were more expensive than those sold outside and that their budget do not permit them to eat in school canteens thus some students (male) jump over the school fence to buy from adjacent restaurants. HACCP also revealed that even basic food hygiene precautions were not always observed by food workers.



#### **6.4. Results of assessment of the TLMs:**

Teaching/ learning materials are the backbone of any education programme and are important resources for empowering the public. They have been used in training, education and dissemination of information to people. Teaching/ learning materials have contributed to the knowledge acquisition, attitude change and behaviour modification and helped people learn more about health issues (Atwood et al, 1991).

##### **6.4.1. General findings:**

Teaching/ learning materials in Bahrain are produced by the Educational Technology Centre. The centre consists of the following divisions: models production, printing and book design, bindery, television and audio production, educational resources, maintenance, and administration services.

The centre aims to obtain maximum benefit from the limited resources available to them so that they become self reliant and gradually do not depend on external support.

This section produces 60 to 70 textbooks annually. The section receives the written material from the MoE. Textbooks are written by subjects' specialists and curriculum designers. All the art works which consist of the layout, drawings, illustration, typing, selection of colours, etc. are carried out by this section. The section uses advanced and powerful computers, like Macintosh Quadra 700, Macintosh Quadra 800, and Linotronic equipment which is used for colour separation. The section is also

equipped with a silk screen for the production of posters, and flash cards. Besides, the centre has offsets and photocopiers for printing large numbers of TLMs.

Textbooks which are produced by the MoE are field tested and modified before final adoption. Feedback from both teachers and students are used to evaluate the textbooks according to the workers in the centre.

Sixty five textbooks were included in the assessment. Most of the materials that have been used by students in the governmental schools in Bahrain were produced locally. Very few, such as Social Sciences and English textbooks, were produced outside Bahrain. All of the materials which have been evaluated in this study were produced during 1992-1993.

Up to the second intermediate level, science textbooks are unified for the six Arabian Gulf Co-operation Council countries (AGCC) . The aim is to standardise the school curriculum for all the AGCC countries in the future.

Reading level of the textbooks was determined by the authors and the subject experts. They did not use a standard formula which determines reading levels as used when writing in English literature, thus it is totally based on the experience of the specialists to determine the reading levels. Authors deciding the contents and levels of a TLM could impart their own biases to the writing (Mcleod, 1991).

#### **6.4.2. Textbook contents:**

A review of school textbooks in all levels of Bahrain schools revealed that a great deal of the course work (approximately 20 %) was devoted to health topics. The textbooks contained such a variety of health topics that it is difficult to list them all in this section. The most important topics were: microbes and their characteristics, communicable and non-communicable diseases, genetic problems, personal hygiene, environment, nutrition, human anatomy and physiology, accidents, and first aid. Many other health issues were also briefly covered.

Supplemental activities that reinforce information were provided either in the book itself or in other exercise books. Activities like questions to be answered, filling blank spaces, completing drawings, etc. Mcleod (1991) mentioned that if subjects are written in question form rather than statements, users of such materials will remember more.

#### **Topics related to food:**

Topics which were directly or indirectly related to food safety were found in the textbooks. They were as follows:

Personal hygiene was emphasised in almost all the textbooks. Subjects such as cleanliness of all parts of the body supported by clear illustration which were in multi-

colours were included. These hygiene topics were more noticeable in the textbooks designed for primary levels.

Characteristics of fresh and spoiled fish were detailed in the science textbook of the third primary level.

The science textbook for fourth primary level had information on food preservation. It covered the following methods: cooling, dehydration, adding sugar, adding salt, canning, and other methods. A clear table was given with clear illustrations.

The textbook of family development for the fifth primary level contained detailed information on personal and premises hygiene, cleaning of vegetables and fruits, and storing of milk and eggs at home are worth a mention here.

The textbook of family development for the sixth primary level had criteria for preparing foods in which some statements were related to food hygiene. The statements were as follows:

- Food workers must be clean,
- Foods must be clean,
- Make sure that foods are not expired,
- Make sure that the package is not broken or damaged,
- Leave frozen foods for adequate time at room temperature before cooking, and
- Do not re-freeze foods.

Keeping frozen foods at room temperature to thaw is dangerous. foods must be kept in the refrigerator on the lower shelves at temperature of 10°C to thaw (Trickett, 1992a).

The textbook of family development for the first intermediate level contained information on how to wash vegetables, and what type of disinfectants should be used. Information on insects and their role in contamination of foods were also given in detail.

The science textbook for the first intermediate level contained information on typhoid and cholera and suggested methods to control these diseases. The suggestions emphasised the following:

- Hand washing,
- Drinking clean water,
- Washing of vegetables and fruits
- Protecting foods from insects by covering them.

Clear pictures and illustrations were given. This textbook also included subjects on parasitic diseases which can be transmitted to man by contaminated meat. Suggestions for prevention of infection were given.

Mention of food labels and their importance were found in the textbooks intended for the second intermediate level. Several types of information were recommended for the food label. The authors suggested the following items in the food labels:

- Type of food
- Ingredients
- Weight of the package
- Date of production
- Shelf life
- How to prepare the food
- Directions and information

However, the authors did not include any information on storage requirements. Storage is more important than any other information due to the extreme environmental conditions in Bahrain. Many foods spoil long before their expected shelf-life because of ignorance on how to store pre-packaged foods. This textbook also contained information on nutrition. A part of this section discussed how to store leftover foods. The authors recommended that leftover foods must be:

- Kept in glass containers rather than the cooking utensils,
- Covered with waxed papers or aluminium foil,
- Kept in refrigerators at 4° C and
- Must be heated at temperatures enough to kill microbes.

The authors did not mention the heating temperature and the time of exposure at which microbes could be killed.

The natural study textbook for second secondary science level contained information on how foods become contaminated by microbes. The authors stated that contamination reaches food from air, insects, rodents, and from carriers. Some diseases which are caused by microbes are given. They listed: cholera, typhoid, dysentery, and botulism. Moreover, contamination of foods by viruses, parasites and chemicals were briefly given.

Home economics textbook for third secondary (for Literary section) contained information on cholera and typhoid and how to protect oneself from such diseases.

Suggestions were as follows:

- Isolation of patients in a private room, and
- Boiling all clothes, bed covers and utensils which were used by the patient. Today, this information is considered to be out of date.

Furthermore, recommendations were given to protect man from diseases at home, schools and outdoors. Suggestions emphasised that food premises must be supervised and must be cleaned. A section on nutrition included a topic which suggested storing food at temperature under 50° F and at low humidity to stop the growth of microbes.

In other books, the Celsius measurement was used. Using different units of measurements might cause confusion to the students and teachers, especially in Bahrain because Fahrenheit measures are not common. The same units must be used in all the textbooks.

Natural studies textbook for the third science level included a variety of topics which directly or indirectly related to food safety. Information such as introduction to microbiology, the harmful and the beneficial bacteria in foods, how foods become contaminated with microbes (from excreta which are used to fertilise lands and from hands). Only these two sources were mentioned. This part is very important, they should have elaborated more and included other sources. The textbook also included methods of protecting foods from contamination. They were:

- Heating to 100° C to kill all microbes except their parasites,
- Cooling and freezing to preserve foods,
- Dehydration to preserve milk products, fruits, and vegetables,
- Salting and curing,
- Adding additives and
- Using of radiation.

These are not methods of protecting foods from contamination, but they are methods for preserving and preventing spoilage. This point has to be clarified. The textbook also contained information on typhoid and cholera.



The findings of the TLMs suggest that students in all grades were being taught adequate health subjects. Findings also indicated that subjects related to hygiene are more emphasised in the textbooks. Little or no information was noted on the factors that contribute to foodborne illnesses. Authors should have included these items and should have laid more emphasis on these elements. It has been discussed earlier that these factors are the most critical points in food safety at which control measures are to be applied. Teachers, students and health workers must address these factors before any other measure. Results of epidemiological findings and HACCP should have been used as a guide to develop the curriculum. There will be a chance of misinterpretation if hygiene aspects are given greater emphasis by the inspectors and in the textbooks.

#### **6.4.3. Health education materials:**

Materials which are developed for health promotion come mainly from (a) the health education section within the MoH, (b) private and (c) international resources. Materials prepared by the health education section can become personally relevant to the needs of teachers, students and the community.

Health education materials which contained some information related to food are listed below:

##### **Booklet one:**

This booklet is entitled “diarrhoea in children”:

The booklet listed the causes of diarrhoea as (a) viruses and bacteria. It stated that diarrhoea happens because of eating foods which are not clean or foods which are contaminated with flies. (b) side effects after taking medicine and (c) because of infection of the middle ear. The booklet included some suggestions:

**Comments on the booklet:**

This booklet is designed for the general public, particularly parents. The booklet contained clear illustrations and text. However, it contained some technical terminology which non-medical people might find difficult to understand. Two mistakes were detected. One related to contamination and the other related to the role of flies in transmission of microbes which cause foodborne diseases. The booklet did not contain important factors which lead to contamination, survival, and multiplication of microbes.

**Booklet two:**

This booklet entitled “Communicable diseases of summer and how to protect ourselves”.

It stated that communicable diseases are (a) more common among children than adolescents, (b) they affect stomach and intestines and (c) they are more common in summer because the temperature is proper and due to the presence of more flies which

contaminate foods and drinks. The booklet also reported that (a) milk is a good medium for bacterial multiplication, (b) digestive system of children is less able to fight infection than in adolescents and (c) the ability of a child's body to produce antibodies and immunity is less than that of an adults.

The booklet indicated that most important causes of gastro-enteritis are dysentery, typhoid, para-typhoid and others such as infectious hepatitis, poliomyelitis, which are all transmissible by food and drink.

The booklet listed important summer diseases. Diseases and information given in this booklet are (a) gastro-enteritis: It stated that gastro-enteritis or food poisoning which is common in summer, is caused by microbes which contaminate children's food or drink. It is more common among children. The symptoms are diarrhoea, lack of appetite and dehydration. Victims of dehydration should be re-hydrated. (b) infectious hepatitis: Infectious hepatitis is caused by a virus which affects liver cells. This virus is produced through the faeces of the carrier or sick person and infection happens after consuming contaminated food or drink. Incubation period and symptoms were also given. To protect the community, practice hygiene and avoid contaminated foods or drinks. (c) poliomyelitis: This included: description of the disease, symptoms, protection (vaccination) besides avoiding contamination of food or drink and boiling milk and controlling flies. (d) cholera: This contained: description of the bacteria, how the bacteria are killed (in vinegar, lemon, heat, sun light). Transmitted from faeces or infected persons through food or drinks, symptoms. For protection from this disease, the booklet suggested the following: make sure foods are

clean and that water is from safe sources, also make sure that those who come from infected areas are free from microbes. (d) typhoid and para-typhoid: It stated that bacteria which cause this disease belong to salmonella group. Source is human (sick or carrier), microbes come out with faeces or urine. Infections likely to happen if food is contaminated. Symptoms were included in the booklet. For protection, the booklet suggested: keep food and drinks clean, control flies, take an injection which is available at the health centres. The booklet also included general suggestions for protection against summer diseases. They listed the following:

- Take care of personal hygiene, particularly washing hands before eating and after using the toilet.
- Cleaning of foods and drink is important.
- See the doctor when vomiting or diarrhoea appears.
- Control flies and their breeding sites and store refuse in covered containers and dispose of them immediately.

### **Booklet three:**

This booklet is entitled “What do you know about infectious hepatitis?”:

It included: definition, causative agents (A&B) and how they are transmitted. It was mentioned that type A is transmitted through eating contaminated food or drink. Similarly, methods for transmission of type B was given. Incubation periods and symptoms were also included. Protection against type A was given as follows: make

sure foods and drink is clean, wash hands before and after eating and after using toilets.

### **Comments:**

Protection methods which were given in this booklet are not adequate and do not tell much to the users. The authors should have clarified what they meant by making foods and drinks clean, how? etc.

### **Booklet four:**

Maternal and child care: (No. 1 and 2):

**Number 1:** This booklet is mostly about diarrhoea among children. The following areas were covered: Types and causes, ORS and foods to compensate loss of water and minerals. Little on how to control distribution of microbes which cause diarrhoea. The booklet emphasised personal hygiene, washing hands after toilet use and before preparing and eating food.

**Number 2:** This booklet is entitled "What is diarrhoea?". It covered the following: risk associated with diarrhoea, how to diagnose diarrhoea, treatment. Protection from diarrhoea and reducing its harmful effects. It was stated that diarrhoea is caused because of (a) low standard of health, (b) use of unclean water, and (c) lack of

personal hygiene. All these help microbes to multiply. According to the booklet, the best method to prevent growth of these microbes will be through: (a) hand washing with water and soap before and after eating and after the use of toilet, (b) washing of vegetables and fruits before consumption and before preparation, (c) drinking water must be clean, (d) food must be covered all the time to prevent flies and insects which carry microbes, (e) cooked foods and leftovers must be kept in refrigerators, left over food must not be given to children, (f) refuse must be disposed of by putting it into containers with covers, (g) clean toilets all the time by using disinfectants. Most serious diarrhoea come from toilets in which microbes are transmitted by touching or by flies and (h) make sure that toys and other things which are used by children are clean.

**Comments:** Both booklets contained many technical and difficult words. Parents and other non-professional community members will find them very difficult to understand.

## CHAPTER SEVEN

### Chapter 7

#### **7. Discussion:**

##### **Overview:**

This chapter highlights discussion of the results. It consists of three parts. First, discussion related to the findings of the questionnaires and focus group interviews. Second, discussion related to the canteens assessment. Third, discussion of the TLMs findings.

According to the medical model, providing relevant information to people results in increased knowledge, change in attitudes and behaviour leading to health improvements (Fowler, 1985). However, this model has been criticised as ignoring many important factors such as individuals' health perception, beliefs, and culture. According to the health promotion model, environment, resources and health policies are essential for improvement and protection of health. Thus this research has taken all these considerations into account.

##### **7.1. Discussing results of the questionnaires:**

The study addressed six areas in food safety: causes of poisoning, sources of contamination, factors contributing to outbreaks, susceptibility and perception of the

problem and control measures based on the HBM, control measures and community involvement.

As stated earlier, there is no research similar to the current study thus comparison would not be feasible. However, the few studies which studied knowledge, attitudes and beliefs among food workers and food managers, epidemiological and HACCP findings will be crucial to this section. Also TLMs studies which are relevant to the current research will be used.

The first question of this survey was answered. The questionnaire results suggest that Bahraini teachers, students, parents and health promoters have acceptable empowering knowledge in food safety. However, there was also some confusion, misunderstanding and lack of knowledge in some areas. The results suggest that there is correlation between level of education, the section at which students study and teachers teach and sex and awareness in food hygiene. Generally, subjects who had higher level of education, those in science section, private schools and females seemed to be more knowledgeable and more often responded positively to the questions than other groups.

Knowledge, attitudes and beliefs are the predisposing factors for initiating behaviours according to the PRECEDE (Green et al, 1980) and self-empowerment models. However, knowledge should be reinforced so that they do not deplete with time. The key findings from the survey included:



### **7.1.1. Causes of food poisoning:**

#### **Microbes or their toxins:**

Microbial food poisoning has been considered as major causes of foodborne illnesses, across the literature, despite the increase use of chemicals in food industry (Cross, 1992; Foster & Kaferstein, 1985; Kaferstein et al., 1990; WHO, 1991e). As revealed in Figures (6.2 A&B), it was found that the majority of the subjects were aware of this fact (91.23%). There was no statistically significant difference between the groups. However, statistically significant differences were noticed within the groups between students of the governmental and private schools and between male and female students within the governmental schools (Figures 6.31 A&B). The findings revealed that students in the private schools and females in the governmental schools were significantly more aware of the above statement. This indicate that future health education should target governmental schools, particularly male students.

#### **Mixing certain foods at a meal:**

Although the majority of the respondents were informed about the causes of the problem, there were some (26.77%) of the subjects who believed that mixing certain foods at the same meal could lead to food poisoning (Figure 6.3 A&B). It is widely believed in Bahrain that mixing of certain foods at a meal (eating certain foods together) such as eating fish followed by milk or a milk product, or fish and water melon will lead to poisoning or disease. Interestingly, it was found that teachers and

students were more likely than parents and health promoters to believe this (29.58%) and health promoters scored the least (18.18%) as shown in Figures (6.3 A&B). Moreover, Figure (6.32 A&B) revealed that this belief was more common among students in the private schools and non-science students in the governmental schools. This was an expected finding. The majority of students and teachers in the private schools in Bahrain are from the Indian subcontinent. It is assumed that this belief is common in the Gulf Region because of the influence of those groups on the locals. The same belief has been reported by Hernandez & Blatazar (1987) in the Philippines.

The lower percentage of science students who had this belief in this reflects that they were more knowledgeable perhaps because of the effect of their school studies.

#### **Improper supervision of canteens:**

Figures (6.4 A&B) revealed that all the participants, particularly teachers, blamed improper supervision of canteens as a major contributor to food poisoning. Also (Figure 6.33 A&B) showed that science students in the government schools were more likely to believe this. Supervision of food premises is necessary. Researchers (Ali, 1986; Bryan, 1992; WHO, 1991e) reported that supervision is important only if HACCP is used and critical control points (CCPs) are identified and monitored. However, Bryan (1992), Bryan et al (1992a & c) and WHO (1991e) stressed that education and training of food workers in safe food handling and supervision through monitoring of the CCPs would be the most rational control measure of foodborne

illnesses. These points have to be clarified when tailoring health education or continuing education programmes.

### **Hair falling into food:**

Hair falling into food has been seen as an important cause of food poisoning. Significant number of the participants (53.09%) believed in this statement as shown in Figures (6.8 A&B). Figures (6.34 A&B) however, revealed that female teachers were more likely to believe in this. Hair as discussed earlier does not contribute to food poisoning however it reflects lack of hygienic standards. However, Sprenger (1992 p. 30) believed that hair along with dandruff, can cause contamination. Whether or not hair causes contamination of foods, it should not be considered as an important source of contamination because raw foods of animal origin are already much more contaminated when they arrive at the kitchens. More contamination happens during processing and handling of these foods through cross-contamination. This belief might interfere with proper inspection and control measures and might divert attention from more important factors which lead to the hazards. Furthermore, the community might focus their efforts, at home or other places, on less important issues. Female teachers have to be informed and this area of food hygiene should be dealt with in the future training programmes for the community.

### **Inadequate training of food workers:**

Figures (6.5 A&B) reported results of training of food workers. Teachers, parents, and health promoters were more in favour of training of food workers than students. Also science students Figures (6.35 A&B) considered training as important. Training of food workers has been recommended by many authors (Bryan, 1992; Hobbs & Roberts, 1993; West, 1992; WHO, 1988b; Woolaway & Bartlett, 1986). West (1992) attributed the decrease of foodborne outbreaks in UK to (a) high level commitment of the Department of Health towards sanitation (b) training of staff by the National Health Services (NHS) (c) employing qualified managers by the NHS and (d) co-ordination of NHS with the environmental health officers. According to the author, all these factors contributed to low level of outbreak. West (1992), believed that training of food handlers is not successful if it is not a part of an ongoing educational policy. Penninger & Rodman (1984) reported that training and certification of managers in food services improved actual sanitary condition. Whereas Burch & Sawyer (1991) showed a positive correlation between manager's knowledge of sanitation with sanitary condition of food stores. Hence, they suggested a mandatory certification of managers in food service sanitation. Figures (6.34 & 6.35 A&B) suggest that the percentage of female students and students in the science sections who responded positively to the statement was higher than other students.

Perhaps, the possible problems which might arise if food workers are to be trained in Bahrain are the following:

- communication problem due to language and illiteracy of food workers.
- workers work on temporary or part time basis and often change roles.
- small size of food stores makes it difficult as a setting for training.
- health inspectors and food workers are overwhelmed with work.

Obviously these pose a problem for conducting training but should not be taken as an excuse to ignore food workers in any educational activity. I strongly believe that investment in training will empower food workers and ultimately brings positive results.

#### **Medical examination & certification of food workers:**

Data analysis (Figures 6.6 A&B & 6.7 A&B) showed that the majority of the respondents were in favour of medical examining and certification of food workers. A high proportion of health promoters believed that food poisoning occurs because food workers are not medically examined (Figures 6.7 A&B). Also more female students believed this (Figures 6.38 A&B). Many authors do not recommend and discourage medical examination and certification of food workers (Bryan, 1992; Charles, 1983; Hobbs & Roberts, 1993). However, some other authors suggested certification after training, not after medical examination (Ali, 1986; Bryan, 1992; Burch & Sawyer, 1991; Hobbs & Roberts, 1993; WHO, 1991b). Training in food safety through using workshop plus manuals has resulted in significant improvement in scores of the staff of community-based adult care facilities compared with training via the manual alone (Soneff et al, 1994).

The subjects responded in this way perhaps because of (a) the influence of the traditional method of food inspection which is currently used in Bahrain in which inspectors place high emphasis over health certificates and (b) the education which is provided occasionally by the inspectors and through the media. The conclusion drawn from Figures (6.39 A&B) is that teachers with school level qualifications were less informed compared to teachers with university level qualifications. Figures (6.40 A&B) also demonstrated that students in the governmental schools were less informed than those in the private schools. These are important to be considered when designing health promotion activities.

#### **Responses to the open-ended questions on causes:**

The subjects showed a good level of knowledge to the causes and the processes leading to the occurrence of foodborne illnesses. Important positive data have emerged in this section which have to be considered and reinforced by health authorities. However, the subjects seemed to give great importance to the expiry-dates of canned foods. Expiry-dates are not important if the right storage methods are not considered by people. Many foods expire and spoil long before their expiry-dates are due because of improper storage methods. Temperature and humidity control are the most crucial factors which the public have to be aware of and which should be observed by health officers.

### **7.1.2. Sources of contamination:**

This section discusses Figures (6.9 A&B) through Figures (6.13 A&B) and Figures (6.41 A&B) through Figures (6.45 A&B). This part of the research is meant to assess the subject's knowledge and beliefs in the sources of food contamination. Researchers throughout the literature reported that processing of foods, food workers, raw foods, and the environment are source of food contamination. Although there is controversy over the role of food workers as a source of contamination, several studies have shown that food workers were the prime source of pathogens in foods. (Lo et al, 1994; Dryden et al, 1994; Richards et al, 1993).

As indicated in Figures (6.9 to 6.13), the majority of the subjects have answered positively to the statements indicating that the participants have knowledge in this area. However, the findings in Figures (6.12 A&B) were against expectation. 40% of health promoters agreed that cooked foods are sources of food contamination. It was expected that health promoters would disagree with this statement. This confusion is most likely because most food poisonings which happen, in Bahrain or elsewhere, are the result of improperly cooked, stored or re-heated foods. Thus the inspectors felt that cooked foods contribute to food contamination. Also this high response rate could also be because of the influence of health promoters work in other sections of public health such as in rodent and insect control, communicable diseases. They are not qualified in food safety.

Figures (6.43 A&B) showed that younger teachers were more knowledgeable than older ones about this source of contamination. Younger teachers in Bahrain usually have higher levels of education than older ones. Also among teachers  $\geq 40$ , those who teach secondary and more than one level were more aware of this source compared to those who teach in the primary and intermediate levels. Figures (6.43 A&B) also revealed that teachers who have university level of education were more aware of this source than those having school levels. The conclusion drawn from Figures (6.43 A&B) is that teachers with higher level of education were more informed than those with lower level of education. All these findings were expected.

Figures (6.44 A&B) revealed that students in the governmental schools were more aware of the contribution of cooked food to contamination of other foods compared to those in the private schools. Note that (76.60%) students in the governmental schools disagreed that cooked foods cause contamination of other foods compared to (51.72%) in the private schools.

No statistically significant differences were noticed between the subjects Figures (6.13 A&B). All agreed that the environment contribute to contamination of foods. The subjects seemed to be fully aware of the effect of the surrounding environment on contamination of foods. Note that female students were more informed about the environment as a source (Figures 6.45 A&B).

Figures (6.41 A&B) showed un-expected results. Compared to the science teachers, non-science teachers seemed to be more aware of the fact that processing of foods can



increase the chance of contamination. Female students appeared to be more informed than male students. Those in the science section were more knowledgeable about processing and handling of foods as a source of contamination than students in the non-science sections (Figures 6.42 A&B).

Responses to the open-ended questions, however, further support the findings that the subjects have sound knowledge of the sources of food contamination. Table (6.20) showed interesting responses in which only one confusion has been listed by the respondents. The response which indicated that canned foods could be a source of food contamination is the one which has to be considered and clarified by health educators.

### **7.1.3. Factors that contribute to outbreaks:**

This part discusses Figures (6.14 to 6.19 A&B) and Figures (6.46 to 6.53 A&B). The statements in this section were put to measure the subject's knowledge, attitudes and opinions to the most contributing factors of foodborne illnesses. (a) inadequate cooking, (b) preparing food long in advance and not eating food while hot (leaving it for long time), (c) storing foods in deep pans, and (d) not heating already cooked food adequately have all been incriminated as important contributing factors in foodborne illnesses (Bryan, 1988; Hobbs & Roberts, 1993; West, 1992; WHO, 1992). Figures (6.14 A&B) showed that all the subject had positive attitude toward thorough cooking. Figures (6.46 A&B) revealed that male students were more aware of the

effect of cooking than females. Also, as expected, among female students, those in the science section were more informed about the effect of heat on food safety.

Figure (6.15 A&B) revealed some confusion and lack of knowledge in the response. It was expected that the subjects mark “good practice”. Figures (6.15 A&B) showed significant difference between students and the three other groups. Note that teachers, parents and health promoters responded similarly. Although all the subjects selected ‘neutral’ option, students seemed to be more happy with this option. The second option which was supported by high percentage of responses was ‘good practice’. The majority of the teachers, parents and health promoters (26.19%) agreed that eating hot food is a good practice as far as food poisoning is concerned compared to students (10.82%). This suggest that students are less informed in this area than the other groups.

Note that Non-Bahraini teachers, Figures (6.46 A&B), were much more knowledgeable than Bahraini about eating hot food. However, there is still a high percentage of both Bahraini and Non-Bahraini who believe that heat has a neutral effect on food safety. This suggests that confusion among the teachers exists and needs to be clarified and corrected. The figures also revealed that female Bahrain teachers were slightly more informed than male teachers about the effect of heat on food safety. Branch three of this figure must be interpreted with caution. Note that the percentage of females who selected the ‘neutral’ option was higher than males. But again, the percentage of females who selected ‘bad practice’ were much lower

than males. The conclusion is that female teachers were more informed than male teachers.

As expected, health promoters had correct knowledge (84%) responded as re-heating of pre-cooked foods is a good practice followed by teachers and parents. However, students had some problems because more felt that re-heating of cooked foods has a neutral effect (Figures 6.16 A&B).

Figures (6.47 A&B) revealed that teachers with university qualification were slightly better informed than those with school level of education about the effect of re-heating of food on food safety. Also the same Figure clearly showed that Non-Bahraini teachers were also more knowledgeable than Bahraini teachers about the same factor.

Figures (6.48 A&B) showed that students in the private schools were less knowledgeable about re-heating of foods because much higher percentage of them (24.56%) compared to (8.76%) in governmental schools thought that re-heating has a bad effect on foods.

These are important finding that are worth consideration when designing any health promotion programme.

Figures (6.17 A&B) showed that the participants had good knowledge in cross-contamination. All the subjects stated that cross-contamination is bad to food. As expected health promoters scored the highest for this statement. Note that teachers

teaching the intermediate and more than one level were more knowledgeable than those teaching the primary level (Figures 6.49 A&B). Students, however showed some degree of knowledge but also some confusion and lack of awareness as shown in Figures (6.50 A&B). More students in the governmental schools (34.65%) did not know if cross-contamination is bad to food safety compared to students in the private schools (18.97%).

Storing large quantities of food in deep pan is a bad practice for food safety as it helps multiplication of micro-organisms because heat takes a long time to distribute to all over the food particularly the centre. This factor has been incriminated in many large outbreaks of food poisoning particularly in mass-catering.

It was found that respondents also had good knowledge in this field. This was particularly true for health promoters (71.01%) (Figures 6.18 A&B). However, authorities should be cautious about those who believe that storing large quantities of foods in deep pans is a good practice. As shown in Figures (6.18 A&B), out of which 16.06% were teachers and parents, 10.77% were students and 15.94% were health promoters.

Although there were significant differences between male and female students and those in the science and non-science sections (Figures 6.53 A&B) and the majority showed positive attitudes towards this kind of food storage, still there was some confusion which will have to be considered by health planning authorities.

Refrigerators are meant to protect food from spoilage and ensure safety. Figures (6.19 A&B) revealed some confusion among all the subjects. Unexpectedly, teachers and health promoters felt that refrigeration has neutral effect on food safety (50.89%) and a bad effect (34.10%). Students and parents had some similar beliefs, but their response to “bad practice” was higher than those for teachers and health promoters.

Several conclusions can be drawn from Figures (6.51 A&B). First, the second branch revealed that higher rates of students in the private schools were aware of the advantage of refrigeration. Note that 58.18% students in the governmental schools said that refrigeration is bad for food compared to 29.31% in private schools. However, this does not mean that students in the private schools had good knowledge in this field. Note that 55.17% said that refrigeration has a neutral effect on food. Second, the third branch demonstrated that both male and female students showed lack of knowledge in this area. The majority in both sexes felt that refrigeration is bad for food safety, however, females were even more convinced (65.50%) compared to males (50.3%). Finally, the fourth showed that sections at which students study seemed to be significant. Females in both science and non-science showed confusion. Unexpectedly, the response rates for students in the science section were slightly higher than those in the non-science sections for “bad practice”.

Similarly, parents showed confusion about refrigeration of foods (Figures 6.52 A&B). It is necessary to consider this factor in any training programmes for the community. Many people in Bahrain dispose of foods, which are still safe to consume, thinking that they are bad.

#### **7.1.4. Susceptibility and control based on the HBM:**

According to the postulate of the HBM (Becker, 1974; Becker & Maiman, 1975), for any control measure to be successful, individuals must believe that they are susceptible to the problem, and that the problem is preventable. These are two important points in the HBM. Following the guidelines of the model, food poisoning was identified as a particular health problem affecting the quality of life in Bahrain. The subjects felt that everybody is at risk and that food borne illnesses could be reduced (Figures 6.20 A&B & 6.21 A&B). 98% of the subjects agreed that food poisoning could occur at any age. 98% of health promoters felt that incidence of foodborne illnesses could be reduced. This was also supported by teachers, students and parents. Students in science sections showed more positive responses than those in other sections (Figures 6.54 A&B). Similarly, teachers who had university level of education reported better understanding and positive attitudes compared to teachers with lower level of education (Figures 6.55 A&B). Also students in the private schools and their parents were more aware and knowledgeable compared to students in the governmental schools and their parents (Figures 6.57 and 6.58 A&B). These findings indicate the effect of knowledge on the response rates, suggesting that those with lower or negative responses should be targeted in future training. Baric (1991 p. 49) stated that awareness about the existence of a health hazard is important, although not absolutely necessary requirement for prevention and management of such ailment. Tones (1987 p. 26) stated that belief about cause and effect will in turn generate belief about

susceptibility and seriousness. These are important points which merit consideration in health promotion and self empowerment.

#### **7.1.5. Control measures:**

Two areas were selected in this section. One which dealt with punishment and the other suggested an educational approach. For the first part, the subjects were more prone to agree with punishment of food workers and closing down of premises as the best way of controlling foodborne hazards (Figures 6.22 A&B and 6.23 A&B). Bahraini teachers and children in the government schools were more likely than Non-Bahraini to select this option (Figures 6.59 and 6.60 A&B). Figures (6.61 A&B) revealed that female students were more likely than males to favour closing down of food premises. Among male students, those in science sections were more likely than those in other sections to agree with closing down of food premises. Also note in Figures (6.62 A&B) that Bahraini parents were more likely to select closing down of food places than Non-Bahraini parents. Laws are meant to promote health, protect the consumers from fraud and to secure producers interests. However, Baric (1991 p. 39) stated that policies are meant to facilitate access to health, reduce inequalities in health and increase opportunities for better health. The author also reported that legislation, communication, education, organisational change and community development against health hazards are complementary approaches to health promotion. According to Shank & Carson (1994), the best way to protect the consumer is that industry must be responsible for preparing food that is safe and that the government should provide monitoring to ensure that food premises are performing their job- that is producing

safe foods. Respondents stressed punishment and legal actions against food workers and food services establishments. Baric (1991 p. 152) stated that punishment is a negative reinforcer which affects the outcome of a learning experiences; however, reinforcement control plays a major part in behaviour modification. Sanction and downgrading, publishing the results of inspection in local newspaper all these efforts did not affect the behaviour of the food workers sufficiently to prevent large outbreaks (Luby et al, 1993). Luby et al (1993) suggested further legal actions. I strongly disagree with them because punishment is not health education and such action might change behaviour, but only for a short time.

The second part of this section dealt with education (Figures 6.24 A&B and 6.25 A&B and Figures 6.63 A&B). Note that 97.49% of the subjects (Figures 6.24 A&B) recommended education of food workers and 97.00% Figures (6.25 A&B) recommended education of the community in food safety as the best approach for controlling foodborne illnesses. Female teachers gave much more value to education of food workers (Figures 6.63 A&B). This suggested that participants ranked education as one of the most important control measures. These findings were also supported by the interviewees. Also, in the open-ended question, education was the most reported comment by the subjects indicating that the subjects place education high on the agenda. Education has been recommended by almost every researcher in food safety as the best control measure. FAO/WHO (WHO, 1984) believe that health education in developing countries can offer the best solution for achieving higher levels of food safety. Kolybine (1992) attributed the improvements in health status, over the past decades, to the promotion of health knowledge and information. WHO (1988a p.



11) suggested three health education strategies for food safety. These were based on Ottawa Charter for Health Promotion (WHO, 1986). They are: (a). advocacy which aimed at obtaining relevant public policies and creating sound social environment, (b) involvement of all members of the community and (c) promotion of food safety via education and motivating the public. Many of the comments given by the subjects in the open-ended question are interesting and worth considering by health authorities. These comments, however, need to be prioritised through involvement of teachers, parents, students and health promoters. Having found that participants have positive attitudes towards education is crucial for health promotion. It is necessary to understand their feelings if we are to secure their participation in health promotion activities.

#### **7.1.6. Community involvement:**

There is a need for active partnership between teachers, students, parents, and health professionals to help with understanding and planning food safety actions. Figures (6.26 through 6.29 A&B and 6.64 through 6.67 A&B) revealed that all the subjects were in favour of involving the community in the fight against foodborne illnesses. These findings were also complimented by comments given by the focus group and responses to the open-ended question (Table 6.22). Statistically significant differences were noted within the groups. For example, Figures (6.63 A&B) showed that female teachers were more in favour of involving food workers than male teachers. Teachers with university level of education were more than those with school level of education in favour of involving students in health education (Figures 6.64 A&B). Female

students were much more in favour of involving students in health education than males (Figure 6.65 A&B). Male teachers, however, were slightly more in favour of involving health educators in health education than female teachers (Figures 6.66 A&B). Finally, students in the governmental schools were more in favour of involving their parents in health education than students in the private schools (Figures 6.67 A&B). Community involvement in health promotion activities is the centre of self-empowerment. In a study about children's beliefs about health and illnesses, Green & Bird (1986) reported that junior high students ranked the family as more important than doctors for health. Novello et al (1992) concluded that parents involvement in health promotion is critical to the success of a programme. They also recognised the importance of engaging professionals, private sector, government and families in achieving health objectives. The importance of parental involvement for initiating health behaviour change among children is reported by several authors (Perry et al, 1989; Cohen et al, 1989; Nader et al, 1989). Wetton & Moon (1987 p. 51) felt that parents were involved only when sensitive areas such as sex are discussed. The authors suggested that parents' involvement should be broadened if the aim is to protect children from immediate and long-term hazards. Mutter (1986) stated that special education was introduced in Canadian schools due to insistence of parents. Involvement of the community is essential in health promotion in two ways according to (WHO, 1988a) (a) the community impose pressure for social policies and resource allocation, and (b) translating policies into action and practices at the community level. As community involvement in the planning and implementation of any health promotion programmes ensure that characteristics, beliefs, customs, habits, perception and preferences are reflected in the programme (WHO, 1988a), it is important that the

community has correct knowledge, positive attitudes and beliefs. Hewett (1992) suggested that schools are a place for parents to meet and discuss key issues to improve the community life and well-being. The author also suggested the use of school children as communication channels to educate those who left schools, parents, and the community in general. Hewett (1992) felt that using students in health education will not only improve community life but also would strengthen the effectiveness of teaching. Kolybine (1992) stated that school-based health promotion is limited if families and the community are not involved. The author added that schools children, parents and teachers are all potential receivers and providers of health knowledge and information. Involvement of doctors in health promotion and disease prevention has been suggested by Patterson et al (1989).

#### **7.1.7. Responses to the open-ended questions:**

##### **A. Perceived needs:**

This part attempted to identify the needs of teachers, students, parents and health promoters and provide some viable data for initiating the development of relevant health programmes. Formidable number of topics have been suggested by the respondents. Interestingly, teachers, students and parents results for this part were similar to each other. Kolybine (1992) mentioned that health education must be relevant to common health problems. Whereas Novello et al (1992) felt that for children to be healthy, policies and programmes should be based on the needs of families. Yarham (1990) listed some problems as the priorities for health policy.

These are: nutrition deficiency, drug misuse, dysentery, child violence, injuries, sexually transmitted diseases (STD) and sexual abuse. However, the Task Force Report (1992) stated that the decrease of coronary heart diseases, cancer, accidents, Alcohol, tobacco, drug abuse, and STD, including AIDS as the main aim for European health policy.

A comparison of the health problems reported by the Bahraini community and the ones given by those authors and by Green et al (1980 pp. 148-9) revealed some similarities. Food safety, nutrition, hygiene, communicable diseases, smoking, drugs and sex behaviour were common in most societies. Green & Bird (1986) argued that cause of illness which are more frequently mentioned may not necessarily be perceived as more important. Yet, these problems merit study and intervention. It is necessary to take into consideration the needs of children when planning school-based health programmes (Williams, 1987 p. 73). These findings should provide more useful information for designing and promoting relevant school and community health programmes.

All respondents considered food poisoning and hygiene to be the top priorities for action. Although food safety is important to the public, however, ranking it so high reflects the bias effect of the research on these particular responses. This finding must be interpreted with caution. The subjects felt that these are the problems (Table 6.23) which affect physical, emotional and social health of the community. The results indicated clear areas for health promotion.

## **B. Perceived barriers:**

This question was used to examine the perceived barriers to health promotion in schools. Scarcity of resources, lack of trained personnel, carelessness and neglect by schools and the MoE, lack of support and interest as far as students concerned, and tight schedules emerged as the most important barriers to health promotion (Table 6.24). The study of this part has revealed information worth considering when developing health projects. Similarly, Downie et al (1993 p. 53) reported neglect, failure to look for, and failure to give priority as being barriers to health. Fakhro (1992) listed some barriers to health promotion in the Arabian Gulf Countries. Most importantly were: (a). societal commitment, (b) students are not introduced to the concept of health promotion in the schools and medical colleges, and (c) women in some countries are confined to their homes. Absence of women make implementing of health promotion difficult.

However, Mutter (1986) outlined the following as important problems that face school health education in Canada: (a) teachers lack specialised training, (b) improper use of TLMs, and (c) crowded time-tables. According to Gezairy (1990), the constraints to school health are: (a) manpower, (b) structural limitation, (c) bureaucracy, (d) resistance to change, and (e) professional jealousy. However, Boulton and Williams (1986) reported some similar barriers to health education in general practice (time, lack of interest).

### **C. Comments given by the subjects:**

The comments given by the subjects are extremely important for designing comprehensive health promotion in schools. Interestingly, education emerged as key component in this section. Tones (1987) emphasised that self-empowerment model is built on an educational approach. It starts with parental and family influences and should be developed during school age. The effect of education on behaviour and performance have been reported by many authors across the literature. Brown et al (1989) reported an increase in the knowledge and change in the behaviour after a health education campaign to AIDS crisis on junior and senior high school students. However, we have to be cautioned about providing knowledge because information by itself is not effective. Wetton & Moon (1987 p. 56) stated that children do not learn about health by being told what to do or what not to do, what is good or bad for their health. However, they learn through active participation with role models around them. Moreover, Wetton & Moon (1987 p. 55) mentioned that many of the attitudes, beliefs and values and other lifestyles of the children have their roots in school training. WHO (1988a), stated that educational efforts had an immediate impact on promoting the health and prevention of illnesses in certain countries, particularly when these efforts have been reinforced by religious, social and political institutions.

## **7.2. Focus group:**

In addition to the importance of focus groups, mentioned in chapter 5, McKinly (1992) stated that using focus group activities are needed to complement quantitative approaches and fill gaps where quantitative research is not appropriate.

Most of the responses appeared to be appropriate and positive especially those related to sources of contamination, control measures. However, teachers and students showed inadequate conception and reported inappropriate beliefs about contamination, sources and survival and growth requirements of microbes. In certain disadvantaged areas, Kolybine (1992) stated that school teachers themselves may not be much better off than their pupils and thus may benefit from school and health interventions. Health promoters in food hygiene section and those in other section showed conflicting results. Observing this discrepancy may guide officials to develop continuing education programmes for those health promoters who lack the health knowledge. Task Force Report (1992) recommended that school should provide basic knowledge about health promotion to encourage healthy lifestyle.

The findings of the focus group interviews suggest that all children, and teachers were convinced of the importance of food safety but lacked contribution to the health promotion and did not have adequate access to resources. However, there was disagreement among health promoters about the significance of food poisoning in Bahrain.

It was concluded from the discussions that the subjects (a) believed that food poisoning is a serious problem (almost all of them), (b) were conscious of their susceptibility to food poisoning (c) were aware that foodborne illnesses are controllable and (d) were willing to adopt preventive measures and to be involved in health promotion activities. These findings fulfil the requirements of the HBM (Becker, 1974; Becker & Maiman, 1975). All the students and teachers stated that they will participate in any health promotion activity. Carter et al (1991) argued that understanding willingness of older adult to participate in health programmes is critical for health and policies of population.

Surprisingly, contributing factors to food poisoning did not give rise to great concern, even though they are the most important critical measures. These are important to be tackled by health promotion of the public. Increase of health promotion in this area is necessary.

Health promoters and some students felt that preparing food long in advance is an important factor in disease causation. This is a very important finding because this factors has been well document in literature as an important deficiency in food safety (Bryan, 1988; Hobbs & Roberts, 1993; West, 1992). Nevertheless, preparing food long in advance is a perfectly acceptable practice provided that the storage temperature is regulated after preparation and shallow-type pans are used for this purpose. Such food should never be left at room temperature. Placing food in shallow pans guarantees the distribution of heat to all parts of food, particularly the geometric centre. Improper storage emerged as another important factor related to food



poisoning by teachers, students and health promoters. They argued that improper storage is a significant contributor to food poisoning in Bahrain. This supported the findings of Mara & Alabaster (1995) who has classified food storage as an important cause of diseases in the developing countries.

Even among highly educated members of the community, it is believed that God and other powers contribute to the occurrence of foodborne illnesses. Such beliefs must be challenged because they are not rationale, not scientific and might interfere with health promotion. According to Tones (1987 p. 14), “individuals having an external locus of control will tend to believe that their scope for action is limited by fate or by powerful others”. The author also stated that external locus of control has been associated with disease but internal locus of control has resulted into health.

All of the subjects were in favour of involvement of the community in comprehensive health promotion activities. Not only all the subjects suggested community involvement. However, the key findings were that attitudes and willingness of teachers, and students to participate and co-operate with health officers in preventive measure is the key element to be considered in implementing programmes which will ultimately empower the public.

Focus groups discussed the issue of co-ordination and collaboration between authorities within the MoE and between the MoE and the MoH. The findings suggested that co-ordination and collaboration between the MoE and the MoH exist but are not efficient. Furthermore, co-ordination and collaboration between teachers

and families was poor and parents were not aware of health education in schools. This is in agreement with the findings of Young (1992). Food safety requires co-ordination among many organisations. It is a multifaceted issue that needs to be carefully dealt with. Yarham (1990) stressed the need for resources, co-ordination in health promotion and health education to meet the needs of children and enhance their involvement. Kaferstein et al (1990) and WHO (1991e), suggested mobilising three sectors to ensure food safety and to tackle the problem of food poisoning. These sectors were: governments, food service industries and trade and consumers. They also clarified the role of each sector. For example, the government must make sure that updated food laws relevant to the current problems and needs, exist and are enforced and that the government should establish ways of helping industry and trade to grasp and comply with the laws and regulations. With regard to food service industry and trade, they should follow and comply with laws and regulations, and that the producers of food products should follow high hygienic practices. Industry and trade should have to co-operate with the government and also train their staff in food safety. However, the consumer should demand safe foods as well as requesting advice on methods of food handling. Those suggestions are in agreement with the findings of this research. It is the responsibility of all to ensure safe food and prevent disease. Communication and understanding the rules by each of these sectors is crucial to the success of any health education programme. The MoE and the MoH must co-ordinate to ensure that health promotion in schools becomes a reality by developing and implementing of health policies, developing curriculum and training and improving skills of teachers and health personnel. A healthy community can not be achieved without healthy schools, a healthy environment, and empowered people. Nakajima

(1992) argued that for a comprehensive school health education, school setting, home environment, mass media and the community must be used.

Teachers were asked to comment on health education training available to them. It was found that a small minority of teachers have attended a workshop in health education. It was apparent that the workshop did not adequately fulfil their needs. Furthermore, they felt that health promotion TLMs are not available to them. Even health promoters felt that they do not have health promotion materials. Gann (1986) wrote that many health educators are unaware of the information facilities which are available to them. This could be true in the case of Bahrain because not far away from the Public Health Directorate, where health promoters offices are, there is a large medical library which has many public health, health education and health promotion journals. All of the health promoters are allowed to use this service.

It was found that one of the most crucial concerns of health inspectors, was lack of incentives, motivation, support and career mobility. Wagner et al. (1991) found that participation in health promotion programmes is associated with income, education and involvement in community organisation. However, Baric (1991 p. 40) stressed that health promotion should deal with the social environment of the individuals which includes beliefs, attitudes, culture, occupation, income and the social position in the society. The author continued that health promotion which includes strengthening of social support and recognition of social forces is an important way of coping with stress.

Health promotion emerged as the most important requirement for promoting the health and prevention of disease. According to Aly (1989), achieving health for all is not just through building health centres in every location and providing high standards of medical care, but it is through health education and making essential health information available to people.

Nakajima (1992) and Lavin et al. (1992) reported the relationship between education and health and stated that education make school children self-reliant. The importance of health education to health has been supported by many authors. Examples are Brooks & Howards, (1982); Brown, et al. (1989); and Holcomb, et al. (1982).

All the participants suggested that health promotion should start in primary schools. Also Gezairy (1990) believed that health education should start at primary level. The author suggested several reason to support his suggestion. Most importantly are: a) habits start early and b) most pupils do not continue on to the secondary school. However, Mutter (1986) felt that the most crucial time at which health education is to be provided is at grade 6 to 8. The author believed that this age is critical at which social pressures from their peers and the media start. Social environment and specific behaviour are the biggest threat to health of youth (Lavin et al. 1992). Thus children at this age must be equipped with decision-making skills and increase their self-esteem. Wetton & Moon (1987 pp. 48-49) welcomed integrating health education into the whole primary school curriculum and they did not like the notion of teaching health education as a separate subject or integrating it into any one curriculum as this denies the importance and the nature of health education. Wetton & Moon (1987 p. 54)

suggested that health education should be integrated in the primary-school school curriculum as has more freedom and flexibility of time tables and not constrained by examinations or changing class-rooms thus enable teachers to put more time to health education. However, Dhillon (1992) and Lavin et al. (1992) mentioned that comprehensive school health education is the one which starts from the first grades to the final year.

### **7.3. Discussion of canteen assessment:**

Raw chicken, meat, eggs and their products are often contaminated with microbes and incriminated in food borne disease outbreaks. Information from developed countries where surveillance data are available have shown the risk of such food items. Although sampling was not done, the potential for pathogenic microbial contamination, germination and multiplication exist because of holding temperatures. Cross-contamination provides opportunities for contamination. Contamination might have occurred from (a) some workers touching foods after cooking, although spoons were used to fill sandwiches, yet bread and buns were held by hands; and (b) wiping cloths and sponges used in both raw and cooked areas. It is extremely difficult to completely eliminate contamination of foods, but it is easier to control further multiplication of pathogens and stop them from producing toxins in foods. Holding sandwiches which consist of meat, chicken, eggs, cheese after preparation for prolonged periods i.e. several hours and at temperatures of 17 to 40° C is a hazard and is unacceptable by most public health standards. Keeping potentially hazardous foods at room temperatures for several hours is the most frequent contributing factor to the

occurrence of food borne disease (Bryan, 1978; 1988; Davey, 1985; Roberts, 1982). According to Bryan et al. (1992d); Hobbs & Roberts (1993), foods that contain sufficient moisture, and often a temperature of 73.9° C will be lethal for large numbers of parasites, viruses and vegetative bacteria if the temperature is maintained for less than a minute. Bryan also mentioned that temperature greater than 54.4° C can also destroy large numbers of vegetative microbes if the temperature is maintained for several seconds. Bryan et al. (1992d) mentioned that temperature greater than 54.4° C can also kill vegetative microbes if the temperature is maintained for a sufficient duration, (e.g. a couple of hours). It is not only in Bahrain where foods were held at un-acceptable temperatures. Also, Worsfold & Griffith (1992) have found that students lunches were held at unacceptable temperatures for a prolonged period.

Sandwiches were touched by hands and wrapped manually and kept in the boxes. Similar handling conditions were found to be the primary reason for significant bacterial contamination of foods in Japanese schools (Bryan et al, 1991). Bryan (1988) indicated that staphylococcal poisoning, shigellosis, and hepatitis A are often transmitted by colonised persons touching cooked foods. Although wrapping of sandwiches will decrease contamination by dust and microbes, it will maintain humidity inside the foods thus creating a suitable environment for multiplication of microbes (Bryan et al, 1992d). Furthermore, wrapping of foods will maintain the warmth and moisture for sometimes thus allowing germination of spores and growth of vegetative cells. It will be extremely dangerous in summer when air temperature rises to above 40° C and the relative humidity goes above 80 %.

An outbreak of salmonellosis occurred in a Swedish hospital in 1981 which was probably caused by improperly stored sandwiches in which over a hundred patient and staff were affected (Charles, 1983 p.37). Sandwiches with various fillings including eggs were associated with many outbreaks of staphylococcal food poisoning (Wieneke et al, 1993). Personal hygiene during preparation practices is the basis for preventing the transmission of pathogens from food to the consumer (Cruickshank, 1990). However, it is extremely difficult to control contamination, but it is easier to control further multiplication of pathogens and stop them from producing toxins in foods.

Bryan (1992) and Bryan et al. (1992d) stated that the optimum growth temperature for food microbes could vary slightly from one micro-organism to another. For example, the optimal growth temperature for *B. cereus* is 30° C and, for *C. perfringens* is 46° C and for *Salmonella* ranges from 37° C to 43° C.

Food workers were found to be ignorant in even basic sanitary condition. This finding confirms with the previous research. For example, Ashley (1990) said that food handlers in small or large food services establishments are not sufficiently trained and have poor knowledge of hygienic food preparation and personal hygiene. Ashley also argued that premises are also not equipped with appropriate facilities require to produce safe foods and also incentives are not available to food workers to change unsafe behaviour patterns. All this evidence points to the urgent need for education of food workers. Basic understanding of bacterial growth and spread is enough at the beginning to link the food and food poisoning.

Health inspectors cannot inspect canteens. The main complaint from the teachers and students was lack of proper inspection of canteens. According to Irwin (1989), restaurants with poor inspection scores and improper temperature control of critical food items were five and ten times more likely to have outbreaks than restaurants with better inspection results.

Fakhro (1992) stated that health promotion can not be achieved unless there is a balanced distribution of wealth, accessibility of all citizens to essential social services such as housing, employment, health education and leisure.

Food poisoning has been considered as a major health problem throughout the literature (WHO, 1984; WHO, 1991e). It was found that the majority of the participants have confirmed that food poisoning is a major health problem. This also was supported by teachers. Interestingly enough, most health promoters confirmed this view, two were not in favour of it.

#### **7.4. Teaching and learning materials (TLMs):**

Most of the materials used by Bahraini students are locally produced. Bahrain still purchases a part of the needed textbooks.

Production of textbooks in the centre had many advantages according to the specialist in charge of the printing and book design section. First, materials produced locally are often relevant. Second, they meet the institutional needs and goals. Third, they are



relatively cheaper. The expenditure was reduced by 40% according to the administrator in charge. Fourth, they save a lot of time. Fifth, they overcome many mistakes that they witnessed in textbooks that were prepared by private companies. Sixth, the materials were of high quality. Last retrieval of the materials is easy because they are saved on floppy disks for future revision and updating.

It was found that simplicity, ease of reading, clarity and visual appeal were the main criteria of the evaluated textbooks. Lohr et al (1989) argued that these criteria are important to be considered when designing TLMs. The quality of a reading material is often determined by its readability (Farrell-Miller, & Gentry, 1989; Lohr et al, 1989). The textbooks were found to be attractive, have clear illustration and pictures, white pages, and aesthetically pleasing. The most interesting aspect of the textbooks was without doubt the repetition of important health issues, simplicity and use of illustration. Weinrich & Boyd (1992) stated that repetition of important materials, pictures and illustration can help explain difficult subjects and help in increasing retention. There is no doubt that these health subjects are important for children to learn about themselves, their environment and how to promote their well-being. Ease of reading, clarity and simplicity are seen to be extremely important in improving quality of TLMs (Lohr et al, 1989; Mcleod, 1991). Such TLMs for sure communicate rapidly, and reinforce understanding of the topics (Mcleod 1991; Charlton 1986). This was particularly true for the textbooks intended for primary up to the second intermediate levels. Visual diagrams according to Squires (1990) are the most powerful learning tools which aid in information retention. Graphical aids and drawings and diagrams were in colour. Mcleod (1991) stated that colour has not

shown to have any significant effect on learning but learners prefer colour for appearance and motivational reasons. Textbooks for third intermediate and secondary levels were found to be congested with information and few pictures. This is possibly normal for this level, however the print was large enough and clear.

The most striking aspects of the textbooks were without doubt the tremendous amount of health topics. According to Wetton & Moon (1987 p.55), children need to have knowledge and experiences about themselves, their body, and the environment around them to make important decisions which relate or will relate to their health.

Hull (1987 p. 121) stated that health knowledge is important aspect of health education, however their inclusion in science does not guarantee that they will cause a change. Baric (1991 p. 69) reported that there is an association between the level of education and morbidity of a population in the developing countries. The author added that the state of health of a population may be directly influenced by including certain health subjects in the curriculum.

The science textbooks are intended for those who are studying in science section. However, other students will miss health topics thus there should be some sort of balance in the curriculum course. Health topics should be distributed and some information should be included in other school settings.

In the textbooks, generally, very few rational suggestions were made to improve food safety, however, the textbooks were overwhelmed with other health topics. Typhoid

and cholera took a big share in the textbooks. Typhoid is an important disease in Bahrain however, cholera is not that serious anymore. The authors should have included more relevant infectious diseases to Bahrain.

The textbooks and other materials provided to students are important educational tools which contain empowering health topics which can therefore be utilised as a resource in a broader multi-faceted health promotion programmes. The health topics which are taught in the schools provide an excellent base line for future development of health education in schools.

It seemed difficult, in this short time, that more than what was already given to be included according to the teachers, students and parents. However, because of the limitation of time available for health education in the curriculum, Williams (1987 p. 68) suggested that only important health topics are an obvious answer. The author stated that these important topics should come from views of staff and not from a single person.

Although varied amount of health topics were noticed in the textbooks; yet health promotion should not be seen merely as the transmission of knowledge and advice about health issues. It should be inseparable from the environment, health policies and resources. Make TLMs available to all segments of the population, particularly parents, they should be aware and involved in curriculum design. Gann (1986) stated that health professionals including health promoters did not have access to many library services in the past, either, because they were not entitled to use the services or

because the materials were inappropriate to their needs. Parents according to Young (1992) felt that TLMs that deal with health education in schools are not readily available and that parents expressed interest in the idea of producing literature in health education specifically for schools.

The only problems noticed in the textbooks were some spelling errors that appeared in most of the textbooks.

However, many of the health education TLMs were found to be victim blaming. Blaming of victims according to Green et al (1980 p. 54) means that health personnel place all the responsibility for protection of health on people who their health is threatened. The authors believe that considering non-behavioural besides behavioural factors which affect health will solve the problem of blaming the victim. However, Mutter (1986) stated that we must provide youngster with the necessary knowledge, skills and supportive environment and go beyond blaming the victim.

To compliment other facilities available to the school community, the MoE has provided schools with necessary equipment to facilitate learning. For example, slide projectors, overhead projectors, microscopes, videos, televisions, computers, cameras are among the main equipment. These are additional empowering resource for students to use. Novello et al (1992) recommended that appropriate and accessible services must be available to the public.

## **CHAPTER EIGHT**

### **Chapter 8**

#### **8: Recommendations:**

##### **Overview:**

This chapter provides a health promotion framework. The findings of this research are translated into specific actions which integrate strategies suggested by the Ottawa Charter for health promotion (WHO, 1986). Only parts of the Ottawa Charter relevant to the current study and Bahrain are included in the recommendations.

Based on the Ottawa Charter, a model of health promotion intervention is suggested within which awareness, supportive environment, community participation, and health policy play a central role. The aim is to empower the community with knowledge, attitudes and resources to take control over their health and their environment. To achieve this aim, health promotion in food safety should involve the following phases:

##### **8.1. Community awareness:**

Empowerment of the community to influence public policy, to support health and to achieve health promotion goals towards food safety is required. Many different activities can be incorporated into this phase to achieve its objectives. To empower

through awareness, every group of the community should receive a different educational programme.

### **8.1.1. Professionals:**

**Provide information and training:** Providing information and continuous training to health professionals and teachers are important objectives to be achieved. There is no question about the necessity of training health workers in different fields of health. The aim of health promotion in food safety is to empower people, motivate them to improve personal and general hygiene and to create among them demand for cleaner food and a safer environment. The following points must be considered:

- Correcting the inappropriate knowledge and beliefs through health promotion and continuous education is needed. Professionals should have accurate and up-to-date food safety knowledge so that they can offer consistent and valid information to the public.
- Teachers should be further trained in health so that they are better able to defend their opinions and be in a favourable position for providing health education. Training of teachers make them credible resources which strengthen the relationship of trust, respect and commitment between them, students, parents and health officials. Training of teachers in health would help in the development of school health promotion and can increase the opportunity for empowerment and control over the health and environment.

- Social workers in Bahraini schools should be targeted. Currently, their work is limited to referring sick children to the health centre and sometimes providing simple first aid. Social workers may be trained and better informed about the health problems of children and the environment. They should be trained to recognise important health problems and make proper referrals to health facilities. They should be empowered to have better control over children's health and school environment including canteens.
- Encourage teacher/ teacher, teacher/ student and teacher/ and other staff and teacher/ parents interaction.
- Educational programmes which will be offered to different segments of the community must address the comments given by the subjects and the problems and gaps revealed by this study.

**Provide support and motivation:**

- Health promoters and teachers need support and motivation to increase their self-esteem and improve their contribution to health promotion.

### **8.1.2. Non-professionals:**

**Promote practical knowledge and skills:** The first step towards successful implementation of health promotion is awareness of the community. The following points should be considered by the authorities:

- Awareness should start in the primary schools so that all children can benefit from it and spread the information to their friends outside the schools and also to empower their families. All the community should be involved if a comprehensive school health promotion is to be implemented. Families must be supported and assisted so that they raise healthy and educated children.
- Educating of women is a vital issue and must be targeted because (a) women play the major role in food preparation at homes (b) supervise the house-maids while cooking and (c) because they take care of children during their early years.
- Empower students and parents so that they become effective lobbyists for health issues.
- Enable the community to investigate and understand their own health problems, thus empowering them to change their social environment.
- Improve the training and skills of The Bahrain Catering graduates through provision of continuous training at various intervals. Those graduates must be



motivated and given responsibilities of supervising food shops and educating food workers.

### **8.1.3. Food workers:**

The knowledge and behaviour of food workers are both extremely important factors in the prevention of foodborne illnesses.

- Huge amounts of foods are consumed by the school body everyday. The profits generated from this business should be used to: (a) improve food quality, (b) provide training for food workers, (c) provide jobs for those who complete their training in catering and (d) pay salaries and further improve standards.
- All food managers must have a basic level of competence in food hygiene and safety and must be responsible for food safety in their stores and for the training of their employees. West (1992) has suggested detailed courses for managers in food hygiene. These courses should be adapted to suit Bahrain's local needs.
- Food managers must make sure that all food workers understand and practice the highest standards of personal hygiene of food preparation and storage methods. Some books which can be used to train the community or food workers are for example: Trickett (1992a), Trickett (1992b) and Williams et al. (1990).

- Medical examination (clinical and laboratory) should not be the basis for licensing food workers. However, licensing should be done after proper training in food safety and personal hygiene and passing a simple test in food safety.
- Food workers responsible for cooking, hot holding and filling the sandwiches are the main target for educational courses. Management must make sure that they know what is exactly required to prevent contamination, survival and multiplication of microbes.

## **8.2. Community involvement and communication:**

For all members of the community to work together, it is essential that they understand each other and agree on an effective communication method which will lay the ground for further co-ordination. Schools can play an important role in bringing the groups together and mobilising resources. The following points are important to strengthen health promotion:

- Control programmes should encompass communication between health authorities, consumers and politicians; collaboration, policy development and enforcement. Thus the role of the school has to be clear to all members of the community.
- Science teachers should be encouraged to collaborate with other teachers on health related topics. Teachers must find ways, methods and the proper time to involve

parents in attending school meetings to discuss health promotion and disease prevention.

- Meetings and interaction of different groups of the community, are vital for the exchange of opinions, expertise and the raising of awareness.
- Teachers should encourage students to develop positive attitudes towards food hygiene.
- Doctors should be involved when parents and students and other groups are meeting or when health education is implemented. Also doctors in their surgeries should focus on health education and provide counselling when applicable.

The role of health professionals is to act as facilitators to help individuals and the community to participate, and protect themselves. These elements are crucial tools for community empowerment.

### **8.3. Supportive canteen environment:**

Knowledge by itself is not enough to make a significant change in the behaviour of a community; however, ensuring a supportive environment, social policies and the allocation of resources can make a change. The advantage of promoting a healthy environment is substantial for empowerment. Schools are the environment which make a major contribution to the new generation's knowledge and it is where attitudes

are formed. It should be an ideal place where a clean and safe environment is established. A clean, smooth indoor and outdoor environment should act as a model of a healthy environment. School environment cannot be separated from health promotion. To support the environment, authorities should consider the following:

- A specially designed food premise should be allocated by the MoE. This place should be provided with cooking, cooling and other storage facilities, clean water, waste disposal area, and toilets. Specially designed equipment and heavy duty cookers are important for school catering. Food should be prepared in central kitchens and transported to the schools.
- Foods must be transported cold below 6° C and re-heated before serving or can be transported hot at a temperature above 60° C. Re-heating ovens and cooling facilities are required in school canteens.
- Toilets should be equipped with hot and cold water and soap. Toilets should be allocated in a convenient place, not within nor away from the canteens.
- Canteens should be supervised by a team of health professionals, teachers, students, parents and food managers. All members of the community should contribute to the development of schools.

#### **8.4. Hazard analysis critical control points (HACCP):**

Due to the importance of HACCP in controlling foodborne illnesses and insuring quality of foods, special recommendations in HACCP are given here. This part also includes education and training.

- The data gathered from this HACCP could be used by health education officials and school administrators to promote appropriate control measures.
- The data should be used in any training or educational programmes particularly for food workers.
- HACCP must be used to ensure the safety of high-risk foods at all levels and must be introduced to the consumers and food workers to better understand it.
- The safety of foods sold in school canteens must focus on prevention of contamination, multiplication of microbes and production of toxins. Workers performing manual packaging operations must exercise great care to prevent contamination of cooked foods.
- Foods should not be prepared long in advance before consumption, and holding temperature should be maintained at over 60° C.

- Food workers with language difficulties and those with low levels of literacy should not be labelled as 'hard-to-reach' as this is dis-empowering, frustrating and discouraging community development. This preconception associated with food workers must be corrected, and they should be empowered through communication, respect of culture and caring.

#### **8.5. Health policies:**

Although food laws in Bahrain are up-to-date, food safety should be strengthened:

- Through better education and training,
- By proper utilisation of resources and
- Through effective monitoring of food establishments.
- Policy should be designed to bring together all community members in an empowering environment of caring and support.
- Rules must be clear and unambiguous. Any unnecessary details must be omitted and vague parts should be simplified so that communication of food safety become clear to all levels.
- Codes of hygienic practice for foods prepared for schools are needed. WHO Codex Alimentarius should be consulted and Bahrain's own codes should be developed concerning school foods. This code should target improving food

quality and food safety, services, facilities, staffing levels, training of staff, and communication. The following parts should be an inseparable component of the health policy:

- Authorities must provide varieties of nutritious foods at affordable prices to reduce health hazards and to prevent students from buying street-vended foods.
- Appropriate, accessible services must be available to the community. Services should include (a) thermometers with probes for health officers to use when inspecting food premises, (b) incentives, (c) in-service training and (b) TLMs for all categories of the population.
- Training of food workers should be a compulsory policy. All food workers should have training in food hygiene at the time of employment, and managers must make sure that new workers are able to read and understand the food hygiene policy of the country. The MoH should provide all managers of food services establishments with a copy of the food policy document. This document should be written in a level which is understood by slow learners and should be in different languages.
- Policy must involve curriculum, community health agencies, school canteens and outside environment. Laws should include the design of canteen environment, must address heating, cooling, other storage requirements and outdoor environment.

- Health promotion and awareness should not merely target teachers, students, parents, health promoters and food workers. However, policy and decision makers should also be targeted in health promotion and should be informed about health problems which affect people.

## **8.6. Curriculum and TLMs:**

### **8.6.1. Curriculum:**

Putting some health courses here and there in the textbooks is not enough to achieve empowerment. There should be a framework which integrates all the courses inside schools, health education outside schools, mass-media, school environment, policies and resources. They should all complement each other. Integrating health topics and skills in science courses only has some drawbacks. To make sure that all the community receive some health awareness before they finish school, food safety should be a component of school curriculum and health education programmes. The following parts are essential for empowering the community:

- Authorities have to value knowledge, behaviour, beliefs and attitudes of their clients and determine the healthy from the unhealthy and the inappropriate ones and eventually develop curriculum to help. School staff should act as facilitators within the groups.



- All the needs, comments, gaps and the critical control points identified in this research should be used in a way to create a dialogue among all the participants, and also involve mass-media. Results of the dialogue must be reflected in the health promotion programme. Curriculum development should be based on the health needs of the target group. The subjects and the planners must agree on a framework of involving those needs in the school health promotion programme. The community must work together as partners in which everybody has a part to play to achieve the goal of health promotion. Parents involvement must take into consideration parents awareness towards the aims of school health promotion. Perhaps a parent-guide would be helpful to explain the aim.
- Mass media should be used to reinforce what is being taught in the school curriculum. This cannot be achieved without active participation and strengthening communication between different sectors in the MoE, the MoH and the Ministry of Information.
- Food hygiene courses in the Hotel and Catering Institution should be evaluated and revised to keep pace with new foods and recent epidemiological findings.

#### **8.6.2. Teaching/learning materials (TLMs):**

- TLMs have to be prepared for each age group separately and must take into consideration readability, layout and content quality.

- TLMs are important resources which should be designed, revised and updated to support self-study and self empowerment.
- Management in schools, colleges, universities and the services has the responsibility to maintain quality, secure TLMs for every age group and speciality, and identify the need for training within their, and if possible within other establishments. Training of key elements cannot be introduced overnight but needs to be considered by management.
- Management is obliged to update technology and make proper use of the available resources.
- TLMs should be inseparable from health promotion to accomplish health goals and guide the community towards empowerment.
- Evaluation of TLMs in food safety is an essential component of successful planning and implementation of health promotion. This should be achieved by team work which consists of representatives of all the community groups including religious and political parties. There is a need to understand and use much of the existing TLMs.
- Clear and easy to read and relevant to the current problems TLMs should be distributed to the public. Authorities must make sure that materials reach every person and that there is no one who has difficulty to access TLMs.

- Mass media should be used which is required to be clear, simple, relevant and consistent with the overall contents of the TLMs.
- Countries must allocate ample time for training and producing TLMs and integrating them with the mass-media.
- There is, however, an even more pressing need for national co-ordination and co-operation to secure safe food, to discuss issues related to safety, education and TLMs.
- Authorities should make resources available to the community so that information spreads and skills are improved.

#### **8.7. Suggestions for future studies:**

Directions for future research on the empowerment of the community through awareness, maintenance of the environment and securing appropriate resources are examined in this section of the research. Suggestions for further studies include the following:

A similar HACCP study be repeated in the summer months when extreme environmental conditions exist. Adjacent restaurants or street food vendors should be studied using the HACCP model. The study should include food handlers to find the

best way to motivate their education and to involve them in better hygienic practices. The prices and cost of foods in such restaurants are also another important aspect especially because food prices are more powerful motivating factors for students with a low budget than hygiene.

The list of health problems reported by the subjects should then be used as a basis for a further survey to establish their interest in these problems. This would help in prioritising needs.

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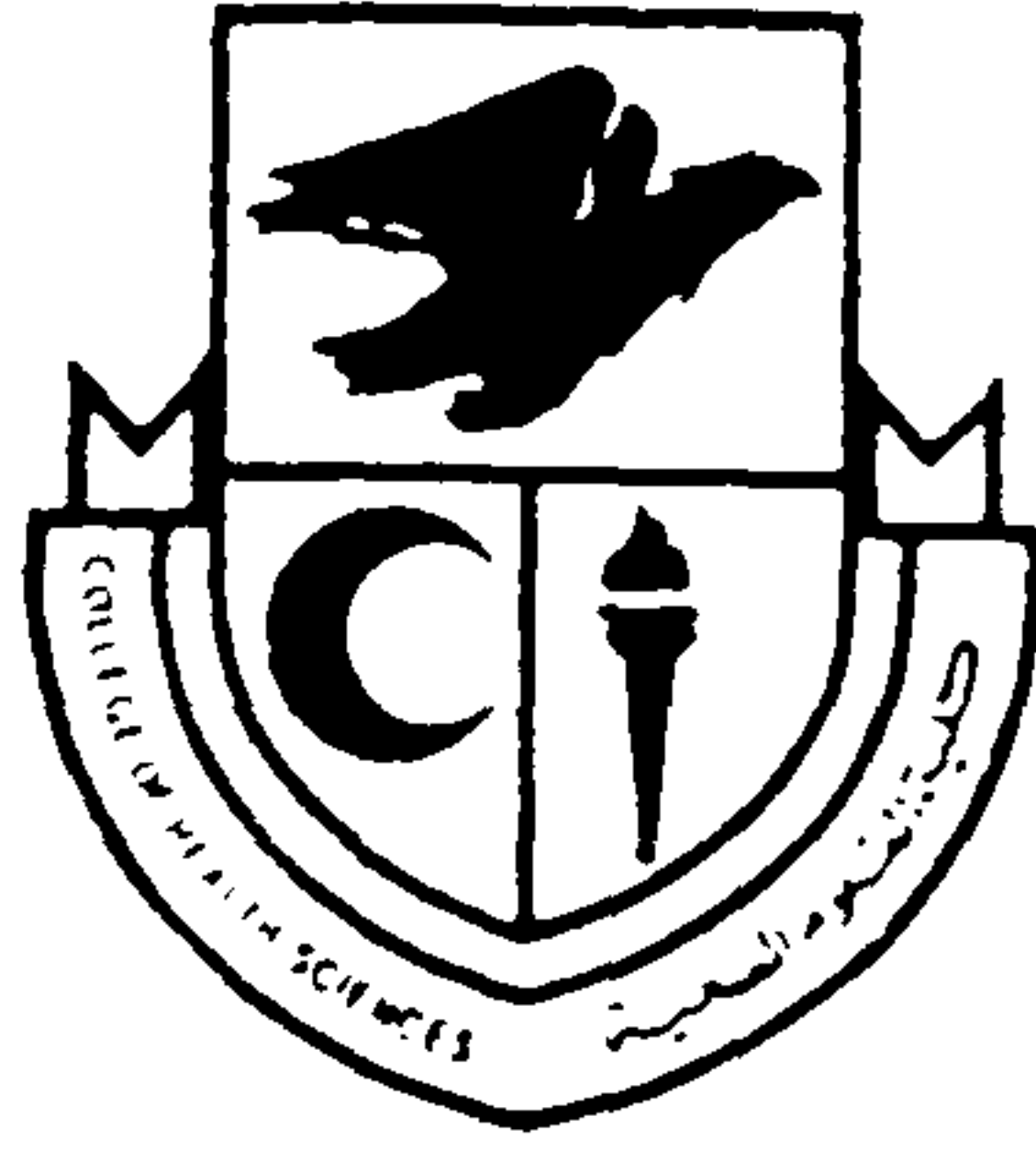
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# APPENDICES

## Appendix 1:

Teachers' questionnaire (Arabic & English).



بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

عزيزي المشارك / عزيزتي المشاركة

تحية طيبة وبعد ،،،

انني من كلية العلوم الصحية واعد لشهادة الدكتوراه في جامعي  
وورك بالمملكة المتحدة. انا الان بمدد اجراء بحث في مجال  
"التسمم الغذائي والتثقيف الصحي". لأتمام هذا البحث فقد قمت  
باعداد استبانة تحتوي على اسئلة ستساعدني على التعرف  
على مشكلته التسمم الغذائي بصورة اوضح وبالتالي العمل على  
اعداد برنامج توعويه وبيئيته تساعد في الحد من هذه المشكله.

بالاضافه الى الاستبانة فانني سوف اقوم بتقرير المتصف المدرسي،  
الكتب الدراسيه ووسائل التعليم الصادره من قبل وزاره الصحه.

ان هذه المعلومات قيمه جدا ولا يمكن الحصول عليها دون مساعدتكم.

ان اختياركم في هذا البحث تم بطريقته عشوائيه. لذلك فان  
مساهمتكم في الاجابه على هذه الاستبانة ضروريه جدا لان رايتكم  
يمثل البقيه الذين لم يتم اختيارهم. ان معظم الاسئلة تتعلق  
بالعائق، المواقف والاراء فلذلك يرجى الاجابه عليها دون الرجوع  
الى اي كتاب او مصدر اخر.

ان اجاباتكم على جميع الاسئلة ستكون سريه وكل شيء تكتبونه سيكون  
خاصا بالبحث ولا يمكن باي شكل من الاشكال مطابقتها اجاباتكم  
باسمائكم. والرجاء عدم كتابه اسمائكم على الاستبانة.

ولكم جزيل الشكر والتقدير لمساهمتم الطيبه.

عبدالله احمد عبدالله علي  
رئيس برنامج الصحه العامه

دولة البحرين  
وزارة الصحة  
كلية العلوم الصحية

استبانة حول التثقيف الصحي للحد  
من التسمم الغذائي الجرثومي  
في البحرين

الى

المدرس ، الأخصائي الاجتماعي والاداري

عبدالله أحمد عبدالله علي  
رئيس برنامج الصحة العامة  
كلية العلوم الصحية  
ص ب : ١٢  
تلفون (عمل) ٢٥٥٥٥٥ تحويل ٥٢١٢  
(منزل) ٢٢٥٦٢٢

\*\*\*الرجاء الأتصال عند وجود اي استفسار

الرجاء الاجابة على كل الأسئلة التالية . ضع دائرة حول الاختيار المناسب

- ١ . الجنس : a . ذكر . b . أنثى
- ٢ . العمر : a . أقل من ٣٠ سنة . b . من ٣٠ الى ٤٠ سنة . c . من ٤١ الى ٥٠ سنة . d . أكثر من ٥٠ سنة
- ٣ . مذهب المدرسة : a . حكومية . b . خاصة
- ٤ . المستوى التعليمي : a . دبلوما . b . بكالوريوس . c . ماجستير . d . دكتوراه

غير ما سبق: الرجاء التحديد:

- ٥ . الجنسية : a . بحريني . b . غير بحريني
- ٦ . الوظيفة : a - مدرس . b - اختصاصي اجتماعي . c - اداري
- ٧ . اذا كنت مدرسا . القسم الذي تقوم بالتدريس فيه .  
a . علمي . b . أدبي . c . ديني . d . تجاري . e . صناعي . f . أقسام أخرى -----
- ٨ . المرحلة التي تقوم بالتدريس فيها :  
a . ابتدائي . b . اعدادي . c . ثانوي

الرجاء وضع دائرة حول الرقم الذي يناسب اختيارك من بين الأعداد ( ١ - ٥ ) حيث :

- ١ = أوافق بشدة  
٢ = أوافق  
٣ = لا أعرف  
٤ = لا أوافق  
٥ = لا أوافق بشدة

٩ - يحدث التسمم الغذائي الجرثومي بشكل رئيسي للأسباب التالية :

- a - وجود الجراثيم أو سمومها في الأغذية  
١ ٢ ٣ ٤ ٥
- b - أكل أغذية مختلفة في ان واحد ( خلط )  
١ ٢ ٣ ٤ ٥
- c - المراقبة غير الجيدة للمطاعم  
١ ٢ ٣ ٤ ٥
- d - قلة التدريب الصحي للعاملين في مجال الأغذية (الطباخ ومساعديه)  
١ ٢ ٣ ٤ ٥
- e - عدم وجود شهادة فحص صحي صالحة لدى بعض العاملين في مجال الأغذية.  
١ ٢ ٣ ٤ ٥
- f - عدم اخضاع العاملين في مجال الأغذية لفحص طبي دوري  
١ ٢ ٣ ٤ ٥

- ١ = أوافق بشدة  
٢ = أوافق  
٣ = لا أعرف  
٤ = لا أوافق  
٥ = لا أوافق بشدة

- ٥ ٤ ٣ ٢ ١ -g- تمرض الأغذية للحشرات  
٥ ٤ ٣ ٢ ١ -h- سقوط الشمر في الأكل  
٥ ٤ ٣ ٢ ١ -i- المدفئة والتي لا يمكن السيطرة عليها  
٥ ٤ ٣ ٢ ١ -j- مئونة الله  
-k- مسببات أخرى. الرجاء كتابتها

١٠ - ما هو موقفك مما يلي ( من الناحية الجرثومية ) :

- ١- عادة جيدة  
٢- (وسط) ليست جيدة ولا سيئة  
٣- عادة سيئة  
٤- لا أعرف

- ٤ ٣ ٢ ١ a - طبخ الغذاء حتى يستوي جيدا .  
٤ ٣ ٢ ١ b - أكل الغذاء مباشرة بعد الطبخ وهو حار .  
٤ ٣ ٢ ١ c - تخزين الغذاء المطبوخ داخل الثلاجة لمدة يوم واحد أو أكثر .  
٤ ٣ ٢ ١ d - تسخين الغذاء المطبوخ حتى يصبح حارا قبل أكله (أي عدم أكله باردا) .  
٤ ٣ ٢ ١ e - ملامسة الغذاء المطبوخ للغذاء النيء (داخل الثلاجة أو اثناء اعداد الطعام)  
٤ ٣ ٢ ١ f - التبريد البطيء للغذاء (اللحوم ، الدجاج ، ..) (أي وضع كمية كبيرة من الغذاء في وعاء وتركه في الثلاجة ليبرد بصورة بطيئة)

١١ - الجزء الاتي يشتمل على اعتقادات و آراء . الرجاء الاجابة عليها بكل حرية .

- ٥ ٤ ٣ ٢ ١ a - التسمم الغذائي قد يحدث لأي شخص مهما كان عمره .  
٥ ٤ ٣ ٢ ١ b - الاصابه بالتسمم الغذائي يمكن السيطرة عليها  
c - الأغذية النيئة (دجاج ، لحم ، بيض) غالبا ماتكون ملوثة بالجراثيم عند شرائها .  
٥ ٤ ٣ ٢ ١ d - الأغذية النيئة تتلوث بالجراثيم خلال تداولها او عند اعدادها .

- ١ = أوافق بشدة  
٢ = أوافق  
٣ = لا أعرف  
٤ = لا أوافق  
٥ = لا أوافق بشدة

١ ٢ ٣ ٤ ٥ -e- البيض غير المطبوخ جيدا يجعلك أكثر صحة .

١ ٢ ٣ ٤ ٥ -f- شرب الحليب مباشرة من الحيوان دون غليه يجعلك أكثر صحة.

١ ٢ ٣ ٤ ٥ -g- اعطاء السوائل للطفل المصاب باسهال قد يسيء الى صحته.

١٢- الجراثيم التي تسبب التسمم الغذائي تأتي من:  
(المصدر الرئيسي للجراثيم):

١ ٢ ٣ ٤ ٥ -a- العاملين في مجال الأغذية

١ ٢ ٣ ٤ ٥ -b- الغذاء النيء (غير مطبوخ)

١ ٢ ٣ ٤ ٥ -c- الغذاء المطبوخ

١ ٢ ٣ ٤ ٥ -d- البيئة المحيطة

-e- مصادر أخرى الرجاء ذكرها :

١٣ - يمكن السيطرة على التسمم الغذائي باستخدام مايلي :

١ ٢ ٣ ٤ ٥ -a- زيادة التفتيش الصحي المفاجيء للمطاعم

١ ٢ ٣ ٤ ٥ -b- تطبيق قوانين ولوائح صحية على المطاعم.

١ ٢ ٣ ٤ ٥ -c- فرض المتوبة على عاملي الأغذية

١ ٢ ٣ ٤ ٥ -d- اغلاق المطاعم التي يحدث فيها التسمم.

١ ٢ ٣ ٤ ٥ -e- تثقيف عاملي الأغذية في مجال صحة الأظمية.

١ ٢ ٣ ٤ ٥ -f- تثقيف المجتمع في مجال صحة الأظمية.

-g- طرق أخرى : الرجاء تحديدها :

١٤ - السيطرة على حالات التسمم الغذائي يمكن ان تكون اكثر فاعلية اذا تم مشاركة مايلي :

١ ٢ ٣ ٤ ٥ -a- المدرس

١ ٢ ٣ ٤ ٥ -b- الطبيب

١ ٢ ٣ ٤ ٥ -c- المثقف الصحي

١ = أوافق بشدة  
 ٢ = أوافق  
 ٣ = لا أعرف  
 ٤ = لا أوافق  
 ٥ = لا أوافق بشدة

5	٥	٤	٣	٢	١	-d الطلبة
6	٥	٤	٣	٢	١	-e الالباء
						-f اخرين . الرجاء تعديدهم :
7	٥	٤	٣	٢	١	١٥ - في الوقت العالي يوجد أخصائي تثقيف صحي في المدرسه.
3	٥	٤	٣	٢	١	١٦ - لا حاجة لمدرس متخصص في التثقيف الصحي في المدرسة.
3	٥	٤	٣	٢	١	١٧ - أنا مؤهل للقيام بعملية التثقيف الصحي .
						١٨ - التدريب في التثقيف الصحي لي :
١	٥	٤	٣	٢	١	a - موجود
١	٥	٤	٣	٢	١	b - كاف
١	٥	٤	٣	٢	١	c - ملائم لا احتياجي
						d - أشياء أخرى . الرجاء ذكرها :
						١٩ - في الوقت العالي يتم مشاركتي في القرارات المتعلقة بالتثقيف الصحي في المدرسة.
	٥	٤	٣	٢	١	
	٥	٤	٣	٢	١	٢٠ - أنا احب أن اشارك في القرارات المتعلقة بالتثقيف الصحي في المدرسة.
	٥	٤	٣	٢	١	٢١ - من الممتحن مشاركة الطلبة في تخطيط عملية التثقيف الصحي.
	٥	٤	٣	٢	١	٢٢ - من الأفضل ان يقوم المدرس وليس الطالب بتخطيط عملية التثقيف الصحي.
	٥	٤	٣	٢	١	٢٣ - من الممتحن مشاركة الالباء في عملية تخطيط التثقيف الصحي في المدارس.
	٥	٤	٣	٢	١	٢٤ - في الوقت العالي هناك تنسيق جيد بين هذه المدرسة والمؤسسات الأخرى في مجال التثقيف الصحي .



٢٥ - الرجاء كتابة المشاكل الصحية التي تمتد بضرورة  
ادخالها ضمن برامج التثقيف الصحي في المدارس.

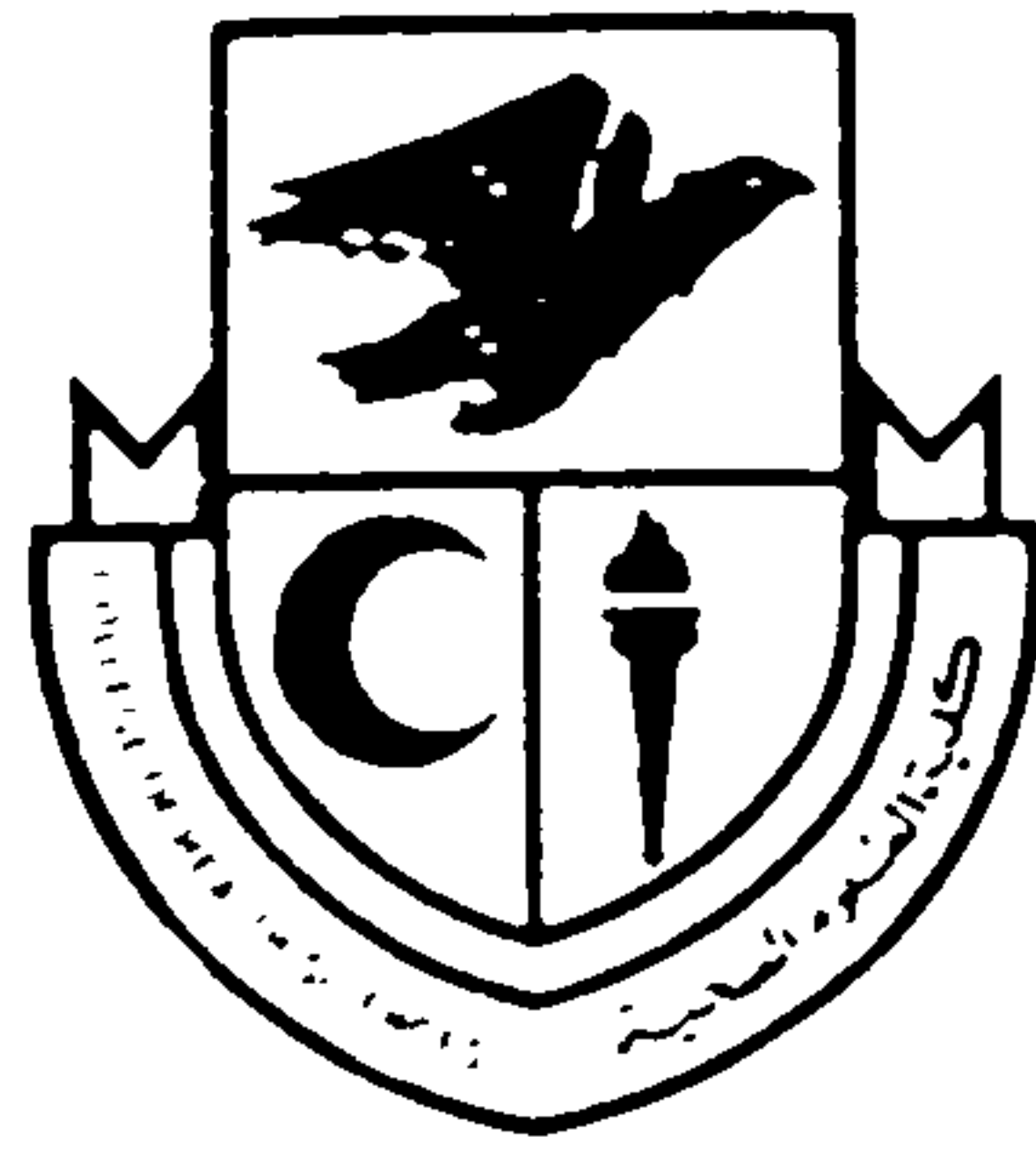
٢٦ - الرجاء ذكر المشاكل التي قد تميق ادخال التثقيف الصحي في  
المدارس .

٢٧ - هل هناك أي اقتراح أو استفسار تود أن تذكره فيما  
يتعلق بالتثقيف الصحي ، التسمم الغذائي أو أي شيء آخر .

\*\*\*\*\*

أشكركم على مشاركتكم لنا في هذا البحث الذي نأمل بأن يعود  
بالنفع على الجميع .

عبدالله أحمد عبدالله علي  
رئيس برنامج الصحة العامة  
كلية العلوم الصحية  
ص . ب : ١٢  
لأستفسار يرجى الاتصال على  
تلفون (عمل) ٢٥٥٥٥٥ تحويل ٥٢١٢  
تلفون (منزل) ٢٢٥٦٢٢



Dear Participants,

Good morning, I am from the College of Health Sciences and reading for my PhD in the University of Warwick in the United Kingdom. I am conducting a research on food poisoning and health promotion. In this research, I have included several questions which will help me evaluate food poisoning and health promotion. The research will also include assessment of school canteen, evaluation of school as well as health education teaching/learning materials. I intend to form a database which would help us plan better health promotion programs for our community. The information needed is valuable and can't be achieved without your contribution. You have been selected by a scientific sampling method., thus your response to this questionnaire is very important as you represent others who haven't been selected. Most of the questions are about facts, opinions and attitudes. It will be not necessary to refer to your records for any of the questions. Just use your memory as best as you can and mark what you think best. EVERYTHING YOU WRITE WILL BE STRICTLY CONFIDENTIAL.

Please answer all the questions in the handout.

Thank you very much for your contribution

Abdulla Ahmed Ali  
Head, Public Health Program.

Ministry of Health  
College of Health Sciences

Questionnaire on Health Promotion To Control  
Microbial Food borne Hazards in Bahrain

(To The Teachers, Social Workers and Administrators)

Abdulla Ahmad Ali  
Head, Public Health Program  
Tel. 255555 ext. 5212 (Work)  
335622 (Home)

\*\*\* Please call if You have any inquiries



It is your attitude towards the following. The rating  
 in this part differs slightly from the previous ones, where:

1. Good practice
2. Neutral (neither good/nor bad)
3. Bad practice
4. Don't know

cooking food until it is well done.	1	2	3	4	019
eating cooked food immediately/while hot. (i.e. not waiting long to become cold)	1	2	3	4	020
storing cooked foods in refrigerators overnight or longer.	1	2	3	4	021
re-heat pre-cooked food until it is very hot before eating.	1	2	3	4	022
raw food comes in contact with cooked food. during preparation or in the refrigerator.	1	2	3	4	023
storing large quantities of food in a deep pan in the freezer or in the refrigerator.	1	2	3	4	024

The following part consists of some beliefs and opinions:

- 1= Strongly Agree
- 2= Agree
- 3= Don't Know
- 4= Disagree
- 5= Strongly Disagree

poisoning can occur at any age.	1	2	3	4	5	025
poisoning incidents can be reduced	1	2	3	4	5	026
foods (chicken, meat, eggs) are contaminated when they are bought	1	2	3	4	5	027
foods become contaminated during processing (cooking, cutting, slicing, etc.)	1	2	3	4	5	028
partially cooked eggs make you healthier.	1	2	3	4	5	029
raw/un-boiled, milk taken directly from the animal, makes you healthier.	1	2	3	4	5	030
giving liquids to a child suffering from diarrhoea will worsen his health conditions.	1	2	3	4	5	031

Microbes which cause food poisoning come from:  
 (the source of microbes)

food handlers	1	2	3	4	5	032
raw food	1	2	3	4	5	033
cooked food	1	2	3	4	5	034
environment	1	2	3	4	5	035

If others, please specify:

- 1= Strongly Agree
- 2= Agree
- 3= Don't Know
- 4= Disagree
- 5= Strongly Disagree

---

Following are some suggested methods for control of food poisoning.

Reduction of food poisoning can be achieved only through:

Increased 'surprise inspection' of restaurants and other food premises	1	2	3	4	5	036
Enforcement of laws and regulations.	1	2	3	4	5	037
Removal of food handlers.	1	2	3	4	5	038
Closing down of places where food poisoning had occurred.	1	2	3	4	5	039
Educating food handlers in food hygiene.	1	2	3	4	5	040
Educating the community in food hygiene.	1	2	3	4	5	041
If others, please specify,						

Control of food poisoning can become more effective if the following are involved:

Teachers.	1	2	3	4	5	042
Doctors.	1	2	3	4	5	043
Health educators.	1	2	3	4	5	044
Students.	1	2	3	4	5	045
Parents.	1	2	3	4	5	046
If others, please specify:						

---

There is a specialist health education teacher in your school.	1	2	3	4	5	047
There is no need for a health education specialist in the school.	1	2	3	4	5	048
Some are trained to carry out health education.	1	2	3	4	5	049

1= Strongly Agree  
 2= Agree  
 3= Don't Know  
 4= Disagree  
 5= Strongly Disagree

Health education training for me are

available.	1	2	3	4	5	050
adequate.	1	2	3	4	5	051
relevant to my needs.	1	2	3	4	5	052
If others, Please specify:						

Currently, I am involved in decisions related to health education at school.	1	2	3	4	5	053
--	---	---	---	---	---	-----

I would like to be involved in decisions related to health education at school.	1	2	3	4	5	054
---	---	---	---	---	---	-----

Parents should be involved in the planning of health education.	1	2	3	4	5	055
---	---	---	---	---	---	-----

It would be better if teachers, and not students, plan health education activities.	1	2	3	4	5	056
---	---	---	---	---	---	-----

It would be better if parents are involved in the planning of health education in schools.	1	2	3	4	5	057
--	---	---	---	---	---	-----

There is good cooperation between schools and other institutions in areas of health education.	1	2	3	4	5	058
--	---	---	---	---	---	-----

---

Please list the health problems that you believe should be included in health education programs in schools.

Please list the problems which might inhibit health education in schools.

Do you have any further comments which you wish to make regarding health education, food poisoning or any other issue?

Thank you for your participation in our research.

Abdulla A. Ali  
 School of Postgraduate Medical Education  
 University of Warwick  
 Coventry CV4 7AL  
 United Kingdom

## Appendix 2:

Students' questionnaire (Arabic & English).



دولة البحرين  
وزارة الصحة  
كلية العلوم الصحية

استبانة حول التثقيف الصحي للحد من  
التسمم الغذائي الجرثومي  
في البحرين

الى

الطلبة/ الطالبات

عبدالله أحمد عبدالله علي  
رئيس برنامج الصحة العامة  
كلية العلوم الصحية  
س . ب : ١٢  
تلفون (عمل) ٢٥٥٥٥٥ تحويل ٥٢١٢  
(منزل) ٢٢٥٦٢٢

\*\*\*الرجاء الأتصال عند وجود اي استفسار

الطلبه/الطالبات

الرجاء الاجابة على مايلي : ( ضع دائرة حول الاختيار المناسب)

1	الجنس	a - ذكر	b - أنثى
2	المدرسة	a - حكومية	b - خاصة
3	القسم	a - علمي	b - أدبي
		c - ديني	d - تجاري
		e - صناعي	f - أقسام أخرى، اذكر :

الرجاء وضع دائرة حول الرقم الذي يناسب اختيارك من بين الأعداد ( ١ - ٥ ) حيث :

- ١ = أوافق بشدة  
 ٢ = أوافق  
 ٣ = لا أعرف  
 ٤ = لا أوافق  
 ٥ = لا أوافق بشدة

٤- يحدث التسمم الغذائي الجرثومي بشكل رئيسي للأسباب التالية :

4	a- وجود الجراثيم أو سمومها في الأغذية	١	٢	٣	٤	٥
5	b- أكل أغذية مختلفة في ان واحد ( خلط )	١	٢	٣	٤	٥
5	c- المراقبة غير الجيدة للمطاعم	١	٢	٣	٤	٥
7	d- قلة التدريب الصحي للماملين في مجال الأغذية (الطباخ ومساعديه)	١	٢	٣	٤	٥
3	e- عدم وجود شهادة فحص صحي صالحه لدى ممسك الماملين في مجال الأغذية.	١	٢	٣	٤	٥
٥	f- عدم اخضاع الماملين في مجال الأغذية لفحص طبي دوري	١	٢	٣	٤	٥
٥	g- تعرض الأغذية للحشرات	١	٢	٣	٤	٥
٥	h- سقوط الشعر في الأكل	١	٢	٣	٤	٥
٥	i- المدفئة والتي لا يمكن السيطرة عليها	١	٢	٣	٤	٥
٥	j- مئنة الله	١	٢	٣	٤	٥
	k- مسببات اخرى. الرجاء كتابتها					

٥- ما هو موقفك مما يلي ( من الناحية الجرثومية ) :

- ١- عادة جيدة  
٢- (وسط) ليست جيدة ولا سيئة  
٣- عادة سيئة  
٤- لا أعرف

- a- طبخ الغذاء حتى يستوي جيدا .  
١ ٢ ٢ ٤
- b- أكل الغذاء مباشرة بعد الطبخ وهو حار .  
١ ٢ ٢ ٤
- c- تخزين الغذاء المطبوخ داخل الثلاجة لمدة يوم واحد أو أكثر .  
١ ٢ ٢ ٤
- d- تسخين الغذاء المطبوخ حتى يصبح حارا قبل أكله (أي عدم أكله باردا) .  
١ ٢ ٢ ٤
- e- ملامسة الغذاء المطبوخ للغذاء النيء . (داخل الثلاجة أو أثناء اعداد الطعام)  
١ ٢ ٢ ٤
- f- التبريد البطيء للغذاء ( اللحم ، الدجاج ، .. ) (أي وضع كمية كبيرة من الغذاء في وعاء وتركه في الثلاجة ليبرد بصورة بطيئة)  
١ ٢ ٢ ٤

٦- الجزء الاتي يشتمل على اعتقادات و آراء . الرجاء الاجابة عليها بكل حرية .

- ١ = اوافق بشدة  
٢ = اوافق  
٣ = لا أعرف  
٤ = لا اوافق  
٥ = لا اوافق بشدة

- a- التسمم الغذائي قد يحدث لأي شخص مهما كان عمره .  
١ ٢ ٢ ٤ ٥
- b- الاصابة بالتسمم الغذائي يمكن السيطرة عليها  
١ ٢ ٢ ٤ ٥
- c- الأغذية النيئة (دجاج ، لحم ، بيض) غالبا ماتكون ملوثة بالجراثيم عند شرائها .  
١ ٢ ٢ ٤ ٥
- d- الأغذية النيئة تتلوث بالجراثيم خلال تداولها او عند اعدادها .  
١ ٢ ٢ ٤ ٥
- e- البيض غيرالمطبوخ جيدا يجعلك أكثر صحة .  
١ ٢ ٢ ٤ ٥
- f- شرب الحليب مباشرة من الحيوان دون غليه يجعلك أكثر صحة .  
١ ٢ ٢ ٤ ٥
- g- اعطاء السوائل للطفل المصاب بالسعال قد يسيء الى صحته .  
١ ٢ ٢ ٤ ٥

- ١ = أوافق بشدة  
٢ = أوافق  
٣ = لا أعرف  
٤ = لا أوافق  
٥ = لا أوافق بشدة

٧- الجراثيم التي تسبب التسمم الغذائي تأتي من:  
(المصدر الرئيسي للجراثيم):

1	٥	٤	٣	٢	١	a - الماملين في مجال الأغذية
2	٥	٤	٣	٢	١	b - الغذاء النيء (غير مطبوخ)
3	٥	٤	٣	٢	١	c - الغذاء المطبوخ
4	٥	٤	٣	٢	١	d - البيئة المحيطة
						e - مصادر أخرى الرجاء ذكرها :

٨- يمكن السيطرة على التسمم الغذائي باستخدام مايلي :

1	٥	٤	٣	٢	١	a - زيادة التفتيش الصحى المفاجيء للمطاعم
2	٥	٤	٣	٢	١	b - تطبيق قوانين ولوائح صحية على المطاعم.
3	٥	٤	٣	٢	١	c - فرض المقوبة على عاملي الأغذية
4	٥	٤	٣	٢	١	d - اغلاق المطاعم التي يحدث فيها التسمم.
5	٥	٤	٣	٢	١	e - تثقيف عاملي الأغذية في مجال صحة الأظعمة.
6	٥	٤	٣	٢	١	f - تثقيف المجتمع في مجال صحة الأظعمة.
						g - طرق أخرى : الرجاء تحديدها :

٩- السيطرة على حالات التسمم الغذائي يمكن ان تكون اكثر فاعلية اذا تم مشاركة مايلي :

7	٥	٤	٣	٢	١	a - المدرس
8	٥	٤	٣	٢	١	b - الطبيب
9	٥	٤	٣	٢	١	c - المثقف الصحى
0	٥	٤	٣	٢	١	d - الطلبة
1	٥	٤	٣	٢	١	e - الالباء
						f - اخرين . الرجاء تحديدهم :

- ١ = أوافق بشدة  
 ٢ = أوافق  
 ٣ = لا أعرف  
 ٤ = لا أوافق  
 ٥ = لا أوافق بشدة

2	٥	٤	٣	٢	١	١٠- في الوقت الحالي يوجد أخصائي تثقيف صحي في المدرسة.
3	٥	٤	٣	٢	١	١١- لا حاجة لمدرس متخصص في التثقيف الصحي في المدرسة.
4	٥	٤	٣	٢	١	١٢- أنا مؤهل للقيام بعملية التثقيف الصحي .
5	٥	٤	٣	٢	١	١٣- التدريب في التثقيف الصحي لي : a- موجود b- كاف c- ملائم لا احتياجي d- أشياء أخرى . الرجاء ذكرها :
148	٥	٤	٣	٢	١	١٤- في الوقت الحالي يتم مشاركتي في القرارات المتعلقة بالتثقيف الصحي في المدرسة.
149	٥	٤	٣	٢	١	١٥- أنا أحب أن اشارك في القرارات المتعلقة بالتثقيف الصحي في المدرسة.
150	٥	٤	٣	٢	١	١٦- من المستحسن مشاركة الطلبة في تخطيط عملية التثقيف الصحي.
151	٥	٤	٣	٢	١	١٧- من الأفضل ان يقوم المدرس وليس الطالب بتخطيط عملية التثقيف الصحي.
152	٥	٤	٣	٢	١	١٨- من المستحسن مشاركة الاباء في عملية تخطيط التثقيف الصحي في المدارس.
053	٥	٤	٣	٢	١	١٩- في الوقت الحالي هناك تنسيق جيد بين هذه المدرسة والمؤسسات الأخرى في مجال التثقيف الصحي .

٢٠- الرجاء كتابة المشاكل الصحية التي تمتد بضرورة ادخالها ضمن برامج التثقيف الصحي في المدارس.

٢١- الرجاء ذكر المشاكل التي قد تعمق ادخال التثقيف الصحي  
في المدارس .

٢٢- هل هناك أي اقتراح أو استفسار تود أن تذكره فيما  
يتعلق بالتثقيف الصحي ، التسمم الغذائي أو أي شيء آخر .

\*\*\*\*\*

أشكركم على مشاركتكم لنا في هذا البحث الذي نأمل بأن يعود  
بالنفع على الجميع .

عبدالله أحمد عبدالله علي  
رئيس برنامج الصحة العامة  
كلية العلوم الصحية  
س . ب : ١٢  
للاستفسار يرجى الاتصال على  
تلفون (عمل) ٢٥٥٥٥٥ تحويل ٥٢١٢  
تلفون (منزل) ٢٢٥٦٢٢

Ministry of Health  
College of Health Sciences

Questionnaire on Health Promotion To Control  
Microbial Food borne Hazards In Bahrain

(To The Students)

Abdulla Ahmad Ali  
Head, Public Health Program  
Tel. 255555 ext. 5212 (Work)  
335622 (Home)

\*\*\* Please call if You have any inquires





It is your attitude towards the following. The rating scale in this part differs slightly from the previous ones, where:

1. Good practice
2. Neutral (neither good/nor bad)
3. Bad practice
4. Don't know

cooking food until it is well done.	1	2	3	4	014
eating cooked food immediately/while hot. (i.e. not waiting long to become cold)	1	2	3	4	015
storing cooked foods in refrigerators overnight or longer.	1	2	3	4	016
re-heat pre-cooked food until it is very hot before eating.	1	2	3	4	017
raw food comes in contact with cooked food. during preparation or in the refrigerator.	1	2	3	4	018
storing large quantities of food in a deep pan in the freezer or in the refrigerator.	1	2	3	4	019

The following part consists of some beliefs and opinions:

- 1= Strongly Agree
- 2= Agree
- 3= Don't Know
- 4= Disagree
- 5= Strongly Disagree

Food poisoning can occur at any age.	1	2	3	4	5	020
Food poisoning incidents can be reduced	1	2	3	4	5	021
Raw foods (chicken, meat, eggs) are often contaminated when they are bought	1	2	3	4	5	022
Raw foods become contaminated during processing (cooking, cutting, slicing, etc.)	1	2	3	4	5	023
Partially cooked eggs make you healthier.	1	2	3	4	5	024
Raw/un-boiled, milk taken directly from the animal, makes you healthier.	1	2	3	4	5	025
Feeding liquids to a child suffering from diarrhoea will worsen his health conditions.	1	2	3	4	5	026

Microbes which cause food poisoning come from:  
(the source of microbes)

1. food handlers	1	2	3	4	5	027
2. raw food	1	2	3	4	5	028
3. cooked food	1	2	3	4	5	029
4. environment	1	2	3	4	5	030
5. If others, please specify:						

1= Strongly Agree  
 2= Agree  
 3= Don't Know  
 4= Disagree  
 5= Strongly Disagree

Following are some suggested methods for control  
 of food poisoning.

Reduction of food poisoning can be achieved  
 mainly through:

Increased 'surprise inspection' of restaurants and other food premises	1	2	3	4	5	031
enforcement of laws and regulations.	1	2	3	4	5	032
punishing of food handlers.	1	2	3	4	5	033
closing down of places where food poisoning had occurred.	1	2	3	4	5	034
educating food handlers in food hygiene.	1	2	3	4	5	035
educating the community in food hygiene.	1	2	3	4	5	036
If others, please specify,						

Control of food poisoning can become more  
 effective if the following are involved:

teachers.	1	2	3	4	5	037
doctors.	1	2	3	4	5	038
health educators.	1	2	3	4	5	039
students.	1	2	3	4	5	040
parents.	1	2	3	4	5	041
If others, please specify:						

There is a specialist health education teacher in my school.	1	2	3	4	5	042
There is no need for a health education specialist in the school.	1	2	3	4	5	043
I am trained to carry out health education.	1	2	3	4	5	044

1= Strongly Agree  
 2= Agree  
 3= Don't Know  
 4= Disagree  
 5= Strongly Disagree

health education training for me are available.	1	2	3	4	5	045
adequate.	1	2	3	4	5	046
relevant to my needs.	1	2	3	4	5	047
If others, Please specify:						
Currently, I am involved in decisions related to health education at school.	1	2	3	4	5	048
I would like to be involved in decisions related to health education at school.	1	2	3	4	5	049
Students should be involved in the planning of health education.	1	2	3	4	5	050
It would be better if teachers, and not students, plan health education activities .	1	2	3	4	5	051
It would be better if parents are involved in the planning of health education in schools.	1	2	3	4	5	052
There is good cooperation between schools and other institutions in areas of health education.	1	2	3	4	5	053

---

Please list the health problems that you believe should be included in health education programs in schools.

Please list the problems which might inhibit health education in schools.

Do you have any further comments which you wish to make regarding health education, food poisoning or any other issue?

Thank you for your participation in our research.

Abdulla A. Ali  
 School of Postgraduate Medical Education  
 University of Warwick  
 Coventry CV4 7AL  
 United Kingdom

## Appendix 3:

Parents' questionnaire (Arabic & English).

دولة البحرين  
وزارة الصحة  
كلية العلوم الصحية

استبانة حول التثقيف الصحي للحد من  
التسمم الغذائي الجرثومي  
في البحرين

الى

أولياء الأمور

عبدالله أحمد عبدالله علي  
رئيس برنامج الصحة العامة  
كلية العلوم الصحية  
ص . ب : ١٢  
تلفون (عمل) ٢٥٥٥٥٥ تحويل ٥٢١٢  
(منزل) ٢٢٥٦٢٢

\*\*\*الرجاء الأتصال عند وجود أي استفسار



٦- ما هو موقفك مما يلي ( من الناحية الجرثومية) :

- ١- عادة جيدة  
٢- (وسط) ليست جيدة ولا سيئة  
٣- عادة سيئة  
٤- لا أعرف

4	٤	٢	٢	١	a- طبخ الغذاء حتى يستوي جيدا .
5	٤	٢	٢	١	b- أكل الغذاء مباشرة بمد الطبخ وهو حار .
6	٤	٢	٢	١	c- تخزين الغذاء المطبوخ داخل الثلاجة لمدة يوم واحد أو أكثر .
7	٤	٢	٢	١	d- تسخين الغذاء المطبوخ حتى يصبح حارا قبل أكله (أي عدم أكله باردا) .
8	٤	٢	٢	١	e- ملامسة الغذاء المطبوخ للغذاء النيء . (داخل الثلاجة أو اثناء اعداد الطعام)
9	٤	٢	٢	١	f- التبريد البطيء للغذاء (اللحوم ، الدجاج ، ..) (أي وضع كمية كبيرة من الغذاء في وعاء وتركه في الثلاجة ليبرد بصورة بطيئة)

- ١ = أوافق بشدة  
٢ = أوافق  
٣ = لا أعرف  
٤ = لا أوافق  
٥ = لا أوافق بشدة

٧- الجزء الاتي يشمل على اعتقادات و آراء . الرجاء الاجابة عليها بكل حرية .

0	٥	٤	٢	٢	١	a- التسمم الغذائي قد يحدث لأي شخص مهما كان عمره .
1	٥	٤	٢	٢	١	b- الاصابه بالتسمم الغذائي يمكن السيطرة عليها
2	٥	٤	٢	٢	١	c- الأغذية النيئة (دجاج ، لحم ، بيض) غالبا ماتكون ملوثة بالجراثيم عند شرائها .
3	٥	٤	٢	٢	١	d- الأغذية النيئة تتلوث بالجراثيم خلال تداولها او عند اعدادها .
4	٥	٤	٢	٢	١	e- البيض غيرالمطبوخ جيدا يجعلك أكثر صحة .
5	٥	٤	٢	٢	١	f- شرب الحليب مباشرة من الحيوان دون غليه يجعلك أكثر صحة .
6	٥	٤	٢	٢	١	g- اعطاء السوائل للطفل المصاب باسهال قد يسيء الى صحته .

- ١ = أوافق بشدة  
 ٢ = أوافق  
 ٣ = لا أعرف  
 ٤ = لا أوافق  
 ٥ = لا أوافق بشدة

٨- الجراثيم التي تسبب التسمم الغذائي تأتي من:  
 (المصدر الرئيسي للجراثيم):

١٧	٥	٤	٣	٢	١	a- العاملين في مجال الأغذية
١٨	٥	٤	٣	٢	١	b- الغذاء النيء (غير مطبوخ)
١٩	٥	٤	٣	٢	١	c- الغذاء المطبوخ
٢٠	٥	٤	٣	٢	١	d- البيئة المحيطة
						e- مصادر أخرى الرجاء ذكرها :

٩- يمكن السيطرة على التسمم الغذائي باستخدام مايلي :

١١	٥	٤	٣	٢	١	a- زيادة التفتيش الصحي للمطاعم
١٢	٥	٤	٣	٢	١	b- تطبيق قوانين ولوائح صحية على المطاعم.
١٣	٥	٤	٣	٢	١	c- فرض العقوبة على عملي الأغذية
١٤	٥	٤	٣	٢	١	d- اغلاق المطاعم التي يحدث فيها التسمم.
١٥	٥	٤	٣	٢	١	e- تثقيف عملي الأغذية في مجال صحة الأطفمة.
١٦	٥	٤	٣	٢	١	f- تثقيف المجتمع في مجال صحة الأطفمة.
						g- طرق أخرى : الرجاء تحديدها :

١٠- السيطرة على حالات التسمم الغذائي يمكن ان تكون اكثر فاعلية اذا تم مشاركة مايلي :

٣٧	٥	٤	٣	٢	١	a- المدرس
٣٨	٥	٤	٣	٢	١	b- الطبيب
٣٩	٥	٤	٣	٢	١	c- المثقف المحي
٤٠	٥	٤	٣	٢	١	d- الطلبة
٤١	٥	٤	٣	٢	١	e- الالباء
						f- احريين . الرجاء تحديدهم :



- ١ = أوافق بشدة  
٢ = أوافق  
٣ = لا أعرف  
٤ = لا أوافق  
٥ = لا أوافق بشدة

- ١١- في الوقت الحالي يتم مشاركتي في القرارات المتعلقة بالثقيف الصحي في المدارس.  
042 ٥ ٤ ٢ ٢ ١
- ١٢- أنا أحب أن اشارك في القرارات المتعلقة بالثقيف الصحي في المدارس.  
043 ٥ ٤ ٢ ٢ ١
- ١٣- من المستحسن مشاركة الطلبة في تخطيط عملية الثقيف الصحي.  
044 ٥ ٤ ٢ ٢ ١
- ١٤- من الأفضل ان يقوم المدرس وليس الطالب بتخطيط عملية الثقيف الصحي.  
045 ٥ ٤ ٢ ٢ ١
- ١٥- من المستحسن مشاركة الاباء في عملية تخطيط الثقيف الصحي في المدارس.  
046 ٥ ٤ ٢ ٢ ١

١٦- الرجاء كتابة المشاكل الصحية التي تمتد بضرورة ادخالها ضمن برامج الثقيف الصحي في المدارس.

١٧- الرجاء ذكر المشاكل التي قد تعمق ادخال الثقيف الصحي في المدارس .

١٨- هل هناك أي اقتراح أو استفسار تود أن تذكره فيما يتعلق بالثقيف الصحي ، التسمم الغذائي أو أي شيء اخر .

\*\*\*\*\*

أشركم على مشاركتكم لنا في هذا البحث الذي نأمل بأن يموذ بالنتج على الجميع .

عبدالله أحمد عبدالله علي  
رئيس برنامج الصحة العامة  
كلية العلوم الصحية  
س . ب : ١٢

للاستفسار يرجى الاتصال على  
تلفون (عمل) ٢٥٥٥٥٥ تحويل ٥٢١٢  
تلفون (منزل) ٢٢٥٦٢٢

Questionnaire on Health Promotion To Control  
Microbial Food borne Hazards In Bahrain

(To The Parents)

Abdulla Ahmad Ali  
Head, Public Health Program  
Tel. 255555 ext. 5212 (Work)  
335622 (Home)

\*\*\* Please call if You have any inquiries

Answer all the questions in this handout:

This questionnaire is completed by:

a. Father    b. Mother    c. Both 001

Nationality: a. Bahraini    b. Non-Bahraini 002

Level of education:

a. Intermediate    b. Secondary    c. Diploma    d. University 003

Occupation. Please specify:

CIRCLE the appropriate number (1 to 5) that most closely describes your level of agreement with the statements.

- 1= Strongly Agree
- 2= Agree
- 3= Don't Know
- 4= Disagree
- 5= Strongly Disagree

Food poisoning occurs because of						
the presence of microbes or their						
poisons in foods.	1	2	3	4	5	004
people eat different foods at						
the same time (mixing)	1	2	3	4	5	005
improper supervision of the canteen	1	2	3	4	5	006
inadequate training of food handlers in						
food hygiene.	1	2	3	4	5	007
food handlers don't carry valid						
health certificates.	1	2	3	4	5	008
food handlers are not periodically						
examined by health authorities.	1	2	3	4	5	009
insects sitting on foods.	1	2	3	4	5	010
hair falling into food.	1	2	3	4	5	011
factors, which cannot be controlled.	1	2	3	4	5	012
the will of God.	1	2	3	4	5	013
If others, please specify:						

It is your attitude towards the following. The rating scale in this part differs slightly from the previous ones, where:

1. Good practice
2. Neutral (neither good/nor bad)
3. Bad practice
4. Don't know

. cooking food until it is well done.	1	2	3	4	014
. eating cooked food immediately/while hot. (i.e. not waiting long to become cold)	1	2	3	4	015
. storing cooked foods in refrigerators overnight or longer.	1	2	3	4	016
. re-heat pre-cooked food until it is very hot before eating.	1	2	3	4	017
. raw food comes in contact with cooked food. during preparation or in the refrigerator.	1	2	3	4	018
. storing large quantities of food in a deep pan in the freezer or in the refrigerator.	1	2	3	4	019

The following part consists of some beliefs and opinions:

- 1= Strongly Agree
- 2= Agree
- 3= Don't Know
- 4= Disagree
- 5= Strongly Disagree

Food poisoning can occur at any age.	1	2	3	4	5	020
Food poisoning incidents can be reduced	1	2	3	4	5	021
Raw foods (chicken, meat, eggs) are often contaminated when they are bought	1	2	3	4	5	022
Raw foods become contaminated during processing (cooking, cutting, slicing, etc.)	1	2	3	4	5	023
Partially cooked eggs make you healthier.	1	2	3	4	5	024
Fresh/un-boiled, milk taken directly from the animal, makes you healthier.	1	2	3	4	5	025
Feeding liquids to a child suffering from diarrhoea will worsen his health conditions.	1	2	3	4	5	026

Microbes which cause food poisoning come from:  
(the source of microbes)

a. food handlers	1	2	3	4	5	027
b. raw food	1	2	3	4	5	028
c. cooked food	1	2	3	4	5	029
d. environment	1	2	3	4	5	030
e. If others, please specify:						

- 1= Strongly Agree
- 2= Agree
- 3= Don't Know
- 4= Disagree
- 5= Strongly Disagree

Following are some suggested methods for control of food poisoning.

Reduction of food poisoning can be achieved mainly through:

Increased 'surprise inspection' of restaurants and other food premises	1	2	3	4	5	031
enforcement of laws and regulations.	1	2	3	4	5	032
punishing of food handlers.	1	2	3	4	5	033
closing down of places where food poisoning had occurred.	1	2	3	4	5	034
educating food handlers in food hygiene.	1	2	3	4	5	035
educating the community in food hygiene.	1	2	3	4	5	036
If others, please specify,						

Control of food poisoning can become more effective if the following are involved:

teachers.	1	2	3	4	5	037
doctors.	1	2	3	4	5	038
health educators.	1	2	3	4	5	039
students.	1	2	3	4	5	040
parents.	1	2	3	4	5	041

If others, please specify:

1= Strongly Agree  
 2= Agree  
 3= Don't Know  
 4= Disagree  
 5= Strongly Disagree

Currently, I am involved in decisions related to health education at school.	1	2	3	4	5	042
I would like to be involved in decisions related to health education at school.	1	2	3	4	5	043
Students should be involved in the planning of health education.	1	2	3	4	5	044
It would be better if teachers, and not students, plan health education activities.	1	2	3	4	5	045
It would be better if parents are involved in the planning of health education in schools.	1	2	3	4	5	046

---

Please list the health problems that you believe should be included in health education programs in schools.

Please list the problems which might inhibit health education in schools.

Do you have any further comments which you wish to make regarding health education, food poisoning or any other issue?

Thank you for your participation in our research.

Abdulla A. Ali  
 School of Postgraduate Medical Education  
 University of Warwick  
 Coventry CV4 7AL  
 United Kingdom

## Appendix 4:

Health promoters' questionnaire (Arabic only).

دولة البحرين  
وزارة الصحة  
كلية العلوم الصحية

استبانة حول التثقيف الصحي للحد  
من التسمم الغذائي الجرثومي  
في البحرين

الى

الأختصاصي الصحي

عبدالله أحمد عبدالله علي  
رئيس برنامج الصحة العامة  
كلية العلوم الصحية  
ص ب : ١٢  
تلفون (عمل) ٢٥٥٥٥٥ تحويل ٥٢١٢  
(منزل) ٢٢٥٦٢٢

\*\*\*الرجاء الأتصال عند وجود أي استفسار



اختصاصي صحي

الرجاء الاجابة على كل مايلي : ضع دائرة حول الاختيار المناسب

١- الجنس : a- ذكر b- انثى

٢- العمر : a- اقل من ٣٠ سنة b- ٣٠ الى ٤٠ سنة

c- ٤١ الى ٥٠ سنة d- أكثر من ٥٠ سنة

٣- الوظيفة : الرجاء التحديد :

الرجاء وضع دائرة حول الرقم الذي يناسب اختيارك من بين الأعداد ( ١ - ٥ ) حيث :

١ = أوافق بشدة  
٢ = أوافق  
٣ = لا أعرف  
٤ = لا أوافق  
٥ = لا أوافق بشدة

٤- يحدث التسمم الغذائي الجرثومي بشكل رئيسي للأسباب التالية :

- |    |   |   |   |   |   |   |
|----|---|---|---|---|---|---|
| ١3 | ٥ | ٤ | ٣ | ٢ | ١ | a- وجود الجراثيم أو سمومها في الأغذية                             |
| ١4 | ٥ | ٤ | ٣ | ٢ | ١ | b- أكل أغذية مختلفة في ان واحد ( خلط )                            |
| ١5 | ٥ | ٤ | ٣ | ٢ | ١ | c- المراقبة غير الجيدة للمطاعم                                    |
| ١6 | ٥ | ٤ | ٣ | ٢ | ١ | d- قلة التدريب الصحي للماملين في مجال الأغذية (الطباخ ومساعديه)   |
| ١7 | ٥ | ٤ | ٣ | ٢ | ١ | e- عدم وجود شهادة فحص صحي صالحه لدى بعض الماملين في مجال الأغذية. |
| ١8 | ٥ | ٤ | ٣ | ٢ | ١ | f- عدم اخضاع الماملين في مجال الأغذية لفحص طبي دوري               |
| ١٩ | ٥ | ٤ | ٣ | ٢ | ١ | g- تضرر الأغذية للحشرات   |
| ٢0 | ٥ | ٤ | ٣ | ٢ | ١ | h- سقوط الشعر في الأكل  |
| ٢1 | ٥ | ٤ | ٣ | ٢ | ١ | i- المصفاة والتي لايمكن السيطرة عليها                             |
| ٢2 | ٥ | ٤ | ٣ | ٢ | ١ | j- ميثنة الله   |
- k- مسببات اخرى. الرجاء كتابتها

٥- ما هو موقفك مما يلي ( من الناحية الجرثومية) :

- ١- عادة جيدة  
٢- (وسط) ليست جيدة ولا سيئة  
٣- عادة سيئة  
٤- لا أعرف

3	٤	٢	٢	١	a- طبخ الغذاء حتى يستوي جيدا .
4	٤	٢	٢	١	b- أكل الغذاء مباشرة بعد الطبخ وهو حار .
5	٤	٢	٢	١	c- تخزين الغذاء المطبوخ داخل الثلاجة لمدة يوم واحد أو أكثر .
6	٤	٢	٢	١	d- تسخين الغذاء المطبوخ حتى يصبح حارا قبل أكله (أي عدم أكله باردا) .
7	٤	٢	٢	١	e- ملامسة الغذاء المطبوخ للغذاء النيء . (داخل الثلاجة أو اثناء اعداد الطعام)
8	٤	٢	٢	١	f- التبريد البطيء للغذاء (اللحوم ، الدجاج ، ..) (أي وضع كمية كبيرة من الغذاء في وعاء وتركه في الثلاجة ليبرد بصورة بطيئة)

- ١ = أوافق بشدة  
٢ = أوافق  
٣ = لا أعرف  
٤ = لا أوافق  
٥ = لا أوافق بشدة

٦- الجزء الاتي يشتمل على اعتقادات و آراء . الرجاء الاجابة عليها بكل حرية .

9	٥	٤	٢	٢	١	a- التسمم الغذائي قد يحدث لأي شخص مهما كان عمره .
0	٥	٤	٢	٢	١	b- الاصابه بالتسمم الغذائي يمكن السيطرة عليها
1	٥	٤	٢	٢	١	c- الأغذية النيئة (دجاج ، لحم ، بيض) غالبا ماتكون ملوثة بالجراثيم عند شرائها .
2	٥	٤	٢	٢	١	d- الأغذية النيئة تتلوث بالجراثيم خلال تداولها او عند اعدادها .
3	٥	٤	٢	٢	١	e- البيض غيرالمطبوخ جيدا يجعلك أكثر صحة .
4	٥	٤	٢	٢	١	f- شرب الحليب مباشرة من الحيوان دون غليه يجعلك أكثر صحة .
5	٥	٤	٢	٢	١	g- اعطاء الموائل للطفل المصاب باسهال قد يسيء الى صحته .

- ١ = أوافق بشدة  
 ٢ = أوافق  
 ٣ = لا أعرف  
 ٤ = لا أوافق  
 ٥ = لا أوافق بشدة

٧- الجراثيم التي تسبب التسمم الغذائي تأتي من:  
 (المصدر الرئيسي للجراثيم):

- 26 - a - الماملين في مجال الأغذية  
 27 - b - الغذاء النيء (غير مطبوخ)  
 28 - c - الغذاء المطبوخ  
 29 - d - البيئة المحيطة  
 e - مصادر أخرى الرجاء ذكرها :

٨- يمكن السيطرة على التسمم الغذائي باستخدام مايلي :

- 30 - a - زيادة التفتيش الصحى المفاجيء للمطاعم  
 31 - b - تطبيق قوانين ولوائح صحية على المطاعم.  
 32 - c - فرض العقوبة على عاملي الأغذية  
 33 - d - اغلاق المطاعم التي يحدث فيها التسمم.  
 34 - e - تثقيف عاملي الأغذية في مجال صحة الأظمية.  
 35 - f - تثقيف المجتمع في مجال صحة الأظمية.  
 g - طرق أخرى : الرجاء تحديدها :

٩- السيطرة على حالات التسمم الغذائي يمكن ان تكون اكثر فاعلية اذا تم مشاركة مايلي :

- 36 - a - المدرس  
 37 - b - الطبيب  
 38 - c - المثقف الصحي  
 39 - d - الطلبة  
 40 - e - الالباء  
 f - اخرين . الرجاء تحديدهم :

- ١ = أوافق بشدة  
٢ = أوافق  
٣ = أعرف  
٤ = لا أوافق  
٥ = لا أوافق بشدة

41	٥	٤	٣	٢	١	١٠- في الوقت الحالي يوجد أخصائي تثقيف صحي في المدارس.
42	٥	٤	٣	٢	١	١١- لا حاجة لمدرس متخصص في التثقيف الصحي في المدارس.
43	٥	٤	٣	٢	١	١٢- أنا مؤهل للقيام بعملية التثقيف الصحي .
144	٥	٤	٣	٢	١	١٣- التدريب في التثقيف الصحي لي : a - موجود
145	٥	٤	٣	٢	١	b - كاف
146	٥	٤	٣	٢	١	c - ملائم لاحتياجي d - أشياء أخرى . الرجاء ذكرها :
047	٥	٤	٣	٢	١	١٤- في الوقت الحالي يتم مشاركتي في القرارات المتعلقة بالتثقيف الصحي في المدارس.
048	٥	٤	٣	٢	١	١٥- أنا أحب أن اشارك في القرارات المتعلقة بالتثقيف الصحي في المدارس.
049	٥	٤	٣	٢	١	١٦- من المستحسن مشاركة الطلبة في تخطيط عملية التثقيف الصحي.
050	٥	٤	٣	٢	١	١٧- من الأفضل ان يقوم المدرس وليس الطالب بتخطيط عملية التثقيف الصحي.
051	٥	٤	٣	٢	١	١٨- من المستحسن مشاركة الالباء في عملية تخطيط التثقيف الصحي في المدارس.
052	٥	٤	٣	٢	١	١٩- في الوقت الحالي هناك تنسيق جيد بين المدارس والمؤسسات الأخرى في مجال التثقيف الصحي .

٢٠ - الرجاء كتابة المشاكل الصحية التي تمتد بضرورة  
ادخالها ضمن برامج التثقيف الصحي في المدارس.

٢١ - الرجاء ذكر المشاكل التي قد تعمق ادخال التثقيف الصحي  
في المدارس .

٢٢ - هل هناك أي اقتراح أو استفسار تود أن تذكره فيما  
يتعلق بالتثقيف الصحي ، التسمم الغذائي أو أي شيء آخر .

\*\*\*\*\*

أشركم على مشاركتكم لنا في هذا البحث الذي نأمل بأن يعود  
بالنفع على الجميع .

عبدالله أحمد عبدالله علي  
رئيس برنامج الصحة العامة  
كلية العلوم الصحية  
ص . ب : ١٢  
للاستفسار يرجى الاتصال على  
تلفون (عمل) ٢٥٥٥٥٥ تحويل ٥٢١٢  
تلفون (منزل) ٢٢٥٦٢٢

## Appendix 5:

Focus group protocol.

**Focused Interview**  
**Interview Guide**  
**Microbial Foodborne Illnesses in Bahrain:**  
**A Strategy To empower The Community, Enhance The Environment and**  
**Improve Resources to Control Such Hazards**

**Major Areas of Inquiry:**

1. Food poisoning. Is it a problem?
2. How does it occur
3. Who gets the disease
4. Where the microbes come from
5. How they get into food
6. Foods most dangerous
7. Can food poisoning be controlled? How?
8. What to do to keep food and community safe
9. Health promotion. what do they think of it. How to be implemented.
10. Resources including TLMs.
11. What you want to know more about.

\* Questions for the focused group will not be prepared in advance, however, the major contents of the interview will be as mentioned up.

## Appendix 6:

Canteens' checklist.



**Check List For Assessment of Canteen Environment  
Health Promotion To Control Microbial Foodborne Hazards**

**I. Canteen Environment:**

1. Water available
  - a. cold 1. Yes 2. No 3. Not Applicable
  - b. hot 1. Yes 2. No 3. Not Applicable
2. Food contact surfaces were clean 1. Yes 2. No 3. Not Applicable
3. Floor was clean 1. Yes 2. No 3. Not Applicable
4. Cooking facilities were available 1. Yes 2. No 3. Not Applicable
5. Comments:
6. Refrigerators were available 1. Yes 2. No 3. Not Applicable
7. Comments:
8. Hot holding facilities available 1. Yes 2. No 3. Not Applicable
9. Comments:
10. Storage facilities available 1. Yes 2. No 3. Not Applicable
11. Comments:
12. Toilets available 1. Yes 2. No 3. Not Applicable
13. Comments:
  - a. clean 1. Yes 2. No 3. Not Applicable
  - b. hot water available 1. Yes 2. No 3. Not Applicable
  - c. cold water available 1. Yes 2. No 3. Not Applicable
  - d. soap 1. Yes 2. No 3. Not Applicable
14. Comments on location:
15. Insects present 1. Yes 2. No 3. Not Applicable

16. Refuse container present

1. Yes 2. No 3. Not Applicable

17. Comments:

II. Personnel:

1. Number:

2. Nationality:

3. Qualification: 1. Illiterate 2. Write 3. Read 4. Both

4. Language

a. spoken: 1. Arabic 2. English 3. Others: \_\_\_\_\_

Good

Fair

Poor

b. Understanding: 1. Arabic 2. English 3. Others:

Good

Fair

Poor

III. Food Served:

1. Source:

2. Type:

3. Comments:

4. Leftover food

a. What happens to it?

5. Storage facilities:

6. Over all Comments:

\* Temperatures will be measured (when applicable) using digital thermometer with a probe.

## Appendix 7:

Published works.

## Annex 8

## INFORMATION AND TECHNOLOGY TO EMPOWER FUTURE HEALTH WORKERS

Mr Abdulla Ahmad Ali<sup>1</sup>**I. Introduction:**

Health and well being of human population is the right of every single person live on this universe that no one should be deprived off. Problems like mal-nutrition, HIV/AIDS, communicable diseases, substance and alcohol abuse and many other social problems have raised the question of why such problems exist. Are they because of ignorance of people to protect themselves and their families or due to some other causes such as the absence of proper health promotion programs, Teaching Learning Materials (TLMs), or due to unavailability of the right technology. Health promotion and training of health workers and community at large are the key factor in achieving optimum health and well being of the nation at large. Researchers have suggested many approaches for teaching and learning of the community. The recent move in training is shifted from teacher-centered to student-centered method. This approach has proven to better enable and empower the learners to take the lead and decide for themselves rather than being recipients waiting for somebody to feed them.

Empowerment is not possible without availability of relevant and adequate resources. These resources are: Proper TLMs, well-trained trainers, and political support and commitment. Since school students are the future health workers, this study has assessed the empowering tools in schools of Bahrain. Particular emphasis was given to the textbooks and the technology used to produce these TLMs. The textbooks were assessed for their contents and layout.

**II. Review of literature:**

No matter how much training and resources are put together for health personnel, yet it is impossible to achieve the health and well-being of the community without involving the community itself. School children are the best to start with. Health learning among school age children will be the focus of this paper. Educating school children and involving them in health issues is fundamental for the following reasons according to Dhillon and Philip (1992): 1- school children represent the largest segment of population in all developing countries. 2- school children are readily accessible and 3- they are receptive to learning. They also stated that

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school setting serves as great opportunity for giving health knowledge, developing appropriate values and attitudes and encouraging health behaviours.

School children represent the largest segments of the overall population. Dhillon and Philip (1992) estimated the number of school-age children to be over a thousand million in the world. They indicated that in developing countries about 80% of children are enrolled in primary or elementary schools. In Bahrain, however twenty-one percent of Bahraini population were students in 1992.(Directorate of Statistics 1993).

Since tomorrow's doctors, nurses, other health workers and parents are today's school children, the literature, however, suggest that they deserve proper attention during their educational growth. WHO, UNISCO, UNICEF (1991) for example, recommends education for health to school children and believes that by acquiring knowledge, values and skills, children can be empowered to pursue a healthy living and they become health promoters and health advocates. School children must receive some doses of health topics before leaving schools so that they become informed and be able to protect their own and their family lives. Health promotion is going to be the future immunity against all sorts of bugs that will threaten the nation's health and well being. Clay (1992) and Chally (1992) support WHO by mentioning that Knowledge is fundamental element of empowerment and that empowering school children has significant influence on their own health and their families.

Empowering school children requires resources such as proper TLM, technology for production of these TLM and well-trained teachers and health training providers. Dowling and Ritson (1985), referring to materials for health workers, stated that where teaching materials do exist , they are often poor quality, out of date, not relevant to local needs, and are translated from foreign texts. Ali (1991), and Estey et al. (1993) Believe that materials of such quality might be difficult to understand, confusing, threatening and could be socially and culturally unacceptable. or not addressing the needs of that country.

WHO, UNISCO, UNICEF (1991) and Ross et al (1991) documented that school health education can have significant influence on students' health, knowledge, attitudes and behaviours.

### **III. Definition of Empowerment:**

We have talked about Empowerment earlier in this paper, and since it is the main theme of this research, It is better to discuss it in some details. According to Adams (1990), empowerment is " a process by which individuals, groups and/ or communities become able to take control of their circumstances and achieve their own goals, thereby being able to work towards maximizing the quality of their lives". Other definitions of empowerment for different segments of populations are also given by several authors French (1990), Bradley (1992). Chally (1992), said that empowerment results from teaching characterized by caring, commitment, creativity, interaction, and recognition of the humanity of both educators and students. Empowering students was first discussed by WHO in the first conference on health promotion which was held in Ottawa, Canada in November 1986. In that conference, they came up with a definition of health promotion which is "a process of enabling people to increase control over and to improve their health. WHO (1986).

As Yeo (1993) puts it "empowerment, I submit should be the primary goal and guiding value of health promotion. People are not simply empowered by simply saying you are responsible, however empowerment depends on whether they do indeed have the power and resources to take control over the problem"

Empowerment has several advantages. Bradley, (1992), it enhances the quality of the care provided by the empowered person,

### **IV. Empowerment Through Involvement:**

The Declaration of Alma-Ata on Primary health (1978) states that "people have the right and duty to participate individually and collectively in the planning and implementation of their health care"

At the International Conference on Primary Health Care organized by WHO, and UNICEF in Alma Ata in the previous USSR in 1978, countries affirmed that "school could indeed provide efficient means of educating young people on major health issues and ensuring that young people are educated to have a good understanding of what health means, how to achieve it, and how it contributes to social and economical development."

## **V. Provision of TLMs.**

According to Miller- Farrell (1989) and Ali (1991), written materials are the backbone of any training program for any group of population. Since out of date materials will convey an out of date messages that consequently will produce an out of date community. Such community will be hindered in their attempts to achieve optimum health.

As an integral segment of the community, Ministry of Education (MoE) in collaboration with Ministry of Health (MoH) and other institutions are responsible for provision of adequate and proper health topics and comprehensive health promotions to school children. Training of future health workers requires an inter disciplinary coordination efforts between school educators and health providers. There is no doubt that some degree of cooperation exist between MoE, MoH and other related institutions on the island and outside.

According to Dowling and Ritson (1985), the severe shortage of health workers in the developing countries is hindering the progress of these countries in their attempts to improve the health of their people. In Bahrain for example, the shortage is not that critical. In fact, there is surplus of health workers in most of the areas of primary health. This surplus has resulted from starting the College of Health Sciences in 1976 that carry the burden of training mid-level health workers in different fields of health.

## **VI. School TLM:**

School TLM are any materials that are given by school to students or used by students, from other sources to achieve the predetermined objectives of learning. They can be classified as textbooks, handouts, audio-visuals (films, videotapes, slides, transparencies,...), models and computer software.

Mcleod (1991), said that TLM for students serve one of the following activities: Primary learning, revision of learned materials, and for reference purposes only.

## **VII. Information Through Teaching/Learning Materials (TLM):**

School TLM are the integral component of the overall training that the communities receive. Maximum benefit will be achieved if facilitators and

trainers use effective strategies in the learning process particularly if the materials are properly designed and written within the reading levels of the students. Adequate learning will not take place unless proper teaching tools are used (Weinrich and Boyd) 1992.

There is tremendous shortage of TLMs in the developing countries, According to Dr. Mneimne, WHO's regional advisor for Health TLMs and education development and support in the Regional Office for the Eastern Mediterranean. (personal communication).

Dowling and Ritson (1985), believe that there is a need to encourage developing countries to produce their own materials to meet the specific requirements of their own health personnel.

Emphasizing readability, Estay et al (1993) said that there are many materials available but TLMs serve no useful learning purpose if the target group are unable to understand and make full use of them. Materials should be written within the reading level of the population. Researchers Mcleod (1991), Estey (1993), Charlton (1986), Lohr et al (1989) and McCabe (1989) mentioned that writing materials beyond the reading level of the target group will not guarantee comprehension also lowering the reading level of the printed materials may not guarantee comprehension. For TLMs written in English, Researchers showed that there are several tests that can be used for assessment of reading levels of the materials. Jastak and Wilkinson (1984), Tayler (1953), Fry (1968), and McLaughlin (1969).

Discenza (1993) stated that evaluating TLM must involve evaluation of content, the instructional design, the technical production of the instructional textbooks and the packaging. In his paper, Dicensa has written in detail about the criteria of evaluation of TLM. Other researchers such as Valaitis and Shea (1993), Bernier and Yasko (1991), Charlton (1986), and Mcleod (1991). followed some similar approaches to evaluate TLMs.

When evaluating the content, the following questions should be taken into consideration: Is the material pertinent to the goals and objectives of the course?, Is the information provided by the material current? Is it accurate and scientific?. Regarding appropriateness, Is it at the level of the intended audience?.



This research was undertaken to assess school textbooks to see whether or not they contain health topics. The information obtained through this study will give a better view of what is available at schools and how learners are prepared for their future roles and whether or not a good investment is being carried out.

### **VIII. Objectives:**

The following were the main objectives of this study:

Determine the health contents of school textbooks.

Assess the quality of These TLMs.

The final element to consider was to find out the type of technology used to produce TLMs and the technology available to the learners.

### **IX. Methodology:**

Evaluations of the textbooks were conducted by the researcher. Evaluation was performed depending on personal judgment criteria set by the researcher opinion. As the number of textbooks was large, only science textbooks were involved in the assessment. The purpose was to determine if the textbook contained health information that will ultimately increase the awareness of the students and eventually will empower them. Assessment of the Textbooks was determined by review of the content. Pictures and illustrations were also assessed for clearness, accuracy of information, and currentness. Accuracy was determined by the investigator for both the written and the illustration parts.

Since reading level is fundamental for students to comprehend the topics, and whether or not a reading level formula is used during writing processes of the TLMs. This was determined by personal communication with the curriculum specialists in the Directorate of Curriculum.

Readability levels of the materials were subjectively evaluated based on researcher's judgment. Easiness, difficult vocabularies, long sentences, and technical terminology were focused. Other factors that affect readability were assessed. These factors were: the type of print or font used, the amount of white spaces and the layout of the textbook. These are important issues that affect readability. Lohr et al (1989), Mcleod (1991)

## **X. Results:**

### **A. Textbooks:**

Sixty five textbooks were included in the assessment. Most of the materials that are used by students of the governmental schools in Bahrain are produced in Bahrain. They are produced in the Educational Technology Center. Very few such as Social Sciences and English textbooks are produced outside Bahrain. All of the materials evaluated in this study were produced during 1992-1993. After discussion with technical and political authorities, the textbooks are written by the authors.

The reading level of the textbooks is determined by the authors and the subject experts. There is no standard formula which determines reading levels thus it is totally based on the experience of the specialists. Up to the second intermediate level, science textbooks are now the same for the six Arabian Gulf Cooperation Council countries (AGCC). The aim is to standardize school curriculum for all the AGCC countries in the future.

It was found that simplicity, ease of reading, clarity and visual appeal were the main criteria of the evaluated books. The textbooks were found to be attractive, have clear illustration and pictures, white pages, and aesthetically pleasing. which for sure communicate rapidly, and reinforce understanding of the topics. Mcleod (1991), Charlton (1986). This is particularly true for the textbooks intended for primary up to the second intermediate class. Visual diagrams according to Squires (1990) are the most powerful learning tools and which aid in information retention.

Graphical aids and drawings and diagrams were in colors. Mcleod (1991), stated that colour has not shown to have any significant effect on learning but learner prefer colours for appearance and motivational reasons. Textbooks for third intermediate and secondary levels were found to be congested with information and few pictures. This is possibly common for this level, however the print was large enough and clear. The only problems noticed were some spelling errors that appeared in most of the books.

### **B. Textbook contents:**

School textbooks contained varied health topics that will be difficult to list all but most importantly, topics like: communicable and non-communicable diseases, microbes, genetical problems, personal hygiene,

nutrition, human anatomy and physiology, first aid and many other health issues.

Supplemental activities that reinforce important information were provided either in the main book itself or in other exercise books. Activities like questions to be answered, filling blank spaces, completing drawings, etc. Mcleod (1991) mentioned that if subjects are written in question form rather than statements, users of such materials will remember more.

Production of textbooks in the center had many advantages according to the specialist in charge of the printing and book design section. Firsts the expenditure was reduced by 40%, second they saved a lot of time, third they overcome many mistakes that they witnessed in textbooks that were prepared by private companies, fourth the materials were of high quality, last the materials were saved on their floppy disks for future revision and updating.

### C. Technology(Equipment):

Materials that are produced in Bahrain are produced by the Educational Technology Center. The center consists of the following divisions: model's production, printing and book design, bindery, TV and audio production, educational resources, maintenance, and administration services.

The center aims at obtaining maximum benefit from the limited resources available to them so that they become self reliant.

The section produces TV programs, educational films, cassettes, models, textbooks, maps, slides, and boosters. Production of such materials requires tremendous resources. The center is fully equipped with equipment and highly trained team of professionals, technicians and helpers. The TV and audio production section are the largest and consist of equipment that do the following: audio recordings, picture recording, picture mixing, video recording, special effects, dubbing, editing, lighting, transfer 16 mm films to video. The human resources in this section is as follows: 2 cameramen, 1 editor, 2 engineers, 1 assistant engineer, 1 sound specialist, 3 producers. The process of production consists of: shooting (recording), editing, copying, and distribution.

Regarding films, there are some films that are purchased from outside Bahrain. These films are carefully evaluated by the producer for

appropriateness. Sometimes some parts of the film are not appropriate for local culture and religion, these films are adapted so that they can be used.

Models production section has 2 specialists, and necessary equipment. Plastic and 2 types of foam are used as raw products for producing learning models..

Printing and book design section: Textbooks for school children in Bahrain seems to be promising. Many printed and audio visual materials are developed. This section produces 60 to 70 textbooks annually, the section receives the written material from MoE, textbooks are written by subjects' specialists. The section does all the art work which consists of the layout, drawings, illustration, typing, selection of colours, etc. This section has 8 designers and artists, 3 computer specialists, 5 printing specialists. The section uses advanced and powerful computers, like Macintosh Quadra 700, Macintosh Quadra 800, and a colour separation equipment called Linotronic. There is also Silk screen for production of posters, and flash cards. the section is supported by an offset and photocopiers for printing.

Textbooks which are produced by MoE are field tested and modified before the final adoption. Feedback from both teachers and students are used to evaluate the textbooks.

MoE has also provided schools with necessary equipment to facilitate learning. For example, slide projectors, overhead projectors, microscopes, videos, TVs, computers, cameras are among the main equipment.

## **XI. Recommendations:**

- . Students should be empowered so that they become effective lobbyists for health issues.
- . New curriculum with health topics are needed for the new generations
- . Enable people to investigate and understand their own situation, thus empowering them to change their social environment.
- . Countries must formulate and implement supportive policies which empower the educators and the learners.
- . Countries must allocate ample time for training and producing TLMs.

## **XII. Conclusions:**

Most of the materials used by Bahraini students are locally produced. Materials produced locally are often relevant, and relatively cheaper and meet the institutional needs and goals. Some of the materials which are used in Bahrain are used by the six AGCC countries. Bahrain still purchases a part of the needed textbooks, yet the production of materials locally had cut the cost by 40%.

There is no question about the necessity for training of health workers in different fields of health, So it is fundamental to shift some of emphasis to properly train students so that they will be empowered to protect, maintain and promote their health and the health of the community. Working with students is not only important to the students themselves, but also to the teachers, and the family. Training of students is therefore of vital importance.

Teachers, curriculum designers, and researchers are responsible for securing TLMs and training for all levels of the community irrespective of the age groups. TLMs have to be prepared for each age group separately and must take into consideration readability, layout and content quality.

we have to admit that there are some excellent textbooks produced by locals, but management in schools, colleges, universities and the services has the responsibility to maintain quality, secure TLMs for every age group and specialty, and identify the need for training within their, and if possible within other establishments. Training of key elements can't be introduced overnight but needs to be considered by management.

Management is obliged to update technology and make proper use of the available resources.

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