ASSESSMENT OF THE FEASIBILITY OF MODIFYING RISK FACTORS FOR ACUTE RESPIRATORY INFECTION IN CHILDREN UNDER FIVE YEARS OF AGE IN WEST JAVA, INDONESIA

NANI NURHAENI

ASSESSMENT OF THE FEASIBILITY OF MODIFYING RISK FACTORS FOR ACUTE RESPIRATORY INFECTION IN CHILDREN UNDER FIVE YEARS OF AGE IN WEST JAVA, INDONESIA

by

Nani Nurhaeni

A thesis submitted to the School of Graduate

Studies in partial fulfilment of the

requirements for the degree of

Master of Nursing

School of Nursing

Memorial University of Newfoundland

September, 2001

St. John's **Newfoundland**

Abstract

Acute Respiratory Infection (ARI) is a major cause of mortality in children under five years of age in Indonesia. Control of the risk factors for ARI can contribute to reducing its incidence. The key purpose of this study was to assess the feasibility of modifying the risk factors for ARI in children under five years of age.

This study used a cross sectional design. Convenience sampling was chosen as a strategy for sample selection; the sample consisted of 120 children who had a history of ARI. In this study, data were collected using five instruments developed based upon a review of the literature. Closed- and open-ended questions were used for data collection.

Descriptive and inferential statistics using Fisher's Exact Test were used to analyze the data. Bivariate analysis results showed that the mother's education, the number of people sharing a bedroom, the kitchen design, exposure to kitchen smoke, and ventilation for the kitchen stoves were significant as risk factors for ARI in children under five years of age ($p < .05$). Based on the multivariate analysis results, only three risk factors were identified: the mother's education, hours the child was carried while the mother cooked, and ventilation for the stove ($p < .05$). Respondents identified that these risk factors could be modified by more health education and health promotion strategies, for example, health teaching for the participants on ways to reduce exposure to kitchen smoke, such as not carrying the child or improving ventilation. The results from this study can be used to target areas for parent education programs.

Acknowledgments

Alhamdulillah (Thanks to God) I have finished my thesis. The completion of this thesis would not have been possible without the support of a number of people. I would like especially to thank my supervisors, Dr. Donna Moralejo and Karen Webber, MN, for their guidance, continued support and accessibility.

I would also like to thank the AUCC/CIDA through a Tier 2 Linkage Project, Nursing, Women's Health and Community Outreach in Indonesia. This is a partnership between the School of Nursing at Memorial University of Newfoundland, Canada and Fakultas Ilmu Keperawatan (Faculty of Nursing) of the University of Indonesia, Jakarta, Indonesia. I would like to thank the School of Graduate Studies, Memorial University of Newfoundland for additional funding. A thank you is extended to Ibu Mary Kathleen Matthews, a project director, and the Canadian project members (Ibu Marilyn, Ibu Sandy, Ibu Shirley, and Ibu Karen) and also Ibu Yani S Hamid, a project director, and the Indonesian project member (Ibu Dewi) for their help in seeking financial support for my study.

I am also in debt to my dean, Elly Nurachmah, and to my other colleagues in the Faculty of Nursing of the University of Indonesia who gave me valuable support and encouragement to complete this thesis. I would also like to thank my editor, Iona Bulgin, for the care and precision she brought to the final preparation of the manuscript.

I would also like to give special thanks to the children and parents who participated in my study in Indonesia, in Cibentang and Kuripan villages, sub-district of

Parung, Bogor District, West Java. My study would not have been possible without their participation.

I am especially grateful to my loving husband, Mohamad Ilham Wicaksono for his continued love, patience, understanding, encouragement, and sincerity during a difficult time. I dedicate this thesis to my loving daughter, Syifa Nabilah Humaira, and to my unborn baby, who inspired me to finish this study. I would like to give special thanks to my parents, my brothers and sisters for their support and understanding. Finally, a special dedication for my mother, Suhaemah, and my father, Sudaman, who have given me the motivation and the encouragement to pursue higher education.

Table of Contents

List of Tables

List of Figures

Chapter 1: Introduction

This chapter consists of three sections: the first will present the background of the study; the statement of the problem and rationale for the study will be described in section two; and the purpose of the study and research questions will be presented in section three.

Children have the potential to be a great resource for the economic and political development of a country. While the population of Indonesia's children is larger than that of other countries, the quality of health of these children is poor. Childhood morbidity and mortality are major problems in Indonesia, where many children fall ill and die before one year of age. Acute respiratory infection (ARI), especially pneumonia, is the major cause of morbidity and mortality in Indonesian children under five years of age. The proportion of deaths caused by pneumonia in 1992 was 36.4% for infants (0-1 year) and 18.2% for children under five years of age (1-4 years) (PPM & PLP, 1998).

The risk factors for acquiring ARI in children under five years of age have been well documented in developing countries. While the majority of efforts to cope with the problem have focused on an identification of cases and case management, no studies have looked at the feasibility of modifying or controlling the risk factors. The purpose of this study is to determine the feasibility of modifying the risk factors for ARI.

1. Background of the Study

The incidence of childhood pneumonia in Indonesia differs for every province. In 1997, Sistem Surveilans Terpadu (SST) revealed that the morbidity of pneumonia in Indonesia was 4% or about 834,400 children. In 1999, the province of West Java had the sixth highest incidence of pneumonia of the 27 Indonesian provinces: the case fatality rate in hospital-treated ARI, for pneumonia, was 18.4% (Departemen Kesehatan, 1999a).

Indonesia has been in a sustained economic crisis since 1997 (Departemen Kesehatan, 1999a). This situation has adversely influenced the socio-economic status of communities, the level of education, and the health status of children. Because of the economic crisis, approximately 20.7% of Indonesian children under five years of age suffer from malnutrition (Departemen Kesehatan, 1999a). It is not surprising that many Indonesian children are more susceptible to a variety of diseases including ARI.

The current economic crisis in Indonesia also contributes significantly to the cost of educational programs. Effective intervention for prevention and medical case management is important in order to save the lives of children under five years of age. Efforts to reduce the mortality from pneumonia have also been made through Indonesian National ARI programs; these include case finding, the management of ARI, and the dissemination of ARI information to all communities (PPM & PLP, 1998). In six developing countries, immunization, case identification, and case management approaches have been partially effective in reducing ARI morbidity and mortality

(Pandey, Boleij, Sramek & Kriz, 1989); however, these approaches are expensive and may not be feasible in villages with limited access to health care services and resources. Another constraint is the unavailability of additional personnel for new programs, the limited infrastructure, and the equipment for collecting and reporting data. Long-term solutions may depend more on the control of risk factors than on expensive management strategies.

Since education, as one of the determinants of health, can contribute to the health of children (Federal, Provincial and Territorial Advisory Committee on Population Health, 1994), its lack can contribute to the health risk of children. Most people in Indonesian rural communities have grade 6 education or less. Few of them know or understand about ARI. As poor economic status is common in rural areas, easy access to health information via television, telephone, or newspapers is limited. It is possible, however, to use health care workers currently working in the villages to educate the community about risk factor management.

Health education may be one potential solution to solving the major problem of ARI in Indonesian children. As a professional health care provider, the nurse is responsible for providing health education in the community, in particular, to parents. Nurses can also collaborate with community health workers, midwives, or traditional birth attendants as a way of supplementing service from the limited number of community health nurses. These health workers are a key resource for the education of parents.

Pender (1996) stated that nursing has a unique opportunity to provide leadership to other health workers to promote better health for the world community because a nurse has the required expertise and contact with clients. As a role model in health-promoting lifestyles, a leader to motivate communities for health promotion, and the largest single group of health care provider, a nurse plays a vital role in health promotion and illness prevention. Health promotion is a combination of educational and environmental supports for actions and conditions of living conducive to health (Green & Kreuter, 1991). Furthermore, health education is a part of health promotion that is comprised of any combination of learning experiences designed to facilitate voluntary behaviour conducive to health (Green & Kreuter, 1991). Nurses can use primary, secondary, and tertiary prevention strategies that may involve environmental support to conduct their roles and improve living conditions and behaviours conducive to the health in any setting, including hospital or community. Currently, the profession of nursing is in an ideal position to help individuals and communities to reduce risks, prevent illness and injury, and create an awareness of the health status caused by environmental hazards (Edmondson & Williamson, 1998).

2. Statement of the Problem and Rationale for the Study

Various microorganisms, including viruses and bacteria, can cause ARI; these are spread through droplet transmission and are acquired by susceptible hosts. Respiratory Syncytial Virus (RSV), *Streptococcus pneumoniae*, *Haemophilus influenzae* and *Staphylococcus aureus* are viral and bacterial agents that have been identified as the principal causes of ARI in developing countries (Berman, 1991a). Factors such as crowding, poor personal hygiene, and poor sanitation facilitate the transmission of these microorganisms. Susceptibility increases in children with immature or compromised respiratory and immune systems.

In a study of rural communities in West Java, Sutrisna (1993) found that 30 out of 139 children under five years of age with pneumonia die without treatment. This was supported by an Indonesian Demographic and Health Survey which reported that among 13,260 children with cough and fast breathing, two of the signs of pneumonia, 20.5% had only home treatment and 11.7% had no treatment (BPS-Depkes-BKKBN, 1991). These findings suggest that the utilization of health care services is not yet optimal in rural communities.

The risk factors for the acquisition of ARI in children under five years of age have been identified in developing countries such as Gambia (O'Dempsney et al., 1996) and the Philippines (Tupasi, Leon et al., 1990). These risk factors include: young age (less than two years), malnutrition, low birth weight (LBW), incomplete childhood immunization, vitamin A deficiency, population density, exposure to environmental tobacco smoke (ETS), exposure to household smoke, low socio-economic status, low maternal education, low access to health services, and chronic conditions such as asthma. In addition, delays in diagnosis and treatment may lead to more severe or recurrent illnesses. Indonesia has similar risk factors because of its economic situation, malnutrition, decreased resources, and low education levels. However, no study has explored the risk factors for ARI in Indonesian children under five years of age.

Controlling or modifying these risk factors is important and possible in rural communities to reduce the incidence of ARI. For example, it is theoretically possible to reduce a child's exposure to ETS, kitchen smoke, and close contact with ill siblings, or to improve the parents' ability to recognize the signs and symptoms of ARI. While O'Dempsney et al. (1996) suggested that mothers should not carry their children on their backs while cooking in an effort to decrease the incidence of ARI in children under five years of age, the feasibility of modifying these risk factors has not been studied. It is not known, for example, if improving the ventilation by opening windows is possible, or if there is someone to care for a child while the mother is in the kitchen cooking. In addition, it is not known if early contact with health care services might reduce ARI before it becomes more serious.

The Health Promotion Model (HPM) can be used as a framework for exploration of the complex biopsychosocial processes that motivate individuals to engage in behaviours directed toward the enhancement of health (Pender, 1996). In this study, the HPM is used to conceptualize the kinds of situational or behavioural factors for ARI that can be modified, eg., when a mother always carries a child while cooking or when there is no ventilation in the kitchen. Controlling risk factors that relate to the host and environment may be useful in reducing the incidence of ARI.

The results of this present study can serve as a basis for planning health education or other community health promotion programs that focus on modifiable key risk factors. Generally, it is assumed that reducing the exposure to risk factors will decrease the frequency of ARI episodes in children.

3. Research Purposes and Questions

The key purpose of this study is to identify the feasibility of modifying risk factors for ARI. This study also describes the relationship between the risk factors for ARI as well as the utilization of health services and the frequency of ARI in children under five years of age.

The following research questions have guided this study:

1. What is the relationship between the risk factors for ARI and the frequency of ARI in children under five years of age?
2. What is the relationship between the utilization of health services and the frequency of ARI in children under five years of age?
3. What is the feasibility of modifying certain risk factors for ARI in children under five years of age?

Chapter 2: Literature Review

The literature review is presented in four sections: an overview of the definition and causes of ARI; the incidence of ARI in Indonesia; the literature related to risk factors for ARI and a conceptual framework; and finally, a summary.

1. Definition and Causes of ARI

In a review of the literature, there is no specific definition of ARI which is used world wide. The World Health Organization (WHO) has developed case management guidelines based on ARI symptoms for use in primary care settings and in small hospitals in an effort to control the incidence of ARI (Berman, 1991b). For the management of a child with symptoms of an ARI, such as a cough, ARI is divided into three groups: no pneumonia, pneumonia, and severe pneumonia. Children are categorized as having no pneumonia if they do not have chest indrawing or fast breathing (≤ 50 breaths/minute if the child is two to 12 months; ≤ 40 breaths/minute if the child is 12 months to five years). Children are categorized with pneumonia if they do not have chest indrawing but have fast breathing (≥ 50/ minute if the child is two to 12 months; ≥ 40 breaths/minute if the child is 12 months to five years). Finally, children are categorized with severe pneumonia if they have chest indrawing and wheezing.

The Indonesian National ARI Program has defined ARI as an infection that occurs in the respiratory tract and lasts less than 14 days (PPM & PLP, 1998). In this program, they also categorize ARI in accordance with WHO guidelines. In North America, ARI is divided into five main clinical categories: upper respiratory tract infection (including colds, pharyngitis, tonsillitis, otitis media, and sinusitis), laryngotracheobronchitis and epiglottitis, acute bronchitis, acute bronchiolitis, and pneumonia (Phelan, Olinsky & Robertson, 1994). The causes of ARI are many, but the most commonly identified are Respiratory Syncytial Virus (RSV), Parainfluenza virus, Influenza virus types A and B, Adenovirus, *Streptococcus pneumoniae, Haemophilus influenzae, and Staphylococcus aureus* (Berman, 1991b; Hussey et al., 2000; John, Cherian, Steinhoff, Simoes & John, 1991; Selwyn, 1990; Shann et al., 1984; Tupasi, Lucero et al., 1990; Vathanophas et al., 1990; Weissennbacher et al., 1990). As the common cold, pharyngitis, otitis media and pneumonia were seen most frequently in the investigator's clinical practice, only these illnesses will be discussed.

The common cold is an upper respiratory tract infection with the following signs and symptoms: a profuse watery, mucous or purulent nasal discharge, nasal stuffiness, sneezing, throat irritation, and no or minimal fever (Cherry, 1998a; Phelan et al., 1994). Rhinoviruses are the most frequent cause of the common cold in developed countries with the greatest amount of virus found in nasal secretions. However, in developing countries, RSV and Parainfluenza viruses are the most common causes of upper respiratory infections (John et al., 1991). Transmission of the common cold occurs by direct contact with infected people rather than by exposure to cold temperatures (Cherry, 1998a). Therefore, hand-to-hand contact, sneezing, and nose blowing are of major importance in controlling viral transmission. Common interventions such as wearing a mask and hand washing can block the chain of transmission (Puhlman, 2000). The time of year also influences the incidence of the common cold. In the tropics, this disease is more frequent in the winter months and the rainy season (Cherry, 1998a). Close contact at home among family members also facilitates the transmission of viruses causing the common cold. While it is a mild disease, early management is important to prevent occurrence of a secondary bacterial infection, such as pneumonia, in the lower respiratory tract (Cherry, 1998a).

Pharyngitis is an inflammatory process affecting the mucus membranes and the underlying structures of the throat (Cherry, 1998b). The most common complaint of pharyngitis is a sore throat (Evans & Misser, 1999). Guidelines in Indonesia categorize children as having streptococcal pharyngitis if they have cervical lymph enlargement, pain on palpation, and throat exudate (PPM & PLP, 1993a). Group A Streptococcus (GAS) has been identified as a major cause of acute bacterial pharyngitis in both developed and developing countries (Steele, 1999). There are four reasons why pharyngitis must be treated early in toddlers: to prevent rheumatic fever, to reduce suppurative and toxin-producing complications, to shorten the duration of acute illness, and to control the transmission of GAS. GAS is commonly found in the upper respiratory tract. This location facilitates the spread of infection (Evans & Misser, 1999) which can occur either endemically or epidemically (Johnson et al., 1996). Early detection of these infections is critical in preventing further complications, particularly spreading to the lower respiratory tract and resulting in pneumonia. Furthermore, GAS, as a secondary infection which causes pneumonia, is common in children with viral infections such as measles, chicken pox, and influenza (Klein, 1998a). Although an immunology laboratory plays a major role in establishing a diagnosis of GAS infections by using blood samples (Johnson et al., 1996), McIsaac and Tannenbaum (1998) suggested using a reliable and valid clinical sore throat score to reduce invasive laboratory examination procedures.

Acute otitis media (AOM) is an acute infection in the middle ear that occurs rapidly with the onset of signs and symptoms (Bluestone & Klein, 1995): these are easily recognized and include otalgia (ear pain), fever, and purulent discharge. Infants with AOM may be irritable, look distressed, cry, have diarrhea and have feeding problems (Bluestone & Klein, 1995; Klein, 1998b). In Indonesia, children are categorized as having AOM if they have purulent ear drainage less than two weeks after infection, earache, and redness as well as stiffness of the eustachian tube. AOM is more commonly caused by bacteria than by viruses, with *Streptococcus pneumoniae* and *Haemophilus in Fluenzae* as the principal causes (PPM & PLP, 1993a). Several factors which may contribute to the increased incidence of AOM in infants and young children have been identified by one study of a North American population. These include the immature anatomy of the eustachian tube, an immature immune system, allergies, and the child's environment, such as living in a day care center, lack of breast feeding, and exposure to passive smoke (Bluestone & Klein, 1995; Klein, 1998b). However, children who are exposed to an environment of people diagnosed with an upper respiratory tract infection commonly suffer AOM as a complication. Common complications of AOM are impaired hearing, impeded speech development, all of which make learning difficult (Bluestone & Klein, 1995).

Phelan et al. (1994) defined pneumonia as an acute inflammation with the following signs: consolidation of alveoli, infiltration of lung interstitial tissue with inflammatory cells, and a combination of both consolidation and infiltration pathologically. In Indonesia, pneumonia is defined as a pulmonary inflammation that is caused by bacteria, virus, fungi, or a foreign body (Staf Pengajar IKA, 1985). Viral infections can initiate a secondary infection such as pneumonia. In developing countries, the early colonization of bacteria in the upper respiratory tracts of young children facilitates the incidence of pneumonia. The most common causes of pneumonia are RSV, Adenovirus, Parainfluenza 3, *Streptococcus pneumoniae*, and *Haemophilus influenzae* type B (Ghafoor et al., 1990; Hortal et al., 1990; Hussey et al., 2000; Tupasi, Lucero et al., 1990).

2. The Incidence of ARI in Indonesia

In developing countries such as Indonesia, Bangladesh, and Pakistan, ARI is very common in infants and young children (Khan, Rehman, & Qazi, 1990; Stewart, Parker, Chakraborty & Begun, 1994; Grace, 1998). Selwyn (1990) reported that among ten countries the incidence rate per 100 child-weeks at risk for ARI in children under five years of age are in the range of 12.7 (in Kenya) to 27.5 episodes (in Thailand). There is no comparable data for Indonesia. However, it has been estimated that Indonesian children under five years of age have three to six cough and cold episodes per year (PPM & PLP, 1998). ARI is also a main reason for patient visits to health care services. About 40.0-60.0% of community health center visits and 15.0-30.0% of visits to hospital out-patient clinics by children less than five years of age (PPM & PLP, 1998) are due to ARI. However, as many developing countries use the terms pneumonia and ARI interchangeably, the interpretation of data is often difficult.

In Indonesia and other developing countries such as the Philippines and Thailand, ARI is classified according to WHO guidelines into no pneumonia, pneumonia, and severe pneumonia (Tupasi, Leon et al., 1990; Vathanophas et al., 1990), and almost all available data of ARI in Indonesia are related to pneumonia (PPM & PLP, 1998). In relation to research studies, each country may modify the WHO ARI guidelines according to the evidence from the signs and symptoms of ARI in that particular country.

The morbidity in children with pneumonia under five years of age in Indonesia is illustrated in Table 1. Each year 4.0-7.0% of Indonesian children under five years of age suffer from pneumonia. The proportion of children with pneumonia was similar in 1995 and 1996, but decreased in 1997. However, because of poor reporting, the accuracy of the data is questionable.

Table 1: ***Pneumonia Cases in Children Under Five Years of Age (in thousands) in Indonesia***

Year	1990	1992	1994	1995	1996	1997
Cases	159.9	950.9	1.200.4	1.197.3	1.383.7	834.4
Total children	no data	no data	no data	19.621.5	20.182.1	20.671.3
Proportion*	**no data**	**no data**	**no data**	**6.1%**	**6.9%**	**4.0%**

*number of cases / total number of children x 100
Source: PPM & PLP. 1998

Not all of the children under five years of age with pneumonia require hospitalization since mild pneumonia can be treated at home. Children with severe pneumonia, however, must be treated in hospital (PPM & PLP. 1998). The proportion of pneumonia cases that were treated at home and in hospital is summarized in Tables 2 and 3 for infants younger than one year of age and children aged 1–4 years, respectively.

As described in Tables 2 and 3, the proportion of infants with pneumonia requiring hospitalization is consistently greater than the proportion of children 1–4 years of age with pneumonia. While the sharp increase in the number of infants younger than one year of age hospitalized with pneumonia in 1995 is unexplained, the proportion of cases requiring hospitalization was similar to those of other years.

Table 2: ***Pneumonia Cases in Infants (0-1 year) Treated at Home and in Hospital in Indonesia***

Year	Total cases	Treated at home	Treated in hospital	Proportion treated in hospital*
1994	107.404	101.188	6.216	**5.8%**
1995	110.216	100.162	10.054	**9.2%**
1996	110.549	104.115	6.434	**5.8%**
1997	66.027	62.411	3.616	**5.5%**

*Proportion = number of cases treated in hospital/ total number of cases x 100
Source: PPM & PLP. 1998

Research from developing countries also suggests that. when analyzing incidence rates of ARI in infants and children (1-4 years of age). infants often are at an increased risk for an illness. Selwyn (1990) reported on age-specific incidence rates for ARI per 100 child-weeks at risk and indicated that infants younger than one year of age have higher incidence rates. in the range of 9.8 (in Colombia) to 36.1 (in Thailand). as compared to children 1-4 years of age. in the range 5.8 (in Uruguay) to 32.4 (in Thailand). Oyejide and Osinusi (1990) also reported that in Nigeria infants younger than one year of age with ARI have incidence rates 7.5 - 7.6 times higher than children 1-4 years of age.

Table 3: ***Pneumonia Cases in Children (1-4 years) Treated at Home and in Hospital in Indonesia***

Year	Total cases	Treated at home	Treated in hospital	**Proportion treated in hospital***
1994	167.244	163.028	4.216	**2.5%**
1995	164.101	159.219	4.882	**3.0%**
1996	163.742	159.407	4.335	**2.6%**
1997	98.045	95.429	2.616	**2.7%**

* number of cases treated in hospital/ total number of cases x 100
Source: PPM & PLP, 1998.

The severity of the problem is indicated by fatality rates for severe ARI in children 1-4 years of age: these are ten times higher in developing countries than in developed countries (Oyejide, 1986). In Indonesia, respiratory system disease is also a major cause of mortality in children under five years of age, accounting for 30.8% of deaths in this age group, as shown in Table 4 (Departemen Kesehatan, 1995).

Table 4: ***Causes of Mortality in Children Under Five Years of Age in Indonesia***

Ranking	Types of disease	Proportion*
1.	Respiratory system disease	**30.8%**
2.	Perinatal disorder	**21.6%**
3.	Diarrhea	**15.3%**
4.	Other infection	**6.3%**
5.	Neural system disease	**5.5%**
6.	Tetanus	**3.6%**
7.	Other combined	**16.9%**

*Proportion of all deaths in children under five years of age
Source: Departemen Kesehatan, 1995

Although Table 5 shows that the proportion of deaths due to ARI in children 1-4 years of age decreased between 1980 and 1992, respiratory disease still represents an important cause of mortality. In comparison, the proportion of deaths in infants in 1992, 36.4%, had doubled in comparison with children 1-4 years of age, 18.2%. In general, the infant population is more at risk for death from ARI than children older than one year of age. The limited amount of data makes interpretation difficult.

Table 5: ***Proportion of Deaths Caused by ARI in Children Under Five Years of Age in Indonesia***

Year	Age	
	Infant (0-1 year)	Children (1-4 years)
1980	22.10 %	28.80 %
1986	18.85%	22.88%
1992	36.40 %	18.20 %

Source: PPM & PLP, 1998

Table 6: ***Proportion of Pneumonia Cases Treated in Hospital in Children Under Five Years of Age in Indonesia***

Province	Pneumonia cases	Treated in hospital	Proportion of cases treated in hospital*
East Java	163.759	4.277	**2.61%**
West Java	85.890	2.202	**2.56%**
Central Java	20.505	no data	**no data**
Bali	18.349	1.233	**6.71%**
South Sulawesi	17.849	386	**2.16%**
Other provinces	52.250	1.863	**3.56%**
Total	358.529	9.961	**2.77%**

*number of pneumonia cases treated in hospital/ total number of pneumonia cases x100
Source: Departemen Kesehatan, 1999a

So far, the data presented has been for all of Indonesia but Tables 6 and 7 present the data related to each province, for the incidence of children hospitalized for pneumonia and the incidence of those who died. Table 6 shows that while the province of Bali had one of the lowest incidences of pneumonia, it had the highest proportion of cases treated in hospital, 6.71%. The proportion of hospital-treated cases was similar throughout the other provinces.

Table 7: ***Case Fatality Rate of Pneumonia Cases Treated in Hospital in Children Under Five Years of Age in Indonesia***

Province	Cases	Death	Case fatality*
East Java	4,277	no data	**no data**
West Java	2,202	405	**18.4%**
Central Java	no data	no data	**no data**
Bali	1,233	73	**5.9%**
South Sulawesi	386	81	**21.0%**
Other provinces	1,863	209	**11.2%**
Total	9,961	768	**13.51%**

*number of deaths of cases total number of pneumonia cases treated in hospital x 100
Source: Departemen Kesehatan, 1999a.

As shown in Table 7, the case fatality rate in West Java was the second highest of all provinces, 18.4%, compared to a total case fatality rate of 13.51% (range: 5.9-20.9%). Thus, deaths from pneumonia were a major concern in West Java. The high case fatality rate in West Java may be attributed to the use of traditional birth attendants (dukun) (Kresno, Harrison, Sutrisna, & Reingold, 1994). In rural areas, the dukun are often the first people consulted rather than educated health care providers for the treatment of infants younger than one year of age.

Although the data presented indicates that pneumonia is a major problem, the validity and reliability of morbidity and mortality data related to pneumonia are questionable. A common limitation in collecting data is under-reporting (PPM & PLP, 1998). For example, communication problems may emerge when the interviewer uses a different language or dialect (PPM & PLP, 1998). In addition, the stigma of pulmonary disease, primarily tuberculosis (TB), may cause under-reporting. People with respiratory infections often do not want to be identified because of the possibility of having TB, a disease perceived to be related to poverty. Finally, not all villages or districts have the infrastructure or human resources for collecting and reporting data (PPM & PLP, 1998)

To monitor the progress of the national ARI program, Indonesia used four sources of data: acute respiratory infection program survey, household survey, Indonesia demographic and health survey, and health facility survey (PPM & PLP, 1998). Although these surveys used a similar case definition in collecting data about ARI, these data cannot be compared easily since the surveys used differing methods of data collection.

In addition, the accuracy of diagnosis further limits the data's validity and reliability. Inadequate knowledge and skills of health care providers, and inadequate facilities and equipment for establishing ARI diagnosis contributes to inaccuracy (PPM & PLP, 1998). Underfunded or poorly supported studies which use dissimilar methods and definitions are common in developing countries and present many difficulties in providing accurate, reliable data.

In summary, the incidence of ARI and pneumonia in Indonesia is similar to the incidence rates in other developing countries and represents a significant health issue (Selwyn, 1990; Oyejide & Osinusi, 1990). The incidence of pneumonia is higher in infants younger than one year of age than in children one to four years of age; this is also common in other developing countries (Deb, 1998; Hortal et al., 1990). Finally, the problems associated with collecting data and carrying out research projects also present challenges to be overcome.

3. Risk Factors for ARI in Children Under Five Years of Age

The conceptual framework, the host factors, and the environmental factors will be described in this section.

3.1. Conceptual Framework

This study used the concept of the chain of infection to understand the transmission of ARI and the HPM as the framework for determining whether the modification of risk factors is feasible. Once the risk factors for ARI are identified, they can then be modified, thereby reducing or diminishing the barriers to healthy behaviour. These modifications can then be taught to parents, caregivers, or community health workers (cadres) (Pender, 1996), or otherwise implemented.

The chain of infection consists of three parts: the reservoir, transmission and the susceptible host (Puhlman, 2000). The human, as a reservoir, transmits or receives pathogens via nasal droplets which enter or exit the body via the respiratory tract. This transmission can occur either directly or indirectly. Direct transmission occurs when an infected human and a susceptible host make direct contact through sneezing, coughing, or talking. Indirect transmission occurs when the susceptible host inhales infected nasal droplets that were deposited on inanimate objects such as clothing and bedding.

A susceptible host is a key part of the chain of infection. Host factors such as age, malnutrition, vitamin A deficiency, and asthma history also influence the host's predisposition to common illnesses such as ARI. In addition, children under five years of age, specifically infants younger than one year of age, are at risk for infection because of an immature immune system. Malnutrition also decreases a child's ability to defend itself against pathogens. Children with protein energy malnutrition and vitamin A deficiency have defects in cell-mediated immunity, impaired intracellular killing by neutrophils causing an inadequate response to infection, reduced complement activity which allows greater penetration of infectious agents, and decreased production of IgA (Ross, 1996). Finally, children with asthma have bronchial hyperactivity of the airways from a variety of stimuli, with a high degree of reversibility of the obstructive process either spontaneously or as a result of treatment (Mutius & Martinez 1999; Godfrey, 1993).

Immunization is one of the strategies that will reduce host susceptibility. Children who are completely immunized have the ability to produce antibodies which destroy the microorganisms causing specific diseases (Puhlman, 2000). This lessens their risk of developing a secondary infection such as pneumonia which is a common sequella when a child is not immunized or is incompletely immunized. Actually, being fully immunized will not protect against all ARIs, but complete immunization may protect against more serious illness such as diseases that caused by *Haemophilus influenzae* or *Streptococcus pneumoniae*.

The environmental factors which contribute to the chain of infection include risk factors such as overcrowded living conditions and outdoor or indoor pollution (Puhlman, 2000). Both direct or indirect transmission of pathogens may occur more easily in overcrowded conditions; transmission can be disrupted by handwashing and environmental cleaning. Furthermore, sulfur and nitrogen dioxide, from indoor pollution in the kitchen, may irritate and adversely affect the function of airways in children who are exposed to respirable particulate matter (O'Dempsney et al., 1996), increasing susceptibility to infectious agents.

Biological characteristics may contribute to susceptibility. Children who have low immunity, for example, malnourished children, will more easily develop ARI than children who have high immunity. Demographic factors such as education and income may also contribute to environments or behaviour that promote transmission. For example, the parent who has a low level of education may not understand how ARI can be transmitted to others.

The HPM is a more complex model than the chain of infection so it is better able to help identify what factors can be addressed to reduce susceptibility and transmission. The HPM emphasizes the cognitive aspect that can influence the regulation of healthy behaviour (Pender, 1987, 1996). Determinants of health are categorized into modifying factors, cognitive-perceptual factors and cues to action. Modifying factors include demographic, biologic, interpersonal, situational, and behavioural factors. Cognitive-perceptual factors are composed of perceived control of health, perceived self-efficacy, definition of health, perceived health status, perceived benefits of and barriers to health-promoting behaviours. Cues to action are factors which determine or support the likelihood of engaging in health-promoting behaviours. The Health Promotion Model can be found in Appendix A.

The HPM is useful for this study because the components of the chain of infection can be integrated into the HPM. Factors influencing the susceptibility of the host include immunization and nutritional status, which would be considered part of demographic factors and biological characteristics. Demographic factors such as children's ages, mothers' education, level of income, and ethnicity cannot be modified but can indirectly influence the cognitive-perceptual factors of the parents in health-promoting behaviour. Environmental factors include indoor pollution from kitchen smoke, the type of stove and fuel used for cooking, the possibility of ventilation for the stove, the feasibility of opening windows, and overcrowded conditions. Finally, behavioural factors include the mother's habit of carrying her child while she cooks, parental smoking habits, and personal hygiene such as hand washing.

In addition, the cognitive-perceptual factors of interest are perceived barriers to health-promoting behaviours which may include a lack of information and the impact of the culture. For example, isolating an individual from others and wearing a face mask when in contact with people with ARI is considered impolite in rural Indonesian communities. Moreover, the lack of appropriate information is a problem. It has been found that some mothers will ingest the drugs prescribed for their infants, believing that the drugs are too strong to be given directly to the child but will be passed to the infant through breast milk. The infant thus receives an ineffective dose, if any (Kresno et al., 1994).

The HPM is useful in the study as a means of assessing host, environmental, and behavioural factors as potentially modifiable risk factors for ARI. Furthermore, health education or health promotion programs may be established, thereby facilitating the feasibility of modifying risk factors. One study tested the HPM as a causal model of workers' use of hearing protection by modifying factors such as job category and situational factors. The model was used to explain the direct effect of using hearing protection equipment (Lusk, Ronis, Kerr & Atwood, 1994).

3.2. Host Factors

A variety of host risk factors contributing to the increased risk of ARI in children under five years of age have been identified in Indonesia, Gambia, Philippines, and Argentina. These include: **young age** (Berman, 1991a; Tupasi, Lucero et al., 1990; WHO, 1983), **malnutrition** (Deb, 1998; O'Dempsney et al., 1996; Rahman & Rahman, 1997; Tupasi, Leon et al., 1990, Tupasi, Mangubat et al.1990; Yoon, Black, Moulton & Becker, 1997), **vitamin A deficiency** (Berman, 1991a; Bloem et al., 1990; Chytil, 1996; Dudley, Hussey, Huskissen & Kessow, 1997; Semba, 1999; Sommer, Tarawotjo & Hussaini, 1983; Sommer, Katz & Tarawotjo, 1984), **incomplete immunization** (Cerqueiro, Murtagh, Halac, Avila & Weissenbacher, 1990; Deb, 1998; Garenne, Ronsman & Campbell, 1992), and **a history of frequent ARIs or a serious recent infection** (Cerqueiro et al., 1990; Dudley et al., 1997; O'Dempsney et al., 1996).

O'Dempsney et al. (1996) conducted a descriptive, case-control study in a rural area of Gambia, West Africa, to identify the risk factors for pneumococcal disease. Eighty cases with a recent diagnosis of pneumococcal disease were found among children who attended outpatient and "under-fives" clinics. Healthy controls (n=159), age-matched to the cases, were randomly selected from the local community. A questionnaire was used to investigate possible nutritional, medical, socio-economic and environmental risk factors for pneumococcal disease. These researchers found a statistically significant association between the risk of pneumococcal disease and poor weight gain or a history of serious illness in the previous six months. The risk of pneumococcal disease was increased if the child had a flat or falling weight curve on the welfare health card. A significant association was also found between an increased risk of pneumococcal disease and a low z-score value of weight as it relates to height and weight for a specific age group. In addition, children who had a previous infection, such as pneumonia or other acute lower respiratory infection (ALRI), were at a statistically greater risk for pneumococcal disease. However, O'Dempsney et al. failed to find an association between age and pneumococcal disease.

Another group of researchers also found that host conditions such as bronchial hyperactivity and the presence of persistent symptoms of upper respiratory tract disease were related to an increased risk of ALRI (Cerqueiro et al., 1990). A prospective, matched case-control study was used by these researchers in Buenos Aires, Argentina, to explore the epidemiologic risk factors for children with ALRI. A total of 669 cases (516 inpatients and 153 outpatients) were matched with healthy controls recruited from children who attended the hospital for vaccination in a well-baby clinic. This study used the matched odds ratio (OR) as an estimate to predict the risk of developing ARI. The study reported that host conditions such as a previous infection, especially pharyngitis, acute otitis media, current asthma, and bronchial hyperactivity were significantly related to the risk of developing ARI for both groups. This is a well-designed study that used a large sample size, appropriate sample selection techniques, and reliable and valid instruments. However, while they used trained personnel for data collection, they did not use health personnel.

In another study, young age and malnutrition were found to be statistically significant risk factors for increasing ARI morbidity (Tupasi, Leon et al., 1990; Tupasi, Mangubat et al., 1990). A prospective cohort study was used in an economically depressed community, located in an urban village in the Philippines, to identify the etiologic agents responsible for ALRI and to determine the risk factors that predispose children to ARI morbidity. A total of 1,978 children, 1,022 boys and 956 girls, were enrolled in the two-year study. The sample included low income households with one or more children younger than five years of age. The sample of households was randomly selected by a multistage sampling method. A cross-sectional interview was used to obtain socio-demographic data and children's morbidity was conducted by nurses and a medical technologist trained in interviewing techniques who visited the households once weekly. A child was considered to have ARI if two or more of the following signs and symptoms were reported or observed: nasal discharge, sore throat, cough, and/or hoarseness. These researchers reported that children less than two years of age had a greater risk of acquiring ARI as compared to older children, and the risk was significant (OR = 1.27, 95% Confidence Intervals (CI) = 1.22, 1.32). In the same study, Tupasi, Mangubat et al. looked at malnutrition as a risk factor for increased ARI. Anthropometric measurements such as height and weight were obtained during a home visit. Monitoring of ARI significant risk ratios were noted for children with weight for age z-scores of less than -4 standard deviations (OR = 3.22, 95% CI = 1.51, 6.87), less than -3 standard deviations (OR = 2.52, 95% CI =1.32, 4.81), and less than -2 standard deviations (OR = 2.00, 95% CI = 1.04, 3.85), as compared with those with more than or equal to -2 standard deviations. However, this study was unable to show the effects of malnutrition on ARI morbidity. Other researchers also found a significant association between malnutrition status and the risk of diarrheal and respiratory morbidity and mortality (Deb, 1998; Rahman & Rahman, 1997; Yoon et al., 1997).

Sommer et al. (1984) conducted a prospective, longitudinal study for 18 months in Indonesian preschool children to explore the impact of mild vitamin A deficiency and the development of respiratory disease and diarrhea. The subjects in this study were selected from families with at least one child below seven years of age. During home visits in six rural villages of Purwakarta District, West Java, Indonesia, a questionnaire was used to obtain data about medical history, weight and height, general health, and eye health every three months. The incidence rates for respiratory disease and diarrhea were calculated separately for each three-month interval stratified by the presence or absence of mild xerophthalmia, an indicator of vitamin A deficiency, at the start and end of that interval.

The results indicated that children with mild xerophthalmia at the start and end of a three-month interval developed respiratory disease and diarrhea two and three times more frequently, respectively, than children with normal eye health during the same interval, independent of age and anthropometric status. However, the magnitude of an increased risk of respiratory disease and diarrhea associated with mild vitamin A deficiency is questionable, since all children were not examined at both the start and the end of the study period. Other researchers have also found that the deficiency of vitamin A has been specifically associated with an increased ALRI morbidity (Sommer et al., 1983). Bloem et al. (1990) found that children in Thailand with deficient serum retinol have a fourfold greater risk of respiratory disease ($p < .01$); in an intervention trial, children in a control group were 2.9 and 3.1 times more likely to have a higher incidence of respiratory disease and diarrhea, respectively, compared to those in the intervention group. Vitamin A status was also found to have a strong relationship with the severity of ARI (Dudley et al., 1997). Chytil (1996) and Semba (1999) have documented the role of vitamin A and immunity.

The effect of immunization has also been investigated. Cerqueiro et al. (1990) reported that incomplete vaccination proved to be a significant risk factor for inpatients with ALRI (OR = 2.90, 95%CI = 2.2, 3.9). Incomplete Diphtheria, Pertussis, and Tetanus (DPT) and measles vaccine were the most significant risk factors for ALRI (OR = 4.4, 95% CI = 2.4, 8.3; OR = 2.4, 95% CI = 1.5, 3.9, respectively). One study, for example, showed that pneumonia, as a secondary infection after measles, caused 30% of deaths in children under five years of age in Senegal (Garenne et al., 1992). One study by Deb (1998) reported that immunization also had a protective role in pneumonia.

3.3. Environmental Factors

Researchers have identified numerous environmental risk factors for ARI in children under five years of age; these include **families with more than four siblings** (Cerqueiro et al., 1990), **more than four people sharing a child's bedroom** (Cerqueiro et al., 1990; Tupasi, Leon et al., 1990), **overcrowding** (Berman, 1991a; Cerqueiro et al., 1990; Rahman & Rahman, 1997; Tupasi, Leon et al., 1990; Wesley & Loening, 1996), ETS (Chen, Li, Yu & Qian, 1988; EPA, 1992; Morris, Morganlanders, Coulehan, Gahagen & Arena, 1990; Tupasi, Leon et al., 1990), **kitchen smoke** (Armstrong & Campbell, 1991; Berman, 1991a; DeFransisco, Hall, Armstrong & Greenwood, 1993; Pandey et al., 1989; Robin et al., 1996), and **mothers carrying their children while cooking** (Armstrong & Campbell, 1991; Azizi & Henry, 1991; DeFransisco et al., 1993; O'Dempsney et al., 1996; Pandey et al., 1989).

Researchers have identified a relationship between the exposure to indoor pollution and lower respiratory infections in young Gambian children (Armstrong & Campbell, 1991; O'Dempsney et al., 1996). Armstrong and Campbell (1991) conducted a cohort study, following approximately 500 Gambian children under five years of age for one year. These children were visited weekly and examined for signs of ALRI, with the diagnosis based on both clinical and radiological signs. Cross-sectional surveys were also conducted to measure the possible risk factors for ALRI at the beginning and end of the study. The study found that three risk factors-- parental smoking, the child being regularly carried on the mother's back while she cooked, and smoking in the room when the child slept-- were significantly associated with ALRI. However, the authors noted that the validity of the examination of ALRI may be questionable since not all the children were followed up for an equal length of time. A significant relationship between carrying the child on the mother's back when she was cooking and a risk of pneumococcal disease was similarly reported by O'Dempsney et al. (1996). Other researchers also found that children were carried by mother while cooking were significant to a high incidence of ARI (Azizi & Henry, 1991; DeFransisco et al., 1993; Pandey et al., 1989)

Tupasi, Leon et al. (1990) also found that children with parents who smoked, compared to those with parents who did not smoke, were significantly more likely to have increased ARI morbidity (OR = 1.09, 95% CI = 1.03, 1.16). These researchers also reported that children from crowded households with six or more people sleeping together, compared to those with three or fewer people sleeping together, were significantly more at risk (OR = 1.12, 95% CI = 1.05, 1.20). Other researchers (Rahman & Rahman, 1997; Wesley & Loening, 1996) also found a significant relationship between overcrowding and a high incidence of ARI. However, O'Dempsney et al. (1996) were not successful in associating domestic crowding or a recent exposure to large crowds at social gatherings or clinics with the increased risk of pneumococcal disease.

Chen et al. (1988) conducted a study of passive smoking and children's respiratory diseases. The effect of household exposure to cigarette smoke on hospitalization and the incidence of respiratory illness was examined among 2227 children at Chang-Ning District Shanghai Municipality, People's Republic of China. The quantity of passive smoke was estimated by determining the total daily cigarette consumption of family members and the number of cigarettes smoked at home. The incidence density ratio of hospitalization for respiratory illness was 2.1 for children living in families with people who smoked 20 or more cigarettes a day compared with those living in non-smoking families. A child was more vulnerable in the first six months of life than at age seven to 18 months. Vulnerability was also higher in those with low birth weight. Further, children who were artificially fed were more susceptible to respiratory disease. However, Chen et al. (1988) only used one indicator, the number of cigarettes, to measure the effect of ETS on the frequency of hospitalization and the incidence of respiratory illness. In North America, one research study indicated that infants and children up to 18 months of age who were exposed to ETS had 1.6–4 times greater risk of experiencing lower respiratory infection compared to non-exposed infants and children (EPA, 1992).

DeFransisco et al. (1993) conducted a case-control study in young Gambian children to evaluate the risk factors for death from ALRI. Subjects were children aged two years of age whose main cause of death was attributed to ALRI. The control group were children whose main cause of death was from a cause other than ALRI. Two live control groups were chosen for each case. Matching was done by age, sex, ethnic group, season of death, and geographical data. There were 129 subjects, 144 dead controls, and 270 live controls. A detailed questionnaire which covered the potential risk factors for death from ALRI was administered to families of subjects and controls as soon as possible after the death of a child. The questions were grouped to form scores that addressed the variables of socio-economic status, indoor pollution, the type of cooking fire used, whether or not the mother carried the child when she cooked, parental smoking habits, and the degree of overcrowding.

These researchers found that exposure to smoke during cooking, parental smoking, and exclusive, prolonged breast feeding were associated with an increased risk of death from ALRI. A comparison of children who died from causes other than ALRI with the live controls showed a similar pattern of association but no significant differences were found in any risk factors. The association of death with exposure to smoke during cooking was the strongest risk factor identified. However, the authors noted that the study had poor sensitivity and instrument specificity. The signs and symptoms between children with ALRI and other than ALRI overlapped, causing difficulties in interpreting the results.

Another group of researchers (Morris et al., 1990) did a case-control pairs study of the effect of wood-burning stoves and the incidence of lower respiratory tract infection in native American children to test the hypothesis that the use of wood-burning stoves at home was an independent risk factor for ALRI in children younger than two years of age. These researchers studied Navajo children diagnosed with pneumonia and bronchiolitis who were recruited from the Tuba City hospital outpatient clinic or emergency department. Case children were those with a diagnosis of bronchiolitis or pneumonia, and control children were those who had no acute infectious disease and no history of ALRI.

They used 81 cases and 69 controls but only 58 age- and sex-matched pairs. A structured questionnaire was used to assess the primary source of energy for heat and cooking in each household. Other environmental factors assessed included exposure to other people with recent respiratory illness, the number of people in the household, the number of rooms, other home characteristics (dirt floor, running water), use of humidification, and the presence or absence of cigarette smoke or pets in the home.

This study reported that the use of a wood-burning stove, recent exposure to respiratory illness, a family history of asthma, dirt floors, and a lack of running water in the house increased the risk of ALRI (Morris et al., 1990). Furthermore, only two risk factors that remained in the model in this study-- the use of a wood burning stove (p = .003, OR = 4.85, 95% CI = 1.69 - 12.91), and exposure to respiratory illness (p = .004, OR= 4.23, 95% CI = 1.58 - 11.30)-- were independently associated with a high risk of ALRI. However, the authors noted that the selection of the controls may not have been accurate and may have biased the study. Incomplete medical records and the mother's faulty memory also affected the data collection. The sample characteristics may also influence the results of this study which was not representative of all Navajo and Hopi children. Another researcher also found that children who live in houses which use a wood-burning stove for cooking have a higher risk of ALRI (Robin et al., 1996).

In another study, the family's environment was also considered a risk factor for ALRI (Cerqueiro et al., 1990). The occurrence of acute respiratory tract disease, such as a "bad cold" or upper ARI, and chronic respiratory tract disease in family members was

1.6 - 5.6 times higher among both inpatient and outpatient cases than in the control group. These researchers also identified that more than four siblings, bed sharing, and crowding were risk factors for ALRI. Findings relating to these conditions indicated that subjects with more than four siblings had an odds ratio that was increased among both inpatients (OR = 2.4, 95% CI = 1.8, 3.1) and outpatients (OR = 2.4, 95% CI = 1.4, 4.2) with ALRI. The odds ratio in inpatient cases was also significantly increased for crowding (OR = 2.0, 95% CI = 1.2, 3.5) and bed sharing (OR = 2.3, 95% CI = 1.8, 3.0).

Another study suggests connections between ARI and cultural practices/ beliefs. Kresno et al., (1994) conducted an ethnographic study in a rural area of West Java, Indonesia, to identify local beliefs, perceptions, and practices surrounding ARI in infants and young children. Data were collected through selecting the geographical areas which have a high ARI pattern. Structured interviews were used with 50 mothers who sought health care for an infant or young child with a respiratory illness. This study found that the most commonly perceived causes of ARI were a chill which entered the body, exposure to a draft or breeze, or a change of weather. The mothers recognized both difficult and rapid breathing as "difficulty breathing". They were more concerned with fever than with difficulty breathing. Effective treatment was more likely delayed for infants than for older children. Sick infants were taken to an indigenous healer as the first choice provider. Infants also tended to receive an ineffective drug dose if the appropriate medication was prescribed as mothers commonly ingested the drugs in order to deliver them to the infants through their breast milk.

4. Summary

Although in a review of the literature, there is no specific definition of ARI which is used world wide, in Indonesia, ARI is defined as an infection that occurs in the respiratory tract and lasts less than 14 days. The most common causes of ARI are RSV, Parainfluenza virus, Influenza virus types A and B, Adenovirus, *Streptococcus pneumoniae*, *Haemophilus influenzae*, and *Staphylococcus aureus*. The more common illnesses in Indonesia are common colds, pharyngitis, otitis media, and pneumonia.

In 1992, 36.40% of deaths in Indonesia infants (0-1 yr) and 18-20% of deaths in Indonesia children (1-4 yrs) were caused by ARI. The province of West Java is the one province that is most concerned with this problem. In 1999, the case fatality rate of hospital treated ARI, primarily pneumonia, was 18.4%. Although ARI is a major problem in Indonesia, the incidence data are not reliable. Furthermore, the incidence of ARI and pneumonia in Indonesia is similar to the incidence rates in other developing countries and represents a significant health issue (Selwyn, 1990; Oyejide & Osinusi, 1990). The incidence of pneumonia is higher in infants younger than one year of age than in children 1-4 years of age; this has also been found in other developing countries (Deb, 1998; Hortal et al.,1990). Finally, the problems associated with collecting data and carrying out research projects also present challenges to be overcome.

Investigators in many developing countries have identified numerous risk factors associated with the host and the environment that contribute to the incidence of ARI. These include age, nutritional status, immunization status, vitamin A deficiency, overcrowding, home indoor pollution such as ETS, bio fuel smoke including firewood and kerosene smoke, and a previous history of ARI.

The chain of infectious processes related to ARI needs to be understood. The host, infectious agent, and environmental factors determine the occurrence of ARI. While the infectious agent is not a modifiable risk factor, modification of the host and environmental factors may be feasible. The HPM will be useful in a study assessing the host factors, environmental factors, and behavioural factors as potentially modifiable risk factors for ARI.

To date in Indonesia no studies related to the risk factors for ARI have been carried out in children under five years of age. Identification of the host, environmental and behavioural risk factors for ARI that may be feasibly modified might provide significant information in determining an effective strategy for health promotion or health education in the rural communities, so that some of the risk factors for ARI can be controlled.

Chapter 3: Methodology

An overview of the methodology used in this study will be described first. This will be followed by details of the study design, definitions, the study population and setting, the sample selection, the sample size, the data collection procedure, instruments, ethical considerations, and data management and analysis.

1. Overview of the Study Design

This descriptive exploratory study used a cross-sectional design. Subjects consisted of children younger than five years of age and their parents who lived in the participating villages of Cibentang and Kuripan. A total of 120 parent-child dyads were interviewed using structured questionnaires with open-ended questions. Data were obtained about the frequency of ARI as the dependent variable of interest, as well as the independent variables of the parents' and children's demographic characteristics, the medical history of the children, the children's home environment, and the utilization of health services. Fisher's Exact Test (FET) and logistic regression were used to assess the statistical significance of the relationships between these variables. The feasibility of modifying the risk factors was also assessed.

2. Definitions

The terms used in this study are defined as follows:

Acute Respiratory Infection (ARI): Children were categorized as having ARI if they had at least two of the following signs and symptoms: nasal discharge, cough, sore throat, ear pain, ear drainage, hoarseness, chest indrawing, cyanosis, and lung sound disorders such as crackles or wheezing.

High frequency of ARI: Children were categorized as having a high frequency of ARI if they had more than six ARI episodes in the previous year.

Low frequency of ARI: Children were categorized as having a low frequency of ARI if they had six or fewer ARI episodes in the previous year.

Complete and incomplete immunization for a specific age group: The usual immunization schedule is DPT at two months, three months, and four months of age, with measles at nine months of age. Parents were asked which immunizations had been received and this was compared to the usual schedule. Those children who had received all immunizations due for their age group were categorized as having complete immunization, otherwise they were categorized as having incomplete immunization for their age group.

Complete and incomplete vitamin A supplementation for a specific age group: Children were categorized as having complete vitamin A supplementation if they had received vitamin A twice during one year for all children older than one year of age or once for infants younger than one year of age. Otherwise, children were categorized as having incomplete vitamin A supplementation if they had vitamin A once for children older than one year of age or had never received vitamin A after six months of age. Infants younger than six months of age were identified as receiving no vitamin A, rather than being categorized as having incomplete vitamin A supplementation for their specific age group. Vitamin A was given orally.

Cadres (community health workers): Cadres were usually women from the local community who were considered to have adequate ability to support health care providers in conducting health programs. Most of them had received training for common health problems and management. Cadres were responsible for the activities of the Posyandu.

Posyandu (village health services): Community-run mother-and-child programs provided by health professionals such as midwives and nurse practitioners who were assisted by cadres. These programs were available once per month, and included nutrition, diarrhea control, immunization, maternal and infant care such as simple treatment, and health education (Sciortino, 1995; United Nations, 1998).

Puskesmas (community health services): Health services available in the community and run for community members of all ages. Health professionals who were in charge as health care providers consisted of physicians, midwives, and nurse practitioners. As the center of health services, the Puskesmas were responsible for the health status of the villages. The Puskesmas had a number of improvement programs that involved health promotion, prevention, and education.

Normal weight and underweight: These two categorizations were based on curves identified in *Buku kesehatan ibu dan anak* (Departemen Kesehatan, 1999b). In this book, nutrition status is determined by the color of the curve in the health welfare card (Appendix B). Children were categorized as being of normal weight if their weight was in the green area on the chart; underweight if it was below the green area; mildly underweight if it was in the yellow area; and severely underweight if it was under the red line.

3. Study Population and Setting

The participants in this study were recruited from the rural area of West Java, specifically from Cibentang and Kuripan villages, in the sub-district of Parung, Bogor district. These villages are under the management of Puskesmas Putat Nutug. In 1998, these two villages had a population of 13,119, with 2,108 children under five years of age (BPS & Bappeda, 1999) (see Appendix C for a village profile). Only 120 children participated in this study. These villages were selected for this study because they are the sites of a research project related to community development conducted jointly by Memorial University of Newfoundland and the University of Indonesia.The Faculty of Nursing at the University of Indonesia, where the investigator was on staff, obtained permission from the Provincial Government of West Java and the districts involved to conduct the study in these villages.

4. Sample Selection

The participants in this study were parent-child dyads living in the villages of Kuripan and Cibentang. There were three inclusion criteria: the participants lived in these villages, the children were less than five years of age, and the parents agreed to participate. There were no specific exclusion criteria.

The investigator met with village leaders and with the staff of community health services (Puskesmas), midwives, and village health services (Posyandu) to explain the study, the inclusion criteria for participants, and the data collection process. A convenience sample of 120 children was used, 60 children from each village. Community health workers (cadres) identified potential participants at the Posyandu, made the initial contact, and asked the parents if they would agree to meet with the investigator for an explanation of the study. The investigator also asked the cadres to determine a convenient time for a meeting with the participants.

5. Sample Size

The sample size of 120 was calculated using the appropriate function in the statistical software, Stata (Statacorp., 1997). This was a descriptive study; there was no hypothesis testing. In a case-control study of pneumonia, O'Dempsney et al. (1996) found that 65% of children in the case group were carried in the kitchen during cooking, as compared to 37% in the control group. Assuming that the same prevalence of children in Indonesia were carried in the kitchen during cooking, a sample of 120 participants had 80% power to detect a statistically significant difference between children with high and low frequencies of ARI ($\alpha = .05$). The prevalence of this risk factor in Indonesia was unknown prior to the onset of the present study and so could not be used in this calculation; it was, however, identified in this study.

6. Data Collection Procedure

Data were collected by the investigator between February and April 2001. Once the cadres obtained a parent's agreement to be contacted, the investigator, accompanied by the cadre, conducted a home visit. During this visit, the investigator explained the study, obtained consent, and collected the data. The explanation about the study included the data collection procedure, the instruments, the infant or child physical examination, and the time required for data collection, and was given in the local language at a level consistent with the participant's understanding. The investigator also explained that the participant had the right to withdraw from the study at any time. The investigator asked the parent who had agreed to participate to sign the consent form, which also was translated. An illiterate parent used a thumb print to indicate his or her permission.

The investigator interviewed the parent using the designed instruments, and then proceeded with the physical examination of the child, she then summarized the results of the interview to validate that the parent had understood correctly, and closed the interview by providing the parent with an opportunity to ask questions, and thanked him or her for participating.

Instruments

The investigator designed the instruments for this study based upon a review of the literature and in consultation with content and questionnaire design experts. Instrument design was also guided by the HPM in terms of assessing cognitive-perceptual factors and modifying factors. The modifying factors included demographic, biologic, interpersonal influence, situational, and behavioural.

Five instruments (Appendix D-H) measured the risk factors and the feasibility of modifying them for ARI:

- participant identity (Appendix D)

- demographic data (10 items: Appendix E)
- medical history and physical examination or biologic (16 items: Appendix F)
- environmental including situational and behavioural questionnaire (32 items: Appendix G)
- utilization of health services questionnaire (16 items: Appendix H)

These instruments were translated into the Indonesian language.

The participant identity questionnaire consisted of the names and addresses of the participants. The data about the participants' age, religion, cultural group, education, occupation, and family income were obtained by a demographic data questionnaire. The medical history and physical examination questionnaire assessed the child's age, number of siblings, vitamin A supplementation status, immunization status, body weight, vital signs, general appearance, history of illness in the previous six months, and the frequency of ARI in the previous year. The environmental questionnaire assessed the current smoking habits of the household members, the type of fuel and stove used for cooking, ventilation for the stove, the kitchen design, the number of windows, the number of people living in the same house, the number of people sharing the child's sleeping room, and also the hand washing and house cleaning habits in the family. Finally, the utilization of a health services questionnaire identified the family decision maker in matters of health, the utilization of the Posyandu, midwife health services, and the Puskesmas, and also the actions taken when a child developed an ARI.

The instruments and data collection procedure were pilot tested for ease of use and for accuracy of data collected. A pilot study was done in the village of Iwul, in the sub-district of Parung, in late January 2001. Three participants were chosen as a trial sample. The investigator obtained feedback from the children's parents as well as from the cadres, and made minor revisions. The report of the pilot study can be found in Appendix I.

8. Ethical Considerations

The ethical issues in this study involved informed consent, vulnerable subjects, human dignity and justice, and beneficence (Polit & Hungler, 1999). Informed consent procedures were followed by the investigator. The investigator visited the homes of those participants who had agreed to be contacted, and explained the study. All participants received a verbal explanation. The investigator explained the study in detail, including the instruments, the participant's physical examination, and the time required for the data collection, in the local language. Those parents who understood and who wanted to participate in the study were asked to sign the consent form (Appendix J); illiterate parents could use a thumb print to indicate their permission. The investigator also obtained the verbal assent of the child as a member of a vulnerable population before conducting the physical examination. As the investigator explained to them, the parent-child dyads had the right to refuse to participate.

The ethical principle of beneficence was not violated as the parents and children were not harmed or exploited by this study. Data collection and physical examination procedures were done after parental consent and assent by the child had been given. There was no risk or discomfort involved in their participation in this study. The physical assessment, which primarily focused on the respiratory system, was a normal examination. The investigator was concerned with comfort and safety factors during the physical examination procedures (Appendix K). For example, the parents might be inconvenienced by the one hour required for the data collection. However, potential benefits for the parents included the gaining of knowledge. When an abnormal physical assessment finding was noted, a recommendation was made to the parents to bring the child to the Puskesmas for assessment. In addition, as part of the dissemination of the findings, the village leader and community staff will be sent a summary of the study's findings to be shared with parents if requested at a future date.

The principles of respect for human dignity and justice were also maintained. To preserve confidentiality, the investigator disguised the participants' identities by code; no name was entered in the database used for analysis. Data from the primary investigation were only accessible by the investigator and her thesis supervisors. Data were, and will be, reported in such a way that individuals cannot be identified.

The research proposal received ethical approval from the Human Investigation Committee of Memorial University of Newfoundland and the Ethics Committee (Komite Etik) of the University of Indonesia Faculty of Medicine (see Appendices L and M for letters of approval). Finally, this project only proceeded with the permission of the districts involved and the provincial government (see Appendices N, O, and P).

9. Data Management and Analysis

Data were entered into a database, then coded and "cleaned" prior to analysis. The Statistical Package for the Social Sciences (SPSS) was used for statistical analysis. Analysis was done by the investigator, with assistance from a nurse epidemiologist. Descriptive statistics were used to describe the demographic characteristics of the subjects and all potential risk factors for ARI as well as the utilization of health services. To see if certain risk factors operated at different ages, given that most factors and child care practices differ for infants, toddlers and pre-school children, data was also stratified for analysis by five age categories: 01-12 months, 13-24 months, 25-36 months, 37-48 months and 49-60 months. Frequency and percentages were used to tabulate categorical variables, and means and medians were used for continuous variables.

To measure the association between the risk factors and the frequency of ARI, univariate, bivariate, and logistic regression were used. Fisher's Exact Test (FET), and logistic regression were utilized to determine if specific risk factors were significantly associated with the frequency of ARI. The alpha level for statistical significance was set at 0.05. Odds ratios (OR) and 95% confidence intervals (95% CI) were used to describe the magnitude of the associations.

Data from open-ended questions which examined the feasibility of modifying risk factors and the utilization of health services for ARI were analyzed by content analysis. Data from these questions were originally sorted into categories and themes, with the frequency of the responses reported.

Chapter 4: Results

The research findings from this investigation are presented in six sections. The first section contains a descriptive profile of the parents' demographic characteristics, the children's demographic characteristics, and the family structure. Section two summarizes the risk factors for ARI in children under five years of age, and includes their medical history: vitamin A supplementation, immunization status, the history of illness in the past six months, current symptoms of ARI, and their weight. Both the children's home environment and the utilization of health services by the parents will also be described. The third section addresses the first research question by describing the relationship between the risk factors and the frequency of ARI. Section four addresses the second question by describing the relationship between the utilization of health services and the frequency of ARI. The final section addresses the third question by presenting the feasibility of modifying risk factors for ARI. Finally, a summary is presented in the sixth section.

1. Characteristics of the Subjects

1.1. The Parents' Demographic Characteristics

A total of 121 parents who met the inclusion criteria were approached about participating in this study. Only one refused, so the final sample size was 120 parent-child dyads.

In the majority of the cases, 86.7% (104 of 120), the mother was the principal source of information. About 12.5% (15 of 120) of the interviews involved both the parent and a grandparent. Of the parents interviewed, there was only one father (0.8% of 120). All parents who participated in the study were Moslem. The cultural groups were equally divided (60 of 120) between Sundanist and Betawist.

More variation was evident in the parents' income level. Almost half of the parents, 46.7% (56 of 120), reported their household income to be in the range of Rp. 200.000-399.000 a month. About 29.2% (35 of 120) identified their income as less than Rp. 200.000 and 16.7% (20 of 120) to be in the range of Rp. 400.000-600.000. Only 7.5% (9 of 120) reported their income as more than Rp. 600.000 a month. The reported national per capita monthly income was approximately Rp. 350.000 (Departeman Kesehatan, 1999a). Thus, 75.8% (91 of 120) of the families in the study reported an income that was similar to or less than the national per capita monthly income.

Table 1: ***The Parents' Demographic Characteristics***

Categories		Father		Mother	
		n[1]	%[1]	n[1]	%[1]
Age	< 25 years	23	**19.2%**	54	**45.0%**
	26-34 years	48	**40.0%**	40	**33.3%**
	35-49 years	43	**35.8%**	26	**21.7%**
	> 50 years	6	**5.0%**	0	**0%**
Education	None	1	**0.8%**	6	**5.0%**
	Grade 1-6	86	**71.7%**	91	**75.8%**
	Grade 7-12	32	**26.7%**	21	**17.5%**
	Grade 13-15	1	**0.8%**	2	**1.7%**
Occupation	None	1	**0.8%**	110	**91.7%**
	Farmer	6	**5.0%**	0	**0%**
	Seller	15	**12.5%**	5	**4.2%**
	Teacher	1	**0.8%**	0	**0%**
	Laborer	97	**80.8%**	5	**4.2%**

[1]number and percentage of 120 fathers and mothers with the identified characteristics

Table 1 summarizes the parents' demographic characteristics. A median age was used since the ages of the parents were not normally distributed. The median ages of the fathers and mothers were 31 years and 27 years, respectively. Almost half of the mothers, 45.0% (54 of 120), were younger than 25 years of age, compared to 19.2% (23 of 120) of the fathers.

Few of either the mothers or fathers had no education or had more than grade 13.

Similar proportions of the fathers, 71.7% (86 of 120), and the mothers, 75.8% (91 of 120), reported an education level of grade 1-6. According to Statistics Indonesia, 24.7% of adults have grade 1-5 education and 45.5% grade 6-12 education. Only 0.2% had higher than grade 12 (BPS & Bappeda, 1999). A higher proportion of the fathers in the study, 26.7% (32 of 120), had grade 7-12 education compared to the mothers, 17.5% (21 of 120).

A total of 80.8% (97 of 120) of the fathers worked as laborers. The type of labor reported included work as a tailor, industrial employee, construction employee, fabrics employee, village staff, private business and ojek (motorcycle driver). Only 12.5% (15 of 120) of the fathers had jobs as sellers, and fewer, 5.0% (6 of 120), worked as farmers. In contrast, most of the mothers, 91.7% (110 of 120), did not work outside the home. Only 8.4% (10 of 120) of the mothers worked, with jobs as sellers or laborers.

1.2. The Children's Demographic Characteristics

There were 64 boys and 56 girls involved in the study, with a mean age of 29.3 months, and a range of ages from 3-60 months. The mean age of the boys was 27.4 months (range: 3-60 months) compared to the mean age of the girls of 31.1 months (range: 3-59 months).

Figure 1 shows the boxplot of the distribution of age by gender. The girls were slightly older but there was a similar and normal distribution of ages in both the boys and girls. However, 20.3% (13 of 64) of the boys were between the ages of 25-36 months compared to 10.7% (6 of 56) of the girls. Table 2 summarizes the age distribution of children by gender.

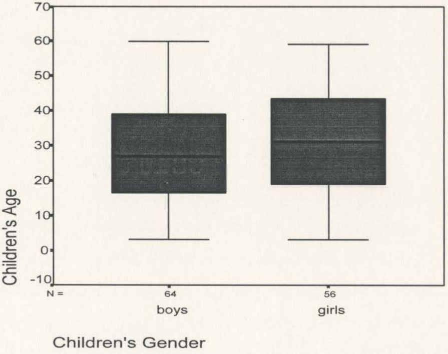


Figure 1: **Boxplot of Children's Age (in Months) by Gender**

Table 2: ***The Children's Demographic Characteristics***

Age group	Boys		Girls	
	n[1]	%[1]	n[2]	%[2]
0-12 months	11	**17.2%**	6	**10.7%**
13-24 months	18	**28.1%**	19	**33.9%**
25-36 months	13	**20.3%**	6	**10.7%**
37-48 months	16	**25.0%**	17	**30.4%**
49-60 months	6	**9.4%**	8	**14.3%**

[1]n = number and percentage of 64 boys with the identified characteristics
[2]% = number and percentage of 56 girls with the identified characteristics

1.3. The Family Structure

The structure of the participants' households is presented in Table 3. The majority of households, 73 (60.8%), had two to four children. While 23.3% (25 of 120) of households had one child, only 8.3% (10 of 120) had only three people living in the household, i.e., the parents with the child. Many households consisted not only of the parents and children but also other family members such as grandparents and aunts or uncles. The majority of households consisted of four to six individuals, 57.5% (69 of 120), with 34.2% (41 of 120) having seven or more individuals.

Table 3: ***Structure of Household***

Number of children	n[1]	%[1]
1	28	**23.3%**
2-4	73	**60.8%**
5-6	16	**13.3%**
> 6	3	**2.5%**
Number of people	**n[1]**	**%[1]**
3	10	**8.3%**
4-6	69	**57.5%**
7-8	31	**25.8%**
> 8	10	**8.3%**

[1]number and percentage of 120 households with the identified characteristics

2. The Risk Factors for ARI in Children Under Five Years of Age

2.1. Medical History

2.1.1. Vitamin A Supplementation.

Table 4 summarizes the vitamin A supplementation status for specific age groups. As no vitamin A supplementation is given before six months of age, the analysis for infants younger than one year involved only those between six and 12 months. In infants between six and 12 months of age, 77.8% (7 of 9) of the boys, and all of the girls, 100% (3 of 3), reported complete vitamin A supplementation for their specific age group. Only two of 12 infants (16.7%) between six and 12 months of age, both boys, had incomplete vitamin A supplementation for their specific age group.

Table 4: ***Vitamin A Supplementation***

Gender and age	Vitamin A supplementation	n[1]	%[1]
Boys < 1 year	None	0	**0%**
	Incomplete for age	2	**22.2%**
	Complete for age	7	**77.8%**
Girls < 1 year	None	0	**0%**
	Incomplete for age	0	**0%**
	Complete for age	3	**100.0%**
Boys > 1 year	None	4	**7.5%**
	Incomplete for age	0	**0%**
	Complete for age	49	**92.5%**
Girls > 1 year	None	3	**6.0%**
	Incomplete for age	5	**10.0%**
	Complete for age	42	**84.0%**

[1]number and percentage of 17 children < 1 year of age and 103 children >1 year of age with the identified characteristics

In children older than one year of age, a similar proportion of boys, 7.5% (4 of 53), and girls, 6.0 % (3 of 50), reported no vitamin A supplementation. A higher proportion of boys, 92.5% (49 of 53), reported complete vitamin A supplementation than girls, 84.0% (42 of 50), in this age group. Overall, 12 of 103 (11.7%) children older than one year of age had incomplete vitamin A supplementation for their age group, while 88.3% (91 of 103) had complete supplementation. Infants 6-12 months of age were not significantly more likely to have incomplete vitamin A supplementation for their age group than children older than one year of age (FET: $p = .639$).

2.1.2. Immunization Status.

Table 5: *Immunization Status*

Characteristics	Immunization	n[1]	%[1]
Boys < 1 year	None	3	**27.3%**
	Incomplete for age	5	**45.5%**
	Complete for age	3	**27.3%**
Girls < 1 year	None	2	**33.3%**
	Incomplete for age	4	**66.7%**
	Complete for age	0	**0%**
Boys > 1 year	None	4	**7.5%**
	Incomplete for age	10	**18.9%**
	Complete for age	39	**73.6%**
Girls > 1 year	None	6	**12.0%**
	Incomplete for age	9	**18.0%**
	Complete for age	35	**70.0%**

[1]number and percentage of 17 children < 1 year of age and 103 children > 1 year of age with the identified characteristics

Table 5 shows the immunization status for specific age groups. In infants younger than one year of age, only boys, 27.3% (3 of 11), reported complete immunization for their age group. All of the girls, (6 of 6), reported no or incomplete immunization for a specific age group compared to 8 of 11 boys (72.7%). Overall, 14 of 17 (82.4%) infants younger than one year of age had no or incomplete immunization for their age group, while 3 of 17 (17.6%) had complete immunization for their age group.

In children older than one year of age, a similar proportion of boys, 73.6% (39 of 53), and girls, 70.0% (35 of 50), reported complete immunization for their age group. A higher proportion of girls, 12.0% (6 of 50), than boys, 7.5% (4 of 53), reported no immunization. Overall, 29 of 103 (28.2%) children older than one year of age had no or incomplete immunization for their age group, while 74 of 103 (71.8%) had complete immunization. Infants younger than one year of age were significantly more likely than children older than one year to have incomplete immunization for their age group (FET: $p < .0005$, OR= 11.91, 95%CI = 3.38 - 41.41).

2.1.3. The Types of Serious Illness in the Previous Six Months.

Of the 120 children, 73.3% (88) reported at least one episode of illness in the six months prior to the interview. Forty (33.3%) children reported one type of illness, 37 (30.8%) reported two types, and 11 (9.2%) reported three or more types. There were only 14 boys and 18 girls (26.7% of 120) without serious illness in the previous six months.

Table 6: ***Types of Serious Illness in Previous Six Months***

Types of illness	Boys		Girls	
	n[1]	%[2]	n[1]	%[2]
Pneumonia	3	**4.7%**	0	**0%**
Diarrhea	27	**42.2%**	23	**41.1%**
Fever	33	**51.6%**	28	**50.0%**
Asthma	15	**23.4%**	11	**19.6%**
Seizure	0	**0%**	3	**5.4%**
Blood in cough	1	**1.6%**	1	**1.8%**
Vaccine preventable disease	2	**3.1%**	0	**0%**

[1]n = number of boys or girls with the type of illness identified; total n > 120 since most children had more than 1 type of illness
[2]% = proportion of 64 boys or 56 girls with the type of illness identified

Table 6 summarizes the distribution of the types of illness by gender. Fever, diarrhea, and asthma were the most common illnesses for boys and girls. Asthma episodes occurred in 23.4% (15 of 64) of boys compared to 19.6% (11 of 56) of girls, but the difference was not statistically significant (FET: $p = .662$). Only boys, 4.7% (3 of 64), reported pneumonia.

2.1.4. Current Symptoms of ARI

A higher proportion of boys, 81.3% (52 of 64), than girls, 78.6% (44 of 56), had signs and symptoms of an ARI at the time of the interview.

Table 7: ***Current Symptoms of ARI by Gender***

Current symptoms	Boys		Girls	
	n[1]	%[2]	n[1]	%[2]
Nasal discharge	38	59.4%	41	73.2%
Cough	40	62.5%	27	48.2%
Sore throat	2	3.1%	2	3.6%
Cervical lymph enlargement	0	0%	0	0%
Ear pain	3	4.7%	2	3.6%
Ear drainage	4	6.3%	2	3.6%
Hoarseness	6	9.4%	4	7.1%
Chest indrawing	7	10.9%	2	3.6%
Cyanosis	0	0%	1	1.8%
Abnormal lung sound	19	29.7%	14	25.0%

[1]n = number of boys or girls with the symptoms identified; total n > 120 since most children had more than 1 symptom
[2]% = proportion of 64 boys or 56 girls with the symptoms identified

Table 7 summarizes the symptoms of ARI by gender. Nasal discharge and cough symptoms were the most frequent symptoms in boys (59.4% and 62.5%, respectively) and girls (73.2% and 48.2%, respectively). Boys demonstrated a higher frequency of chest indrawing, 10.9% (7 of 64), than girls, 3.6% (2 of 56). Similar proportions of boys, 29.7% (19 of 64), and girls, 25.0% (14 of 56), had abnormal lung sounds by auscultation.

Table 8: ***Current Symptoms of ARI by Two Age Groups***

Signs and symptoms	Age < 1 year		Age > 1 year	
	n[1]	%[1]	n[2]	%[2]
Nasal discharge	14	**82.4%**	75	**72.8%**
Cough	8	**47.1%**	59	**57.3%**
Sore throat	0	**0%**	4	**3.9%**
Cervical lymph enlargement	0	**0%**	0	**0%**
Ear pain	1	**5.9%**	4	**3.9%**
Ear drainage	2	**11.8%**	4	**3.9%**
Hoarseness	0	**0%**	10	**9.7%**
Chest indrawing	1	**5.9%**	8	**7.8%**
Cyanosis	0	**0%**	1	**1.0%**
Abnormal lung sound	4	**23.5%**	29	**28.2%**

[1]number and percentage of children < age 1 year with current symptoms of ARI: total n > 17 since most children had more than 1 type of symptom when interviewed
[2]number and percentage of children > age 1 year with the current symptoms of ARI: total n >103 since most children had more than 1 type of symptom when interviewed

Table 8 shows the current symptoms by age group. More infants younger than one year of age, 82.4% (14 of 17), were found to have nasal discharge than children older than one year of age, 72.8% (75 of 103). The reverse was true for cough, which was noted for 47.0% (8 of 17) of infants younger than one year of age, compared to 57.3% (59 of 103) older than one year. There were similar proportions of children with chest indrawing and abnormal lung sounds in both age groups.

Analysis by five categories of age (0-12, 13-24, 25-36, 37-48, and 49-60 months) showed that nasal discharge and cough were the most prevalent symptoms regardless of a child's age (data not shown). Similar proportions of boys. 82.8% (53 of 64). and girls. 80.4% (45 of 56). had symptoms of ARI in the month prior to the interview. Cough and nasal discharge were the most common symptoms reported. Reliable information on the abnormality of lung sounds in the previous month was not available.

2.1.5. Children's Weight.

Sixty percent (72 of 120) of the children had normal birth weight. Only 5.0% (6 of 120) were identified by their parents as having a low birth weight. However. data were missing for 35.0% (42 of 120) of the children.

Table 9: ***Current Weight by Gender and Two Age Groups***

Categories	Normal weight		Mild underweight		Severe underweight	
	n[1]	%[1]	n[1]	%[1]	n[1]	%[1]
Boys	24	**37.5%**	21	**32.8%**	19	**29.7%**
Girls	15	**26.8%**	20	**35.7%**	21	**37.5%**
Total[2]	39	**32.5%**	41	**34.2%**	40	**33.3%**
Age < 1 year	11	**64.7%**	2	**11.8%**	4	**23.5%**
Age > 1 year	28	**27.2%**	39	**37.9%**	36	**35.0%**
Total[2]	39	**32.5%**	41	**34.2%**	40	**33.3%**

[1]number and percentage of 64 boys and 56 girls or of 17 children < age 1 year and 103 children > age 1 year with the identified characteristics
[2]number and percentage of 120 children with the identified characteristics

As shown in Table 9. 67.5% (81 of 120) were underweight for their age group at the time of the interview, while 32.5% (39 of 120) were of normal weight. Table 9 also indicates the current weight by gender and two age groups. Similar proportions of boys, 37.5% (24 of 64), 32.8% (21 of 64), and 29.7% (19 of 64), and girls, 26.8% (15 of 56), 35.7% (20 of 56), and 37.5% (21 of 56), were normal, mildly underweight, and severely underweight, respectively, at the time of the interview. In children older than one year of age, 72.9% (75 of 103), were more likely to be underweight at the time of the interview compared to infants younger than one year of age, 35.3% (6 of 17) (OR = 4.91, 95%CI = 1.659 - 14.535). The difference was statistically significant (FET: p = .004).

Table 10 and Figure 2 show current weights by five categories of age. The majority of the children in the youngest age category (0-12 months), 64.7% (11 of 17), were of normal weight, compared to children in other age categories (range: 10.5-33.3%). A slightly higher proportion of the children aged 25-36 months, 89.5% (17 of 19), were mildly or severely underweight compared to the other three categories of ages older than 12 months (range: 66.6-78.6%).

Table 10: ***Current Weight by Five Categories of Age***

Categories of age	Normal		Mild underweight		Severe underweight	
	n[1]	%[2]	n[1]	%[2]	n[1]	%[2]
0-12 months	11	**64.7%**	2	**11.8%**	4	**23.4%**
13-24 months	12	**32.4%**	18	**48.6%**	7	**18.9%**
25-36 months	2	**10.5%**	8	**42.1%**	9	**47.4%**
37-48 months	11	**33.3%**	8	**24.2%**	14	**42.4%**
49-60 months	3	**21.4%**	5	**35.7%**	6	**42.9%**

[1]number of 120 children
[2]percentage of children in the age category with normal weight and underweight at the time of the interview

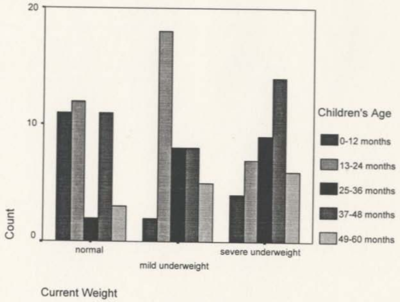


Figure 2: **Bar Graph of Current Weight by Five Categories of Age**

2.2. Children's Home Environment

2.2.1. Environmental Tobacco Smoke (ETS).

Table 11: ***Exposure to ETS by Gender***

Number of Cigarettes	Boys		Girls	
	n[1]	%[1]	n[1]	%[1]
0	5	**7.8%**	4	**7.1%**
1-9	17	**26.6%**	18	**32.1%**
10-20	22	**34.4%**	22	**39.3%**
>20	20	**31.3%**	12	**21.4%**

[1]number and percentage of 64 boys and 56 girls with daily exposure to the number of cigarettes identified

Table 11 summarizes the children's exposure to cigarette smoke in the family home. While 68.3% (82 of 120) of the fathers were identified as smokers, none of the mothers smoked. Furthermore, 24.2% (29 of 120) of the households had more than one smoker. Only nine households (7.5% of 120) had no smokers.

Nine out of 120 (14.9%) children had no exposure to ETS. Similar proportions of boys and girls were exposed to the smoke from one to nine cigarettes per day, 26.6% and 32.1%, respectively. Slightly more girls, 39.3% (22 of 56), than boys, 34.4% (22 of 64), were exposed to the smoke from 10-20 cigarettes per day. A higher proportion of boys, 31.3% (20 of 64), than girls, 21.4% (12 of 56), were exposed to the smoke from more than 20 cigarettes per day.

Table 12: ***Exposure to ETS by Five Categories of Age***

Number of cigarettes	0-12 months		13-24 months		25-36 months		37-48 months		49-60 months	
	n[1]	%[1]	n[1]	%[1]	n[1]	%[1]	n[1]	%[1]	n[1]	%[1]
0	2	11.8%	5	13.5%	0	0%	1	3.0%	1	7.1%
1-9	2	11.8%	10	27.0%	7	36.8%	12	36.4%	4	28.6%
10-20	5	29.4%	17	46.0%	4	21.1%	11	33.3%	7	50.0%
> 20	8	47.1%	5	13.5%	8	42.1%	9	27.3%	2	14.3%

[1]number and percentage of 17 infants aged 0-12 months, 37 children aged 13-24 months, 19 children aged 25-36 months, 33 children aged 37-48 months, and 14 children aged 49-60 months exposed to the identified number of cigarettes/day

Table 12 shows the proportion of children in the five age categories exposed to ETS. Children in all age categories were exposed to ETS. Over half the children in each category were exposed to the smoke from 10 or more cigarettes per day. A higher proportion of infants younger than one year of age, 47.1% (8 of 17), were exposed to the smoke from more than 20 cigarettes per day than children in other age groups (range 13.5 - 42.1%).

2.2.2. *Kitchen Smoke.*

Almost half of the children, 47.5% (57 of 120), were exposed to kitchen smoke because they were carried on their mothers' back during cooking. Although a higher proportion of girls, 57.1% (32 of 56), than boys, 39.1% (25 of 64), were exposed to kitchen smoke, the difference was not statistically significant (FET: $p = .067$).

Furthermore, infants younger than one year of age were not significantly more likely than children older than one year of age to be carried in the kitchen (FET: $p = .123$, OR = 2.45, 95%CI = 0.804 - 7.439).

Table 13: ***Daily Exposure to Kitchen Smoke by Five Categories of Age***

Hours carried	0-12 months		13-24 months		25-36 months		37-48 months		49-60 months	
	n[1]	%[1]	n[1]	%[1]	n[1]	%[1]	n[1]	%[1]	n[1]	%[1]
0	12	70.6%	11	29.7%	12	63.2%	17	51.5%	11	78.6%
< 1	1	5.9%	3	8.1%	1	5.3%	0	0%	1	7.1%
1 - 2	2	11.8%	8	21.6%	4	21.1%	5	15.2%	1	7.1%
> 2	2	11.8%	15	40.5%	2	10.5%	11	33.3%	1	7.1%

[1]number and percentage of 17 infants aged 0-12 months, 37 children aged 13-24 months, 19 children aged 25-36 months, 33 children aged 37-48 months, and 14 children aged 49-60 months exposed to kitchen smoke in terms of hours carried in kitchen per day during cooking

Table 13 summarizes the daily exposure to kitchen smoke by five age categories. The mothers estimated, in half-hour intervals, their children's exposure to kitchen smoke per day. The majority of children in all categories were not carried or were carried less than one hour per day, except for children aged 13-24 months, 62.1% (23 of 37) of whom were carried more than one hour and 40.5% (15 of 37) for longer than two hours. In comparison, 23.6% (4 of 17) of children younger than 12 months, 31.6% (6 of 19) of children aged 25-36 months, and 48.5% (16 of 33) of children aged 37-48 months were carried for one hour or longer. Children aged 49-60 months were least likely to be carried in the kitchen: 78.6% (11 of 15) were not carried at all, while 14.2% (2 of 14) were carried one hour or longer.

A higher proportion of households used a kerosene stove, 75.8% (91 of 120), than a wood stove, 24.2% (29 of 120). Most households, 67.5% (81 of 120), had ventilation for the stove. A similar proportion of children were carried in kitchens without ventilation for the stove, 48.7% (19 of 39), and with ventilation for the stove, 47.0% (38 of 81).

Although 94.2% (113 of 120) of the households had a separate room for the kitchen, in 59.2% (71 of 120) of the houses, the kitchen opened into the living room. Because there was no door or the door was always open, the exposure to kitchen smoke was therefore not limited to the child's presence in the kitchen. Furthermore, 35.8% (43 of 120) of the households had no windows which opened, compared to 64.2% (77 of 120) which had at least one open window.

2.2.3. Crowding.

Table 14 reveals the number of people sharing the child's bedroom. None of the children slept alone. While a few children shared with only one or two other people, most shared sleeping accommodations with three to four others. Boys and girls were equally likely to share sleeping accommodations with more than three other people. In this study, data was not collected as to whether the child shared a bedroom with a smoker.

Table 14: ***Number of People Sharing the Child's Bedroom by Child's Gender***

Number of people	Boys		Girls	
	n[1]	%[1]	n[1]	%[1]
< 3	3	**4.7%**	1	**1.8%**
3 - 4	52	**81.3%**	46	**82.1%**
> 4	9	**14.1%**	9	**16.1%**

[1]number and percentage of 64 boys and 56 girls who shared their bedroom with others

3. Relationship Between ARI and Potential Risk Factors

The children in the study were divided into two groups: those with a low frequency of ARI (≤ 6 episodes in the previous year) and those with a high frequency of ARI (> 6 episodes in the previous year). Children with high (n=52) and low (n=68) frequency of ARI were compared to see if they differed in parents' or their own demographic characteristics, their medical history, their home environment, or their utilization of health services. FET was used to test the significance of differences between potential risk factors and the frequency of ARI. Backward logistic regression was used to determine the risk factors that had an independent effect on the risk for ARI.

3.1. Bivariate Analysis

3.1.1. Parents' Demographic Characteristics and Frequency of ARI.

Table 15 summarizes the parents' demographic characteristics for children with high and low frequency of ARI. The median was used to categorize the parents' ages. There was no difference in the frequency of ARI in children with younger versus older mothers.

Table 15: ***Parent's Demographic Characteristics as Risk Factors for ARI***

Parents' Demographic Characteristics	High ARI[1]		Low ARI[1]		p[3]	OR (CI)[4]
	n[2]	%[2]	n[2]	%[2]		
Maternal age					0.36	1.38 (0.49-3.87)
≤ 27 years	26	**39.4%**	40	**60.6%**		
> 27 years	26	**48.1%**	28	**51.9%**		
Paternal age					0.999	0.51 (0.18-1.43)
≤ 31 years	21	**35.0%**	39	**65.0%**		
> 31 years	31	**51.7%**	29	**48.3%**		
Maternal education					0.01	3.02 (1.20-7.60)
≤ grade 3	17	**65.4%**	9	**34.6%**		
> grade 3	35	**37.2%**	59	**62.8%**		
Paternal education					0.327	1.54 (0.38-6.16)
≤ grade 3	6	**60.0%**	4	**40.0%**		
> grade 3	46	**41.8%**	64	**58.2%**		
Income level					0.544	1.08 (0.46-2.53)
≤ Rp. 200.000	17	**48.6%**	18	**51.4%**		
> Rp. 200.000	35	**41.2%**	50	**58.8%**		

[1]low (≤ 6 times/year) and high (> 6 times/year) frequencies of ARI
[2]number and percentage of children with high and low frequencies of ARI who had parents with the identified maternal and paternal age, maternal and paternal education, and income level at the time of the interview
[3]assessed with FET
[4]Odds Ratio (95% Confidence Intervals)

Different education levels were compared. Mothers who had grade 3 education or less were more likely to have children with a high frequency of ARI compared to mothers who had more than grade 3 education (OR = 3.02, 95%CI = 1.20 - 7.60). The difference was statistically significant (FET: p = .014). The fathers' level of education was not related to the children's frequency of ARI. Different income levels were also assessed and were not found to be related to the frequency of ARI in children, regardless of the categories of income compared.

3.1.2. Children's Demographic Characteristics and Frequency of ARI.

Table 16 shows the demographic characteristics of children with high and low frequency of ARI.

Table 16: ***Children's Demographic Characteristics as Risk Factors for ARI***

Children's Demographic Characteristics	High ARI[1]		Low ARI[1]		p[3]	OR (CI)[4]
	n[2]	%[2]	n[2]	%[2]		
Gender					0.71	1.27 (0.60-2.70)
Boys	29	**45.3%**	35	**54.7%**		
Girls	23	**41.1%**	33	**59.0%**		
Age					0.29	3.03 (0.81-11.27)
≤1 year	5	**29.4%**	12	**70.6%**		
> 1 year	47	**45.6%**	56	**54.4%**		

[1]low (≤ 6 times/year) and high (> 6 times/year) frequencies of ARI
[2]number and percentage of children by gender and age
[3]assessed with FET
[4]Odds Ratio (95% Confidence Intervals)

A similar proportion of boys, 45.3% (29 of 64), and girls, 41.1% (23 of 56), had an increased frequency of ARI. Infants younger than one year of age tended to have a low frequency of ARI. 70.6% (12 of 17), compared to children older than one year of age. 54.4% (56 of 103). Conversely, more children older than one year of age had an increased frequency of ARI. 45.6% (47 of 103), compared to infants younger than one year of age, 29.4% (5 of 17), but the difference was not statistically significant (FET: p = .292). Children younger than two years of age were also compared to children older than two years but there was no difference between these age categories in the frequency of ARI (FET: p = .855).

3.1.3. Medical History and Frequency of ARI.

The medical history of children with low and high frequencies of ARI is indicated in Table 17. There was no difference in the frequency of ARI between children with complete and incomplete immunization for a specific age group. Similarly, children with and without complete vitamin A supplementation did not differ with respect to the frequency of ARI. Two serious illnesses of children, asthma and diarrhea, were assessed; however, there was no difference in the frequency of ARI between children with and without either illness. Although 57.7% (15 of 26) of the children with asthma were categorized as having a high frequency of ARI compared to 39.4% (37 of 94) of the children without asthma (OR = 2.22, 95%CI = 0.87 - 5.63), the difference was not statistically significant (FET: p = .119).

Table 17: ***Medical History of Children as Risk Factors for ARI***

Medical History Characteristics	High ARI[1]		Low ARI[1]		p[3]	OR (CI)[4]
	n[2]	%[2]	n[2]	%[2]		
Immunization status					0.44	1.79
Incomplete	2131	**48.8%**	224	**51.2%**		(0.76-4.24)
Complete		**40.2%**	6	**59.7%**		
Vitamin A supplementation					1	0.97
Incomplete	644	**42.9%**	857	**57.1%**		(0.31-3.01)
Complete		**43.6%**		**56.4%**		
Asthma					0.12	2.22
Yes	1537	**57.7%**	115	**42.3%**		(0.87-5.63)
No		**39.4%**	7	**60.6%**		
Diarrhea					1	0.93
Yes	2329	**44.2%**	293	**55.8%**		(0.43-2.00)
No		**42.6%**	9	**57.4%**		
Current Weight					0.56	1.35
Underweight	3715	**45.7%**	442	**54.3%**		(0.62-2.93)
Normal		**38.5%**	4	**61.5%**		

[1]low (≤ 6 times/year) and high (> 6 times/year) frequencies of ARI
[2]number and percentage of children with immunization status, vitamin supplementation, asthma, diarrhea, and current weight
[3]assessed with FET
[4]Odds Ratio (95% Confidence Intervals)

Finally, the children's current weights were examined. The difference in the frequency of ARI in children with normal weights and those who were underweight was not statistically different. No differences were found in the frequency of ARI between children with normal weights when compared to mildly underweight (FET: $p = .377$) and severely underweight (FET: $p = .820$) children; these categories were collapsed and mildly and severely underweight are both reported as underweight (Departemen Kesehatan. 1999b).

3.1.4. Home Environment and Frequency of ARI.

Table 18 summarizes the children's home environment. There were no significant differences in the frequency of ARI for several home environmental characteristics. For example, the presence of smokers in the house was not found to be related to the frequency of ARI in the children. There was also no significant difference in the frequency of ARI between those children who were exposed to cigarette smoke from less and more than 10 cigarettes (FET: $p = .451$) or exposed to smoke from less and more than 20 cigarettes per day in the house (FET: $p = .680$).

Overcrowding in the house relates to the number of children in the household and the number of people who shared a bedroom with a child. There was no relationship between the number of children in the house and the frequency of ARI. However, the number of people who shared a bedroom with the child was significantly related to the frequency of ARI in these children (FET: $p = .039$). Children who had more than four other people sharing the bedroom were more likely to have frequent ARIs than those children who had less than four other people sharing the bedroom (OR = 3.10, 95%CI = 1.08 - 8.92).

Table 18: ***Children's Home Environment as Risk Factors for ARI***

Home Environmental Characteristics	High ARI[1]		Low ARI[1]		p[3]	OR (CI)[4]
	n[2]	%[2]	n[2]	%[2]		
Smoker in house					0.17	0.22 (0.04-1.23)
Yes	65	**58.6%**	46	**41.4%**		
No	3	**33.3%**	6	**66.7%**		
Number of cigarettes/day in house					0.45	1.30 (0.49-3.50)
≥ 10	35	**46.1%**	41	**53.9%**		
< 10	17	**38.6%**	27	**61.4%**		
Number of children					0.2	1.90 (0.77-4.67)
≥ 2	28	**50.0%**	28	**50.0%**		
< 2	24	**37.5%**	40	**62.5%**		
Number of people sharing a bedroom with child					0	3.10 (1.08-8.92)
≥ 4	1240	**66.7%**	6	**33.3%**		
< 4		**39.2%**	62	**60.8%**		

[1]low (≤ 6 times/year) and high (> 6 times/year) frequencies of ARI
[2]number and percentage of children with home environmental characteristics identified
[3]assessed with FET
[4]Odds Ratio (95% Confidence Intervals)

3.1.5. Exposure to Kitchen Smoke and Frequency of ARI.

Table 19 reveals the factors related to exposure to kitchen smoke. The kitchen design was significantly related to the frequency of ARI in children (FET: $p = .040$). Children who lived in houses where the kitchen was not a separate room tended to have more frequent ARIs than children who lived in houses with a separate kitchen room (OR = 9.26, 95%CI = 0.82 - 104.20).

Table 19: ***Exposure to Kitchen Smoke as Risk Factors for ARI***

Exposure to Kitchen Smoke Characteristics	High ARI[1]		Low ARI[1]		p[3]	OR (CI)[4]
	n[2]	%[2]	n[2]	%[2]		
Kitchen design					0	9.26 (0.82-104.20)
Attached	6	**85.7%**	1	**14.3%**		
Separated	46	**40.7%**	67	**59.3%**		
Kitchen open to living room					0.71	1.08 (0.45-2.60)
Yes	32	**45.1%**	39	**54.9%**		
No	20	**40.8%**	29	**59.2%**		
Window open					0.18	1.53 (0.62-3.73)
No	15	**34.9%**	28	**65.1%**		
Yes	37	**48.1%**	40	**51.9%**		
Type of stove					0.83	0.64 (0.24-1.74)
Wood	12	**41.4%**	17	**58.6%**		
Kerosene	40	**44.0%**	51	**56.0%**		
Ventilation of stove					0	2.60 (1.18-5.75)
No	23	**59.0%**	16	**41.0%**		
Yes	29	**35.8%**	52	**64.2%**		
Carried hours					0.14	1.83 (0.86-3.86)
≥0.5 hour	29	**50.9%**	28	**49.1%**		
None	23	**36.5%**	40	**64.5%**		
Exposed to kitchen smoke[5]					0	27.50 (2.61-289.12)
Higher	10	**90.9%**	1	**9.1%**		
Lower	4	**26.7%**	11	**73.3%**		

[1]low (≤ 6 times/ year) and high (> 6 times/year) frequencies of ARI
[2]number and percentage of children with exposure to the characteristics identified
[3]assessed with FET
[4]Odds Ratio (95% Confidence Intervals)
[5]children were categorized as having lower exposure to kitchen smoke if they were not carried during their mother's cooking, but the house had no ventilation for the stove, and the house had no open window; they were categorized as having higher exposure to kitchen smoke if they were carried during their mother's cooking, but the house had ventilation for the stove, and there was an open window

There were no significant differences in the frequencies of ARI in children living in houses with or without the kitchen open to the living room, and in houses with or without an open window.

Information about the type of stove was also assessed. There was no difference in the frequency of ARI in children exposed to kitchen smoke from a kerosene versus a wood stove. Children who lived in houses with no ventilation for the stove had a higher frequency of ARI than those who lived in houses with ventilation for the stove (OR = 2.60, 95% CI = 1.18 - 5.75); the difference was statistically significant (FET: $p = .019$).

The duration of being carried while their mothers cooked was not related to the frequency of ARI in children. The frequency of ARI was similar for children who were not carried in the kitchen compared to those who were carried for a half hour or more (FET: $p = .141$). The frequency of ARI was also similar in those children who were carried less than or more than one hour (FET: $p = .596$). However, children with a high exposure to kitchen smoke were significantly more likely (OR = 27.50, 95% CI = 2.61 - 289.12) to have frequent ARIs than children with low exposure to kitchen smoke (FET: $p = .002$). Children were categorized as having a high exposure to kitchen smoke if they were carried during the time their mothers cooked, but the house had ventilation for the stove and open windows. They were categorized as having a low exposure to kitchen smoke if they were not carried when their mothers cooked, but the house had no ventilation for the stove, and no open windows.

3.2. Multivariate Analysis

Backward logistic regression was used to assess the risk factors for high versus low frequency of ARI. The first model contained all the risk factor variables of interest as well as all interaction terms. However, the interaction terms did not add significantly to the model and were permanently dropped. Individual risk factors were then assessed. Only three variables remained significant: the mother's education, the duration of being carried by the mother while she cooked (in hours), and ventilation for the stove.

Table 20 summarizes the coefficients and Odds Ratios related to the final model obtained during backward logistic regression for the prediction of a high frequency of ARI. This logistic regression model explained only 14.5% of the variance (pseudo- R^2 = 0.145). The final model was: ln odds high ARI/low ARI = $\beta_0 - \beta_1$ (edumo) + β_2 (hours carried) $- \beta_3$ (venstove) where edumo is the level of mothers' education in years; hours carried is the duration mothers carried the children while cooking, in hours; and venstove is the availability of ventilation in the kitchen for the stove.

β_1 represents the difference in the ln odds of a high frequency of ARI compared to low frequency of ARI in children for each year of the mother's education, when other variables were controlled. The coefficient is a negative number; as the education level increased, the Odds Ratio for risk decreased. This confirms the result found in the bivariate analysis where mothers who had grade 3 or less education were significantly more likely to have children with a high frequency of ARI than mothers with more than grade 3 education (Table 15).

Table 20: ***Odds Ratio for the Logistic Regression Model for the Prediction of High Frequency of ARI***

Variables	Coefficient	Odds Ratio	95%CI for OR	p
Education mother[1]	β_1: -.1833	0.839	0.728, 0.967	0.0167
Hours carried[2]	β_2 : .4428	2.107	0.960, 4.623	0.0498
Ventilation stove[3]	β_3: .9130	2.668	1.168, 6.096	0.0378
Constant	β_0: .9271	....		0.0981

[1]level of education in grade (years)
[2]duration of mothers' cooking in intervals of .5 hours
[3]availability of ventilation for the kitchen stove

β_2 represents the difference in the ln odds of a high frequency of ARI compared to a low frequency of ARI in children for each half hour they were carried during cooking, when other variables were controlled. The coefficient is a positive number; as the duration of being carried during cooking increased, the Odds Ratio for risk also increased. In the bivariate analysis (Table 19), children carried while cooking were 1.83 (95% CI = 0.86 - 3.86) times more likely than those not carried to have a high frequency of ARI, but the difference did not achieve statistical significance (FET: $p = .141$). The model used the actual duration of being carried, which was a more sensitive indicator of this risk factor than those categories used in the bivariate analysis.

The coefficient β_3 can be used to calculate the actual Odds Ratio, e β_3, for the risk associated with having ventilation for the stove, when other variables were controlled. Children who lived in houses without ventilation were 2.67 (95% CI = 1.168 -6.096) times more likely to have a high frequency of ARI than children who lived in houses with ventilation for the stove. This result confirms that found in the bivariate analysis where children who lived in houses without ventilation were significantly more likely to have a high frequency of ARI than children who lived in houses with ventilation (Table 19).

4. Utilization of Health Services

4.1. Decision Maker

In 69.2% (83 of 120) of the households, the mothers were the key health-related decision makers, as compared to the fathers, 20.8% (25 of 120). However, the fathers and the grandparents, 37.5% (24 of 64), made health decisions for boys more often than for girls, 23.2% (13 of 56). More fathers than mothers made decisions for boys, 25.0% (16 of 64), than for girls, 16.1% (9 of 56), but this was not statistically significant (FET: p = 0.180).

4.2. Contact Person for ARI

Table 21 indicates the contact persons for children younger and older than one year of age with ARI. Most parents contacted the grandparents, 64.7% (11 of 17), for infants younger than one year of age with ARI and also for children older than one year of age with ARI, 43.7% (45 of 103). However, they contacted the health care system personnel more frequently for children older than one year of age, 30.1% (31 of 103), as compared to the infants younger than one year of age with ARI, 17.6% (3 of 17). A similar pattern was observed if the child had an illness other than ARI.

Table 21: ***Contact Person for ARI by Age***

Contact person	Age < 1 year		Age > 1 year	
	n[1]	%[1]	n[1]	%[1]
Grandparents	11	**64.7%**	45	**43.7%**
Elder people	2	**11.8%**	14	**13.6%**
Friend	0	**0%**	1	**1.0%**
Cadre	0	**0%**	6	**5.8%**
Midwife	0	**0%**	4	**3.9%**
Other health personnel	3	**17.6%**	31	**30.1%**
Other	1	**5.9%**	2	**1.9%**

[1]number and percentage of 17 children < age 1 year and 103 children > age 1 year with ARI

4.3. Source of Health Information

The cadre was reported as the principal source of health information for children younger than one year of age, 82.4% (14 of 17), and for children older than one year of age, 85.4% (88 of 103). Table 22 summarizes the source of health information by the child's age.

Table 22: ***Source of Health Information by Child's Age***

Source of information	Age < 1 year		Age > 1 year	
	n[1]	%[1]	n[1]	%[1]
Midwife	2	**11.8%**	9	**8.7%**
Cadre	14	**82.4%**	88	**85.4%**
Physician	1	**5.9%**	6	**5.8%**

[1]number and percentage of 17 children < age 1 year and 103 children > age 1 year using the identified source of health information

4.4. Health Care Services

The majority of parents, 85.0% (102 of 120), reported taking their children for regular visits to the village health services (Posyandu), while 15.0% (18 of 120) reported that they had not accessed this service.

Table 23: ***Frequency of Visits to Posyandu by Five Age Categories***

Status visit	0-12 months		13-24 months		25-36 months		37-48 months		49-60 months	
	n[1]	%[1]	n[1]	%[1]	n[1]	%[1]	n[1]	%[1]	n[1]	%[1]
No	3	**17.6%**	1	**2.7%**	3	**15.8%**	7	**21.2%**	4	**28.6%**
Yes	14	**82.4%**	36	**97.3%**	16	**84.2%**	26	**78.8%**	10	**71.4%**

[1]number and percentage of 17 infants aged 0-12 months, 37 children aged 13-24 months, 19 children aged 25-36 months, 33 children aged 37-48 months, and children 14 aged 49-60 months making regular visits to Posyandu

Table 23 indicates the frequency of visits to the Posyandu by children of different ages. A greater proportion of children aged 13-24 months were taken to the Posyandu regularly, 97.3% (36 of 37), as compared to children in other age categories (range: 71.4-84.2%). There was no difference between the frequency of visits by boys or girls. Most families, 98.3% (118 of 120), visited other health care services such as the Community Health Services (Puskesmas) or the Midwifery Clinic if their children were ill.

4.5. *Utilization of Health Services and Frequency of ARI*

Table 24 summarizes the utilization of health services for children with high and low frequencies of ARI: none of the variables were significantly related to the frequency of ARI in children.

Table 24: ***Utilization of Health Services and Frequency of ARI***

Utilization of Health Services Characteristics	High ARI[1]		Low ARI[1]		p[3]	OR (CI)[4]
	n[2]	%[2]	n[2]	%[2]		
Decision maker					0.5	1.86 (0.52-6.68)
Other	43	**45.3%**	52	**54.7%**		
Father	9	**36.0%**	16	**64.0%**		
Source of health information					0.31	2.35 (0.40-13.90)
Other	10	**55.6%**	86	**44.4%**		
Cadre	42	**41.2%**	0	**58.8%**		
Contact person for ARI					0.27	2.42 (0.77-7.60)
Other	31	**48.4%**	33	**51.6%**		
Grandparent	21	**37.5%**	35	**62.5%**		
Regular visit to Posyandu					0.61	0.42 (0.07-2.58)
No	9	**50.0%**	9	**50.0%**		
Yes	59	**57.8%**	43	**42.2%**		

[1]low (≤ 6 times/year) and high (> 6 times/year) frequencies of ARI
[2]number and percentage of children with decision maker, source of health information, contact person for ARI, and regular visit to Posyandu identified
[3]assessed with FET
[4]Odds Ratio (Confidence Intervals)

Whether or not the fathers or others made the health decisions was not related to the frequency of ARI in children. The source of health information, the cadres or others, was not found to be related to ARI frequency. There was also no difference in the frequency of ARI in children between those participants who used a grandparent versus another person as a contact for a child with ARI. Participants who did or did not regularly visit the Posyandu were not significantly different in their frequency of ARI.

5. Feasibility of Modifying Risk Factors for ARI

A total of 120 participants were asked open-ended questions in order to identify the feasibility of modifying the risk factors for ARI in children under five years of age.

5.1. Vitamin A Supplementation

The first area explored was the reasons why participants requested vitamin A supplementation for their children. Of the 108 mothers whose children had vitamin A supplementation, 58.3% (63 of 108) indicated that the most common reason was that they wanted the children to be healthy. Mothers also stated that they gave vitamin A to their children for healthy eyes, 24.1% (26 of 108). Some of the mothers, 13.9% (15 of 108), did not know why they administered vitamin A to their children. Four other reasons given by mothers for supplementation was "to get vitamin A" (1), "to obey the cadre's advice" (1), "to make the child smarter" (1), and "to prevent disease" (1).

For the 12 participants whose children did not receive vitamin A supplementation, four were misinformed about the vitamin A requirements for their child's age. Three mothers reported that their children were too ill to go to the Posyandu. Two mothers said that they did not want to go to the Posyandu and two mothers did not know its hours of operation. Only one mother reported that she was too sick to bring her child to the Posyandu.

5.2. Immunization Status

Seventy-seven participants reported that their children had complete immunization for their specific age groups. The most common reason for complete immunization, given by 68.8% (53 of 77) of the mothers, was that they wanted their children to be healthy. About 22.1% (17 of 77) of the mothers explained that complete immunization for their child's age group could prevent disease. Seven of the participants whose children's immunization were complete indicated that they did not understand why their children should be immunized.

Table 25: ***Reasons for Incomplete Immunization***

Reason	n[1]	%[1]
Child too ill to go to Posyandu	19	**44.2%**
No information about Posyandu hours of operation	8	**18.6%**
Mother worried about fever after immunization	4	**9.3%**
Posyandu closed	4	**9.3%**
Mother misinformed about age for immunization	3	**7.0%**
Mother **did not want to** go to Posyandu	2	**4.7%**
Mother did not know usefulness of immunization	1	**2.3%**
Father did not permit child to be immunized	1	**2.3%**
No time for mother to go to Posyandu	1	**2.3%**

[1]number and percentage of 43 children with incomplete immunization

Forty-three children did not have complete immunization for their age group. Table 25 summarizes the reasons given by mothers as to why immunization was incomplete for their children. When asked why their children had incomplete immunization, almost half of the participants, 44.2% (19 of 43), said that the children were too sick to go to the Posyandu. Furthermore, eight (18.6%) participants did not know the Posyandu's hours of operation. Additional reasons given by participants included, for example, that the father would not permit his child to be immunized.

5.3. The Harmfulness of Environmental Tobacco Smoke (ETS)

Participants were asked to describe the harmful effects of ETS. Two-thirds of the mothers, 65.0% (78 of 120), described respiratory problems including cough, dyspnea, and tuberculosis. About 25.8% (31 of 120) of the mothers stated that they did not know what was harmful about ETS. However, six mothers explained that ETS could cause cardiac disease and five mothers stated that it would affect health status in general.

A total of 92.5% (111 of 120) of the participants had a person who smoked living in the house. Thirty-nine mothers could describe possible ways to decrease ETS, but 72 were unable to identify any means for its reduction. The most common way of decreasing ETS identified by the mothers was to advise their husbands not to smoke, 64.1% (25 of 39). Another strategy suggested by 33.3% (13 of 39) of the participants who could identify a strategy was that the fathers could try to reduce their cigarette consumption. Only one mother wanted to decrease ETS but did not know how this could be done. However, the majority of mothers who could not identify a strategy, 98.6% (71 of 72), reported that it was impossible to reduce ETS because the fathers were addicted to cigarettes. Only one mother stated that she was afraid to advise her husband not to smoke.

5.4. Kitchen smoke

Of the 120 participants, 57 children were carried and 63 children were not carried in the kitchen by their mothers while they cooked. The mothers were asked if there was anyone else to take care of the children while they cooked. The most common person identified was the sister or brother of the child, 45.6% (26 of 57). Other alternatives identified by mothers were grandparents, 28.1% (16 of 57); other relatives including aunt, uncle, nephew, niece, or elder parents' sibling, 10.5% (6 of 57); and also fathers, 3.5% (2 of 57). One mother, 1.8% (1 of 57), identified a neighbor who could look after her child. Six mothers, 10.5% (6 of 57), stated that they had no alternative person to look after their children.

In households where the children were not carried, more grandparents, 30.2% (19 of 63), looked after the children while the mothers cooked than did a sibling, 20.6% (13 of 63). Family relatives also looked after the children. While two fathers, 3.2% (2 of 63), looked after the children while the mothers cooked, 15.9% (10 of 63) of the children played with their friends. Two mothers did leave their children, aged four and five, alone when they cooked.

The types of stove were also explored in the identification of risk factors for ARI. Only one family used a gas stove. The majority of households, 75.8% (91 of 120), used a kerosene stove. The most common reason given for its use, 40.7% (37 of 91), was that a kerosene stove was cheaper than a gas stove. Additional reasons given were that kerosene stoves were easy to use, 28.6% (26 of 91); there was no space for a wood stove, 7.7% (7 of 91); kerosene fuel cooked food faster, 6.6% (6 of 91); kerosene fuel was used out of habit, 2.2% (2 of 91); and kerosene was safe for children, 1.1% (1 of 91).

Sixteen participants, 13.3% (16 of 120), reported using a wood stove for cooking.

The main reason given by mothers, 93.8% (15 of 16), was that a wood stove was cheaper than a kerosene stove. One mother also stated that a wood stove cooked food faster than a kerosene stove.

About 10.0% (12 of 120) of the mothers combined kerosene and wood fuel for cooking. Both the financial situation and the availability of wood for fuel determined the family's utilization of these types of stoves, according to 75.0% (9 of 12) of the users. Two mothers (16.7%) stated that they used a wood stove if wood was available. Only one mother reported that a wood stove was faster than a kerosene stove.

The majority of households, 67.5% (81 of 120), had ventilation for the stove. Most of the ventilation comprised of a hole in the wall above the stove, 97.5% (79 of 81). Two houses had a big hole in the bamboo wall due to the building's construction and the state of disrepair. When the mothers were asked why ventilation was needed, most answered that it was useful for the removal of smoke, 43.2% (35 of 81), and for light as well as air circulation, 56.8% (46 of 81).

For the 32.5% (39 of 120) of households without ventilation, 13 (33.3% of 39) of the respondents said they had received the housing from their parents and could not give a more specific reason for a lack of ventilation. An additional 11 of the 39 (28.2%) also did not know why there was no ventilation for the stove in their houses. Others stated that they did not have the money needed to ventilate the stove, 15.4% (6 of 39). Five other reasons were given by mothers as to why there was no ventilation: the house was not finished (2), there was enough ventilation from the kitchen door and there was a big hole in the ceiling (2), and they wanted to keep out rats (1). About 89.2% (107 of 120) of the mothers reported that to improve ventilation, they could open the kitchen door. Only 1.7% (2 of 120) identified that they could construct an opening for ventilation, while 11 mothers (9.1%) reported that they had no way of improving the ventilation.

In about 59.2% (71 of 120) of the households, the kitchen opened to the living room. In 40.8% (49 of 120) of the households, a permanent door between the kitchen and the living room was usually kept open. It was therefore possible to contain kitchen smoke within the kitchen by closing the door.

Another area that was explored was why the windows were always closed. There were 77 households that always kept their windows closed (Table 26). The most common reason, 26.0% (20 of 77), was that the window did not open. Another reason given was to keep out dust and smoke since the houses were near a main road, 18.2% (14 of 77). Nine mothers, 11.7% (9 of 77), stated that they just did not open the window. Only one participant stated that the windows were always closed because they had enough ventilation holes.

Table 26: ***Reasons why the Windows are Always Closed***

Reason	n[1]	%[1]
Window does not open	20	**26.0%**
Avoid dust and smoke	14	**18.2%**
Avoid animal entering house	10	**13.0%**
Window key was broken	9	**11.7%**
Mother does not open window	9	**11.7%**
Prevent child from an accident or fall	8	**10.4%**
Avoid wind and rain	4	**5.2%**
Avoid bad smells	1	**1.3%**
Avoid person entering house	1	**1.3%**
Enough circulation from ventilation holes	1	**1.3%**

[1] number and percentage of 77 households that always closed the window

5.5. Potential for Transmission of Communicable Disease

While most of the mothers, 95.8% (115 of 120), reported that they could not separate a sick child from other children when sleeping because of their house size or household structure, only five mothers (4.2%) explained that it was possible to separate a sick child from other children. In regards to hand-washing practices in the family, most of mothers, 78.3% (94 of 120), indicated that they washed their hands before eating, cooking, and sleeping, while some mothers, 21.7% (26 of 120), only washed their hands before eating or when their hands were dirty. Water supply was not a problem in the village, either in quantity or quality. Hand washing practices and their influences were not explored further in this study.

5.6. Utilization of Health Care Services

The mothers were also asked why they took their children to the Posyandu. The Posyandu are village health services, provided by midwives, nurses and cadres, in support of the Puskesmas programs (community health services). The posyandu operates in the villages monthly, facilitating access for those unable to go to the Puskesmas.. A total of 85.0% (102 of 120) of the families utilized the Posyandu services. Fifty mothers (49.0% of 102) reported that they took their children to the Posyandu to determine the health status of their children. Another reason given by mothers, 43.1% (44 of 102), was that they wanted to keep their children healthy. Three further reasons were to obtain immunization, 4.9% (5 of 102); to prevent disease, 0.9% (1 of 102); and to obtain vitamin supplementation, 0.9% (1 of 102).

Only 15.0% (18 of 120) of the families did not use the Posyandu services. Mothers who did not take their children to the Posyandu reported that they were busy working, 33.3% (6 of 18). The second most common reason was that the child and mother did not want to go to the Posyandu, 27.8% (5 of 18). Four further reasons identified were: older children or healthy children did not need go to the Posyandu, 16.7% (3 of 18); there was a lack of information about the Posyandu's schedule, 11.1% (2 of 18); the mothers were worried about the occurence of fever after immunization, 5.6% (1 of 18); and the child was too sick to go to the Posyandu, 5.6% (1 of 18).

Almost 98.3% (118 of 120) of the participants said they took their ill children to the Community Health Services (Puskesmas) or Midwifery clinic. There were a variety of reasons given by mothers, the most common, 35.6% (42 of 118), was that the treatment in the Puskesmas was cheaper than other health care services. Some mothers. 28.0% (33 of 118). also stated that they chose the Puskesmas because it was nearer their house and it was also cheaper. About 19.5% (23 of 118) of participants reported that they had gone to the Puskesmas to get treatment so their child would recover faster. Eight (6.8%) participants trusted the Puskesmas and the Midwifery clinic. Several additional reasons why the mothers used the Puskesmas or Midwifery clinic for their ill children were: to become healthy. 4.2% (5 of 118): to ensure the safety of their children. 1.7% (2 of 118): to learn how to care for the sick child. 1.7% (2 of 118): to diagnose an illness. 1.7% (2 of 118): and because of the variety of facilities in the Puskesmas. 0.8% (1 of 118). for example. availability of blood or urine testing.

Most of the mothers. 87.5% (105 of 120). used non-prescription medicines for a child with a common cold. For the treatment of a common cold. some of the participants utilized the Puskesmas. 4.2% (5 of 120): some used a traditional medicine. 4.2% (5 of 120): some went to the physician. 2.5% (3 of 120): and some used a nurse practitioner or midwife. 1.7% (2 of 120). When the child's illness became more serious. most of the mothers used the following health care services: Puskesmas. 57.5% (69 of 120): physician. 19.2% (23 of 120): hospital. 13.3% (16 of 120): and midwife. 6.7% (8 of 120). Only four participants did not know where they would go if their child's cold became more serious.

6. Summary

In the descriptive analysis, this study found that infants younger than one year of age were significantly more likely than children older than one year of age to have incomplete immunization status for their specific age group (FET: $p < .0005$). The majority of the children (73.3%) reported at least one episode of illness in the six months prior to the interview, with nasal discharge and cough symptoms being the most frequent symptoms in boys and girls at the time of the interview. Furthermore, two-thirds of the children (67.5%) were underweight for their age while 32.5% were of normal weight. Children older than one year of age (72.9%) were more likely to be underweight compared to infants younger than one year of age (35.5%) (OR = 4.91, 95% CI = 1.659 - 14.535); the difference was statistically significant (FET: $p = .004$). In addition, almost half of the children (47.5%) were exposed to kitchen smoke.

In the bivariate inferential statistic analysis, this study reported that five factors were statistically significant in relation to a high frequency of ARI: maternal education less or equal to grade 3 ($p = .014$), four or more people sharing a bedroom with a child ($p = .039$), the attached kitchen design ($p = .040$), no ventilation for the stove in the kitchen ($p = .019$), and higher exposure to kitchen smoke ($p = .002$). In multivariate analysis, this study reported only three factors were statistically significant in relation to a high frequency of ARI: maternal education in grade (years) ($p = .016$), no ventilation for the stove in the kitchen ($p = .037$), and duration of mother's cooking while carrying her child in intervals of .5 hours ($p = .049$).

About 69.2% of the mothers were the key decision makers in health-related issues in this study. They contacted grandparents (64.7%) for infants younger than one year of age with ARI and also for children older than one year of age with ARI (43.7%). However, they contacted the health care system personnel more frequently for children older than one year of age with ARI (30.1%) as compared to infants younger than one year of age with ARI (17.6%). Cadres were reported as the principal source of health information for infants younger than one year of age (82.4%) and children older than one year of age (85.4%). Furthermore, the majority of parents (85.0%) reported taking their children for regular visits to the Posyandu, while 15.0% reported that they had not accessed the Posyandu.

Open-ended questions also were explored to identify the feasibility of modifying the risk factors for ARI in children under five years of age. Four participants were misinformed about the vitamin A requirements for the child's age. Four mothers worried about fever after immunization and one father did not permit his child to be immunized. A total of 92.5% of participants had a smoker living in the house. The most common way of decreasing ETS identified by the mothers was that they could advise their husbands not to smoke. Almost half of the children in this study were carried by their mothers in the kitchen while they cooked. Persons identified to take care of the child while the mothers cooked were either the child's sibling (45.6%) or grandparents (28.1%). The majority of households used a kerosene stove (75.8%) and 13.3% reported using a wood stove. About

67.5% of the households had ventilation and 32.5% had no ventilation for the stove. Thirty-three percent of the respondents could not give a more specific reason for a lack of ventilation because they had received their housing from their parents; about 28.2% did not know why there was no ventilation for the stoves. However, this present study reported that mothers (89.2%) could open the kitchen door to improve ventilation during cooking. About 64.2% of the households always kept their windows closed. The most common reason (26.0%) was that the window did not open; 18.2% said they wanted to keep out dust and smoke since the houses were near a main road. In terms of the potential transmission of a communicable disease in the houses, only five mothers said that it was possible to separate a sick child from their other children.

Eighty-five percent of families utilized the Posyandu services. For the 15.0% who did not use the Posyandu services, the mothers said that they were busy working (33.3%), the child and the mother did not want to go (27.8%), and the older children or healthy children did not need to go (16.7%). Most of the mothers (87.5%) used non-prescription medication for children with a common cold; however, when the child's illness became more serious, most of them (96.7%) used the health care services as a referral.

Chapter 5: Discussion

Chapter five will discuss the risk factors for ARI and the feasibility of modifying those factors in a rural village in Indonesia. Possible explanations for the findings of the study will be presented. The first section will discuss the risk factors for ARI in children under five years of age that involve the host, the environment, and other factors. Findings related to the utilization of health care services will be detailed in section two. The third section will present those risk factors that can feasibly be modified. The strengths and limitations of this study will be presented in the final section.

The HPM has guided this study to identify the risk factors for ARI that are feasible to be modified including cognitive-perceptual factors (perceived barriers to health-promoting behaviour such as lack of information and the impact of culture) and modifying factors (demographic, biologic, situational, and behavioural factors). This study found that using bivariate analysis, the results showed that the mother's education, the number of people sharing a bedroom, the kitchen design, exposure to kitchen smoke, and ventilation for the kitchen stove were significant as risk factors for ARI in children under five years of age ($p < .05$). Based on the multivariate analysis results, only three risk factors were identified: the mother's education, the hours the child was carried while the mother cooked, and ventilation for the stove ($p < .05$).

No studies of risk factors for ARI have been conducted in Indonesia, though a number of host and environmental risk factors have been reported from other developing countries. Knowing the risk factors for ARI will help in the development of health education or health promotion program strategies aimed at reducing these factors. This study explored the feasibility of modifying risk factors for ARI. There are five risk factors that are feasible to be modified: the mother's education, the number of people sharing a bedroom, exposure to kitchen smoke, ventilation for the kitchen stove, and hours the child is carried while the mother cooks. Only one risk factor may not feasible to be modified: kitchen design.

1. The Risk Factors for ARI

A number of risk factors identified in a review of the literature were explored in this study to see if they were applicable to Indonesia. At the time that this study's interviews were conducted, about 80.0% of the children had an average of eight episodes of ARI per year and 73.3% had at least one episode of serious illness in the six months prior to the interview. In addition, almost two-thirds of the children were underweight at the time of the interviews. These health problems may contribute to a high morbidity of ARI in children in the future and should be managed.

1.1. Host Factors

The host factors include young age, children's weight, vitamin A supplementation, immunization status, and the serious illnesses that have occurred in the past six months.

Age is a risk factor for ARI since the immaturity of the immune system reduces the host's ability to defend itself against pathogens. Age has been identified by many researchers as a risk factor for lower respiratory tract infections (LRTI); some studies found that infants younger than three months to be at the highest risk, while others found that children younger than two years were at an increased risk (Berman, 1991b; Tupasi, Leon et al., 1990; WHO, 1983). However, this study did not find a significant relationship between age and a high frequency of ARI (FET: $p = .292$). A small sample size in a specific age group and the possible subjectivity of the cadres in selecting participants with upper respiratory tract infections (URTI) and not pneumonia may have influenced the results of the present study, where only 16.5% (17 of 120) of the infants were younger than one year of age compared to 83.5% (103 of 120) older than one year. One study in Kediri, Indonesia (WHO, 1983) found that ARIs occurred mostly in infants younger than three months of age. The majority of children participating in this present study were older than three months of age. However, more studies need to be done to determine age as a risk factor for ARI or URTI. A larger sample size may be needed in order to find significant results.

This study used weight for a specific age group as a measure of the nutritional status of the children. Malnutrition has been reported as a risk factor for ARI (Berman, 1991b; Deb, 1998; O'Dempsney et al., 1996; Rahman & Rahman, 1997; Tupasi, Leon et al., 1990, Tupasi, Mangubat et al., 1990; Yoon et al., 1997). Tupasi, Mangubat et al. (1990) and Yoon et al. (1997) used standard deviation scores (z-scores) from the median of the National Center for Health Statistics (NCHS) reference population for height and weight for specific age group values; O'Dempsney et al. (1996) used standard deviation (z-scores) values of weight for height and weight for a specific age group. These researchers suggested that malnutrition causes an alteration in the immune status, weakness of the respiratory muscles, diminished energy status, and impairment in the recovery of normal pulmonary tissue from inflammation. Two-thirds of the children who participated in this present study were underweight. However, according to the classification scheme used in Indonesia, the study failed to identify a significant relationship between the high frequency of ARI and children's weight: normal versus underweight (FET: $p = .556$), and normal versus severe underweight (FET: $p = .820$). One possible explanation why this study did not find a significant relationship is the measurement of nutritional status. Other measurements beside weight for specific age groups may be used, such as height for specific age groups, weight for height, and body mass index. Assessment of nutritional intake would be the best measure to use but it was not feasible to implement in this study. However, no data suggested which would be a better measure.

Previous studies have identified that vitamin A supplementation has a significant relationship with a high frequency of ARI (Berman, 1991b; Bloem et al., 1990; Chytil, 1996; Dudley et al., 1997; Semba, 1999; Sommer et al., 1983; Sommer et al., 1984; West, Howard & Sommer, 1989). Other researchers have also found that incomplete immunization, especially for DPT and measles, in specific age groups, was significantly related to an increased incidence of ALRI, especially pneumonia (Cerqueiro et al., 1990; Deb, 1998; Garenne et al., 1992). Measles is still a major cause of childhood morbidity and mortality in developing countries, and therefore is the target disease of an expanded immunization program (Aaby & Clements, 1989; Henderson et al., 1988).

This study did not find a significant relationship between incomplete vitamin A supplementation and/or immunization status and a high frequency of ARI (FET: $p = .999$, $p = .443$). Most of the children in this study had an upper respiratory infection (such as a common cold) rather than an acute lower respiratory infection (such as pneumonia). This may be one reason why this study did not have significant results. In addition, it may not only be a lack of vitamin A supplementation and incomplete immunization status that contributed to a high frequency of ARI. Other factors, such as socio-economic status, may increase the risk of children developing ARI. For example, those who have received complete vitamin A supplementation and immunization may not have adequate nutrition; this results in low immunity, which may also predispose them to ARI.

Questions concerning the validity of the data may have contributed to the lack of significant study results. During the collection of data associated with vitamin A supplementation and immunization status, many participants had difficulty recalling the frequency of supplementation or which immunizations their children had received. The cadre, who frequently answered these questions rather than the participants, may have had an inaccurate memory. Data about vitamin A supplementation and immunization was not checked for accuracy and completeness from a secondary data source, the Puskesmas. In addition, the small sample size and non-random sampling may also have been a reason why this study failed to find a significant relationship between a high frequency of ARI and both vitamin A supplementation and immunization status.

This present study found that infants younger than one year of age were significantly more likely than children older than one year of age to have incomplete immunization status for their age group (FET: $p < .0005$). The study did not explore the reasons why infants did not have complete immunizations; it may be related to cultural beliefs. Health care providers should be concerned with this finding. First, infants with incomplete immunization status for their specific age group may be more susceptible to a variety of infectious diseases. Physiologically, infants are still unable to produce adequate amounts of immunoglobulin A (Ig A) since all systems are growing and changing during infancy. Therefore, they have less protection against common pathogens compared to children older than one year. Frequent illnesses during this period, possibly from decreased immunity, can disturb the normal growth and development of a child. Because of this, many of the recommended times for immunizations, with the exception of boosters, are during infancy. Second, the anatomy of the respiratory tract of infants facilitates the rapid transmission of infectious agents from the trachea to the bronchi.

Few of the studies of risk factors associated with ARI have emphasized the role of immunization and the related incidence of ARI, even though incomplete immunization was considered to be an important risk factor for ARI. Studies could be undertaken to evaluate the success and completeness of immunization programs in developing countries. Data in this study indicated poor immunization coverage in infants younger than one year of age. This is consistent with a high rate of vaccine preventable diseases. To improve coverage of base immunization in infants less than one year of age, health education or immunization campaigns that emphasize the benefits of vaccine may feasiblely be conducted in the village. In addition, to reduce morbidity and mortality caused by vaccine preventable diseases, immunization programs need to concentrate on ensuring that all children receive the appropriate immunizations, specifically in developing countries with a high incidence of secondary infections such as pneumonia. The cadres should be concerned with improved record keeping. A better recording and reporting system will strengthen the validity of data.

Two types of serious illnesses need to be considered in the high incidence of ARI: asthma and diarrhea. Asthma has been identified as one of the risk factors for ARI because of the role of bronchial hyperactivity in the development of an infection (Cerqueiro et al., 1990; Morris et al., 1990). In this present study, a proportion of boys (23.4%) and girls (19.6%) were identified as asthmatic during the previous six months. Asthmatic children were 2.22 times more likely to have a high incidence of ARI than those who were not asthmatic (OR= 2.22, 95% CI = 0.87-5.63). However, the study findings did not reach statistical significance (FET: $p = .119$). Data that were based on parental reports of wheezing may not have been as accurate as they should have been, as there is no standard way for parents to determine if their children have asthma. In some countries, language may be a barrier: it may be difficult to translate wheezing into a traditional or local language. Because asthma is one type of chronic obstructive pulmonary disease, and children with asthma are at risk for disease progression, health education as a preventative strategy should help to reduce the financial burdens of illness and the likelihood of serious respiratory illness.

Diarrhea was also more closely associated with incomplete vitamin A supplementation than with general nutritional status (Sommer et al., 1984). Prevention of diarrhea may be an important step in preventing ARI, especially with pneumonia as a complication. While almost half of the boys (42.2%) and girls (41.1%) had diarrhea during the previous six months, the present study did not find a significant relationship between diarrhea and a high frequency of ARI (FET: $p = .999$). One possible explanation for the lack of significant results was that parents may not understand or know the accepted definition for diarrhea or know when their children have it.

All of the host factors were assessed in relation to a high frequency of ARI. However, none of the host factors demonstrated a significant relationship with a high frequency of ARI. Risk factors identified by previous studies were for LRTI, not URTI. However, in this study, most of the children had URTI. The risk factors for ARI include young age, incomplete vitamin A supplementation and immunization for specific age groups, asthma, and diarrhea. Health problems in children usually considered unhealthy and at high risk could lead to future morbidity and should be corrected if possible. Children with URTI may develop LRTI (such as pneumonia), so correcting and reducing URTI could decrease the incidence of LRTI. Providing information or health education to the village mothers may help them to understand about URTI.

1.2. *Environmental Factors*

The incidence of ARI in children may not only be attributed to infectious agents but also to chemical agents such as tobacco smoke, dust, fumes, or gases (IOMC, 1999). If inhaled, these irritants cause inflammation of the upper respiratory tract, sore throat, and bronchial oedema. This inflammation may be followed by an infection, such as pneumonia, in the lower respiratory tract.

The literature review has documented those environmental risk factors that contribute to the incidence of ARI. The following were explored in this study: the number of cigarettes related to ETS, the number of people sharing a child's bedroom, and all potential risk factors related to kitchen smoke such as kitchen design, a kitchen which opens into the living room, windows which open, the type of stove, ventilation for the stove, hours that an infant or child is carried by the mother while cooking, and exposure to kitchen smoke.

Previous studies have found a significant relationship between ETS and a high frequency of ARI (Berman, 1991b; Chen et al., 1988; O'Dempsney et al., 1996; Pandey et al., 1989; Selwyn, 1990; Tupasi, Leon et al., 1990). However, this study failed to find a statistically significant association between children whose parents smoke and a high frequency of ARI (FET: $p = .173$). In this study, about 68.3% of the fathers smoked and 92.5% of the children may have been exposed to ETS. However, the presence of a smoker at home may not guarantee that the children were exposed to ETS. Location may relate to the incidence of ARI; for example, if the fathers smoked outside the house, the children may not have been exposed to ETS. Furthermore, this study used less and more than 10 cigarettes smoked per day to measure the effect of ETS on the frequency of ARI, based on a previous study by Chen et al. (1988) which indicated a significant relationship with these parameters. However, the results in this study were not significant (FET: $p = .451$). The accuracy of the data source may affect the results of the current study. Most of the mothers, as the primary source of information, estimated the number of cigarettes smoked; this may not have been an accurate measure of ETS. The number of cigarettes may not be the best indicator to measure the effect of ETS. The child's actual exposure to ETS may also depend on household ventilation, volume of the enclosed space, the amount of time the father spent with the child when he was smoking, and also the amount of time he spent indoors when he was smoking. It was not feasible to measure these variables in this study. Jin and Rossignol (1993) also did not find a significant relationship between ETS and a high frequency of ARI.

A significant relationship has been identified between four or more people sharing a bedroom with a child and a high frequency of ARI (Berman, 1991a; Cerqueiro et al., 1990; Pandey et al., 1989; Tupasi, Leon et al., 1990). Another investigator found that sharing a bedroom with two or more people can increase the child's risk of ALRI three to almost four times more than in less crowded conditions (Rahman & Rahman, 1997; Selwyn, 1990). However, O'Dempsney et al. (1996) did not find an association between bedroom sharing with less than two and more than two people and the incidence of pneumonia. This may be related to the development of immunity to respiratory pathogens from the frequent contact that can occur when children share the same bedroom (Mims, Playfair, Roitt, Wakelin and Williams, 1993).

The current study also found a significant relationship between a high frequency of ARI and more than four people sharing a bedroom with a child (FET: $p = .039$). Frequent contact and the effect on transmission may be the main reasons for the significant findings. Direct transmission can occur rapidly by droplets from sneezing, coughing, and talking; indirect transmission can occur when the infectious agent is deposited on a variety of surfaces such as handkerchiefs, hands, soiled clothing, and bedding (Abrams, 1991; Harkness, 1995).

Hand washing is a problem in rural communities and may contribute to increased risk of ARI. This health behaviour may be influenced by a lack of scientific knowledge, which results from a low level of education or the community's culture. The villagers may not realize that contaminated hands can transmit diseases and usually only wash their hands before eating and sleeping. Although Moslems, who obey the religious law, wash their hands at least five times per day before praying. Lack of ready access to clean water is a barrier to frequent or effective handwashing. In Indonesian villages, limited finances and prevailing housing and sanitation conditions rarely permit running water in the home.

Sneezing or coughing without covering the mouth, or wearing a mask when in contact with people who have ARI are considered impolite. These behaviours facilitate spreading of ARI. In addition, the socio-economic status may also contribute to the transmission process, and is related to the limited number of rooms in a house. It may be necessary for all family members to sleep in one room with a sick child, thus facilitating the transmission of the disease. In this study, the majority of participants were at or below the national average monthly income.

The number of children in a house may also have a significant relationship with a high frequency of ARI. There are no studies to indicate that a large number of children in one house is significantly associated with a high frequency of ARI. Current literature explores the impact number of siblings rather than the total number of children. In this study, children with more than one sibling were 1.67 times more likely to have a high frequency of ARI than those with one sibling (95%CI= 0.789 - 3.520), but the result was not significant (FET: $p = .190$). Less contact between children inside the house may contribute to this result. In rural communities, children often play outside in a yard, and have more contact with their peers than with their siblings. The small sample size of this study may also affect the results.

Indoor pollution has been reported by many researchers as having a significant relationship with a high frequency of ARI (Armstrong & Campbell, 1991; Cerqueiro et al., 1990; DeFransisco et al., 1993; O'Dempsney et al., 1996; Robin et al., 1996; Sharma et al., 1998). The present study supports this relationship. Three risk factors related to indoor pollution were identified as being significant in both bivariate and multivariate analysis: kitchen design, ventilation for the stove, and exposure to kitchen smoke (FET: *p*

= .040, p = .019, p = .002). Children who live in houses with an attached kitchen were 9.26 times more likely to have a high frequency of ARI than those in houses with a separate kitchen (95% CI= 0.82 - 104.20). An attached kitchen design facilitates the children's inhalation of chemical substances and exposure to kitchen smoke that can irritate their airways when their mothers are cooking. Frequent irritation from chemical substances may contribute to children having frequent ARIs. In addition, families who have small houses and a low socio-economic status in the community may have insufficient room for separate cooking, living and sleeping rooms. As they may cook and sleep in the same room; it is not surprising that their children have the potential for a high frequency of ARI.

Even though 94.2% of the houses had a separate kitchen, almost 60.0% had it open to the living room because the door was always kept open or there was no door between them. However, there was no significant difference in the frequency of ARI in children who lived in homes with kitchens which opened or did not open to the living room (FET: p = .710). It is possible that there was no difference because there was a similar exposure to kitchen smoke.

A similar situation occurred in those households which had or did not have a window to open. The relationship between a high frequency of ARI and an open window was not significant (FET: p = .183). The mothers may only open the window during cooking, and this may not have been long enough to clear the house of smoke. Therefore, in this study, a closed window may indicate a risk factor for ARI.

Ventilation for the kitchen stove was significant in relation to a high frequency of ARI (FET: $p = .019$). Ventilation is an important aspect of air circulation. About 67.5% of the households in this study had ventilation for their stoves; but, the type of ventilation in the kitchen varied. Without ventilation, the room would be filled with smoke. Children who spent time in a poorly ventilated kitchen were 2.60 times more likely to have a high frequency of ARI than those in ventilated kitchens (95% CI = 1.18 - 5.75). In a regression model, ventilation for the stove was still a significant factor.

A wood stove has been reported as a risk factor for ALRI (Morris et al., 1990). However, this present study did not find a significant relationship between the type of stove and high frequency of ARI (FET: $p = .833$). Most of the households had a separate room or a building for a wood stove in the community area. Children who lived in houses where their mothers used a wood stove for cooking may not be exposed to the kitchen smoke caused by the burning of wood fuel. However, when children who were carried in the kitchen by their mothers where a wood stove was used were compared to those exposed to a kerosene stove, there was no significant difference in the relationship to a high frequency of ARI (FET: $p = .999$). Therefore, in this study, the type of stove was not a risk factor for ARI. However, the small sample size may have contributed to these results.

Being carried while the mother cooked has also been reported as a risk factor for ARI (Armstrong & Campbell, 1991; Azizi & Henry, 1991; DeFransisco et al., 1993; Pandey et al., 1989). In the regression model, the number of hours a child was carried by the mother when cooking was significantly associated with ARI ($p = .0498$). This association, however, did not reach statistical significance in bivariate analysis (FET: $p = .141$). Further study of this risk factor is warranted.

This study also categorized high and low exposures to kitchen smoke. Children were categorized as having a high exposure to kitchen smoke if they were carried while their mothers cooked, but there was ventilation for the stove and an open window. Children were categorized as having a low exposure if they were not carried while their mothers cooked, but there was no ventilation for the stove and no open window. There was a statistically significant relationship between a high exposure to kitchen smoke and a high frequency of ARI (FET: $p = .002$). It was reasonable that those children who were always carried by their mothers while they cooked, even though they had ventilation and an open window, had more frequent ARIs than those who were not carried during cooking. Children who were always exposed to kitchen smoke may inhale chemical substances that irritate their airways. In this study, environmental factors such as ventilation and windows which open may not directly influence the frequency of ARI. The behaviour of mothers who always carried their children while cooking may be the most important point of concern in reducing a high frequency of ARI. Increased exposure to kitchen smoke could increase ARI frequency.

Environmental factors are often interrelated with other factors, so it is difficult to quantify the effect of these factors on a high frequency of ARI. As there was no accurate measure of exposure, we may be unable to confirm the accuracy of our exposure data independently.

Overall in this study, ETS, the number of children in the house, the openness of the kitchen to the living room, windows which open, and the type of kitchen stove were not risk factors for a high frequency of ARI. However, the number of people sharing a bedroom with a child, the kitchen design, ventilation for the stove, the number of hours a mother carried her child when cooking, and exposure to kitchen smoke were risk factors for ARI. This study suggests that to reduce the incidence of ARI, it might be useful to improve the ventilation in the kitchen, to keep the children away from a smoke-filled environment, and to discourage the mothers from carrying their children when cooking. Although this study did not provide evidence for an association between parental smoking and ARI, it is also prudent to discourage parents from smoking given the effects of ETS known from other studies.

1.3. Other Factors

In this study, the mothers (86.7%) were the main source of information. One hundred percent of the participants were Moslem, with two cultural groups, Sundanist and Betawist, being evenly represented. The education level (grade 1-6) was similar between the fathers (71.7%) and the mothers (75.8%). In patriarchal communities, fathers usually have the responsibility of financially supporting their families. Their low level of education makes it difficult for them to find good jobs; therefore, most of them worked as labourers, thus producing a low family income. In this study, about 75.8% of the families reported an income similar to or less than the national per capita monthly income (≤ Rp. 350,000). This may influence the health status of family members, especially children under five years of age, who are included in a high risk group and are still in the process of growing and developing, and may be more susceptible to a variety of diseases including ARI.

Although other studies found an association between socio-economic status and ARI or LRTI (Berman, 1991b; Deb, 1998), this study did not find a statistically significant relationship between the income level and a high frequency of ARI (FET: p = .544). This study also assessed other risk factors that might relate to income levels and a high frequency of ARI. When comparing children from low and high socio-economic backgrounds, the number of hours the children were carried by the mother during cooking, the kitchen design, a kitchen open to the living room, and an open window were not statistically significant (FET: p = .056, p = .999, p = .451, p = .235). Therefore, in this study, the parents' income levels may not be a risk factor for a high frequency of ARI in children under five years of age.

In this study, the mothers' level of education was statistically significant to the high frequency of ARI (FET: p = .014). Children whose mothers had less than grade 3 education were 3.02 times more likely to have ARI than those whose mothers had more than grade 3 education (95%CI= 1.20 - 7.60). Most of the mothers in the village did not work or go outside the home, but stayed at home and cared for their children. The mothers' low level of education could influence their decisions about the care of their children. This may result in unhealthy practices; for example, the investigator observed that when some mothers cleaned up their children's nasal mucus, they did not wash their hands afterwards. They may not understand that this is how the common cold is transmitted. Furthermore, mothers with a low education level may be less socially comfortable with health care providers such as physicians, midwives, and nurse practitioners who have a higher level of education, have social status, and come from outside the communities (Grace, 1998). They may not have the confidence to contact them directly when their children are ill.

Although in this study the income level was not a risk factor for ARI, the mothers' level of education was significantly associated with a high frequency of ARI. This study suggests that it may be useful to improve the mothers' knowledge specifically about child care practices as they are the main caregivers for children in rural communities. In addition, the girls, as future mothers, should be encouraged to stay in school as long as possible and learn to read and understand the health information made available in newspapers, magazines and by radio.

2. Utilization of Health Services

In this study, the majority of mothers (69.2%) were the key health-related decision makers. However, most parents contacted grandparents for support and information when their infants were younger than one year and their children older than one year of age with ARI, 64.7% and 43.7%, respectively. They contacted the health care system personnel more frequently for children with ARI who were older than one year of age compared to infants younger than one year of age, 64.7% and 17.6%, respectively. Cadres were also reported as a principal source of health information for infants younger than one year of age and for children older than one year, 82.4% and 85.4%, respectively. The majority of parents (85.0%) reported making regular visits to the Posyandu. However, none of the variables of decision maker, source of information, contact person for ARI, and visits to the Posyandu were significantly related to a high frequency of ARI in children. Health care providers should be concerned about why the respondents contact health care services more often for children with ARI who are older (64.7%) than for infants who are younger (17.6%) than one year of age. Infants younger than one year of age have low immunity and are thus more susceptible to more serious illnesses and complications if management is delayed. The culture and health beliefs of the communities influence the decision to take infants younger than one year of age outside the home. The cause of disease in young infants is believed to be related to a supernatural force, and that only a traditional healer can treat infants (Sutrisna et al., 1993). Overall, the lack of consultation with health care providers occurs because culturally the parents are led to believe that it is unhealthy for young infants to leave the house. Having health care providers make home visits to mothers with infants would provide for opportunities for health education, thereby promoting reduced incidence of childhood illness as well as early detection and treatment. Cadres could be trained to assume the responsibilities of home visits.

3. Modifying Risk Factors for ARI

The risk factors for ARI in children under five years of age were discussed in the previous section. There were six variables with statistically significant results for a high frequency of ARI in this study: maternal education, the number of people sharing a bedroom with a child, ventilation for the stove, kitchen design, the number of hours the mothers carried their children during cooking, and higher exposure to kitchen smoke. Previous studies found some risk factors for which this study found no significant results, such as a deficiency of vitamin A, incomplete immunization, and exposure to ETS. Some of these risk factors can feasibly be modified, thus reducing the incidence of ARI in children under five years of age: vitamin A deficiency, incomplete immunization, harmful ETS, exposure to kitchen smoke, and the number of people sharing a bedroom with a child.

3.1. Modifying Exposure to Kitchen Smoke

Approximately half of the children (47.5%) who participated in this study were carried in the kitchen by their mothers while they were cooking. This study found that a high exposure to kitchen smoke was statistically significant for a high frequency of ARI. Children have a high exposure to kitchen smoke if they always follow the mothers or they are on their mothers' backs and near the stove instead of being placed in a permanent seat such as a bamboo bank. Therefore, they are predisposed to inhale chemical substances directly from the kitchen smoke; this can irritate their airways, although there might be ventilation from an open window. Furthermore, the bamboo bank may be better than keeping children on the floor to avoid additional disease such as diarrhea. However, children who were not carried in the kitchen or who were kept on the floor may avoid direct inhalation from chemical substances even though their house does not have ventilation or an open window. In addition, the duration of exposure to kitchen smoke or indoor pollutants may influence the children's risk of ARI. This study found that the number of hours that children were carried while their mothers cooked was a risk factor for ARI (in the model). Thus, the main focus of the study was to modify the risk factors for ARI, and to change the mothers' behaviour when carrying their children while cooking.

When they were asked about an alternative person who could look after their children while they were cooking, most of the mothers suggested the child's siblings (45.6%), grandparents (28.1%), relatives including aunt, uncle, nephew, niece, or elder parents' siblings (10.5%), fathers (3.5%), and neighbors (1.8%). These alternatives may be possible in rural communities as most children are part of an extended family. However, a lack of information about the harmfulness of kitchen smoke may not consistently change mothers behaviour. They may need more information and time to understand the dangers of kitchen smoke for their children. A parent education program may be useful to maintain healthy behaviour of the mothers.

This study also found significant relationships between the kitchen design and stove ventilation and a high frequency of ARI. However, in this study, there were no significant associations between the type of stove, the presence of a kitchen window, the kitchen being open to the living room, and the presence of an open window and a high frequency of ARI. Furthermore, a previous study by Morris et al. (1990) reported that a wood burning stove was a greater risk factor for ARI, although Honicky, Osbourne and Akpom, (1985) found that a kerosene stove was a greater risk factor for ARI. The latter researchers suggested that kerosene users tended to cook indoors and this effect, interrelated with a less ventilated environment, resulted in increased duration of exposure to indoor pollutants. However, most of these risk factors that involve the physical aspects of housing are related to the socio-economic status of the family and cannot easily be modified. Modifying child-carrying behaviour may be one solution to reducing the effect of kitchen smoke on children.

The majority of the households had a ventilation hole in the wall above the stove (67.5%), while 32.5% had no ventilation. The most common reason given by mothers for not having ventilation for the stove was that they had been given housing by their parents, and they could not make any changes. However, most mothers (89.2%) who had no ventilation for their stoves identified a way to improve the ventilation by opening a kitchen door, while only 1.7% stated that they could make new ventilation.

In about 59.2% of the households, the kitchen opened into the living room. However, 40.8% of the households had a permanent door between the kitchen and the living room. In these households, the mothers could be encouraged to close the door during cooking, and this may reduce the dispersal of kitchen smoke to all the rooms in the house.

The incidence of ARI may also be related to another risk factor: whether a window was open or closed. There were 64.2% of households that always kept their windows closed. The most common reason (26.0%) was that the window did not open. Most families in the community chose the closed window for their house because it was cheaper than the open type: this risk factor cannot be modified. Adding new ventilation may be one possible solution. but difficult because of financial problems. Further suggestions would be for the mothers to keep a door open or move the children out of the kitchen while cooking. Other reasons identified by the respondents as to why the windows were always closed were to avoid dust and smoke because the house was near a main road (18.2%). to prevent animals entering the house (13.0%). to prevent children from having accidents (10.4%). to avoid wind and rain (5.2%). to avoid bad odours (1.3%). to prevent people entering the house (1.3%). and finally. there was enough ventilation from the ventilation hole (1.3%). Most of these reasons were modifiable. In the hot season. many areas including the main road were dry. To prevent dust and smoke from vehicles traveling on the dirty roads. the participants may pour water on the road or open the top and close the bottom window. In the village. availability of water is not a problem. A lack of knowledge may be a major reason why participants do not pour water on the road to control dust. Only the participants who live near the road may be concerned about pouring water to control dust. although the road is public and dust control is a responsibility of all members of the community. Therefore. discussion with the village staff may be needed to provide information about dust control. The participants may also keep their animals (such as chickens) in a coop, so they could then open a window. Situations that cause childhood accidents may depend on the types of window as well as the attentiveness of the main caregiver for the children. When a caregiver takes appropriate care of the children, they will be safe and there is less chance of accidents occurring and windows can still be opened. Conversely, in the rainy season, to avoid wind and rain, the participants may open the window at specific times for ventilation. When the mothers are cooking, it is important for children to get fresh air and to keep the air circulating. For those participants who responded that there was enough ventilation from a hole, information about the adequacy of air circulation may be needed.

Logistic regression analysis accounted for 14.5% of the variance; other risk factors were involved that were not measured or included in the model. However, this study still found statistically significant risk factors for maternal education, the number of hours the children were carried by their mothers while cooking, and ventilation for the stove. Therefore, an intervention was warranted to modify these risk factors in reducing the incidence of ARI in children under five years of age. Further studies are required to identify other relevant risk factors so that other appropriate interventions can be determined.

Overall, children may be protected from the dangers of kitchen smoke when the mothers do not carry them while cooking, a window is kept open, ventilation is maintained for the stove, and fresh air is kept circulating. This information may be offered through campaigns and parent education programs. These results may also be used as a basis for recommendations to the government to help communities in rural areas pay for new ventilation or to modify current windows. The nurse, as a health educator and health care provider, especially in the role of the community health nurse, may be involved in this campaign as well as help to influence the upper levels of government in making new policies for ways to improve housing in the villages.

3.2. Modifying Deficiency of Vitamin A Supplementation and Incomplete Immunization

This study reported that infants younger than one year of age, had incomplete and complete vitamin A supplementation for their specific age groups, 16.7% and 83.3%, respectively. Children older than one year of age had incomplete and complete vitamin A supplementation for their specific age group, 11.7% and 88.3%, respectively. Almost 20.0% of infants younger than one year of age and 12.0% of children older than one year had incomplete vitamin A supplementation. Parents had not given vitamin A to their children because they were misinformed about the requirements for their child's age and they did not know the Posyandu's hours of operation.

In terms of the immunization status of children in this study, infants younger than one year of age had no or incomplete immunization and complete immunization for their specific age group, 82.4% and 17.6%, respectively. Furthermore, in children older than one year of age, 28.2% were reported with no or incomplete immunization, and 71.8% with complete immunization for their specific age group. Most of the infants younger than one year had no or incomplete immunization. In fact, this age group is the most susceptible for a variety of diseases including ARI because of their immature immune systems. Participants offered the following reasons for their children's lack of complete immunization: they did not know the Posyandu's hours of operation (18.6%), they were worried about a fever after immunization (9.3%), they were misinformed about the age of immunization (7.0%), they did not know the usefulness of immunization (2.3%), and one father did not permit his child to be immunized (2.3%).

The basic problem for incomplete vitamin A supplementation and incomplete immunization for a specific age group may be similar: misinformation and lack of information. Misinformation may occur because the majority of mothers receive their information not from health care providers but from other mothers whose children have had vitamin A supplementation or been immunized. Inadequate or inaccurate information can create misunderstanding among people. Low levels of education may also contribute to this problem. The mothers may not know how they should clarify the information and also may not feel comfortable asking the health care providers who are of a different social status in the community. A special effort is needed to reach these participants and to improve their knowledge. Health education is one feasible solution. Health education is one approach used to try to change health behaviour of the mothers. Since cognitive perceptual factors may contribute to health behaviour, mothers' perceived benefits of health-promoting behaviour will influence whether or not they may take a health action. If a mother knows that children with complete immunization and vitamin A supplementation for age are healthier than children who have incomplete immunization and vitamin A supplementation, she may take her children to health services to get complete immunization and vitamin A supplementation. A health education program directed to improve immunization and vitamin A supplementation is warranted, and should be evaluated once implemented.

Health care providers, such as physicians, midwives, nurse practitioners, and trained cadres, have a responsibility to disseminate health information. Health education in rural communities may be achieved through direct and indirect health education (PPM & PLP, 1998). Direct health education may be effective if it is implemented during the activities of the Posyandu. A discussion strategy may be recommended to ask mothers about their problems; it would facilitate direct communication between the mothers and the health care providers. To achieve an optimal result, it may be useful if the health care providers prepare the content of education as a guide to be used during a discussion. Because the average level of education for most communities is less than grade 6, the health care providers may need to use simple or a local language to facilitate learning. Story telling or pictures about children either with vitamin A deficiency or incomplete immunization and some related diseases may help them to understand the dangers of both. If mothers do not attend the Posyandu, individual home visits by cadres may be needed to explain the purposes of specific health educational opportunities.

Indirect health education may be implemented by the dissemination of leaflets and posters to all communities. As illiterate participants are unable to read or understand this material. it may be preferable to use other formats: writing, pictures or other audio-visual methods. A media assessment in the study area indicated that more than half of the households have radio (61.1%) and television (64.8%), but only 3.4% have telephones (BPS and Bappeda, 1999). This information may be useful for the Department of Health when it advertises its health programs. However, an appropriate time for each community should be considered carefully, for example, at 7 p.m., when all family members are at home.

Regarding the lack of information about the Posyandu's hours of operation, it may be feasible to foster communication between the staff of the Puskesmas and the Posyandu. Having regular, consistent hours of operation for the Posyandu would help mothers know where services are available. Moreover, as the Puskesmas has each Posyandu's schedule of activities for every village, the Puskesmas administration could send a letter to the administrative staff in the village to inform the cadres about reminding all participants of the Posyandu's operating hours.

3.3. Modifying the Harmfulness of Environmental Tobacco Smoke

This study reported that about 68.3% of the fathers were identified as smokers and only nine households (7.5%) had no smokers. Therefore, 92.5% of the children may be exposed to ETS. Some of the mothers (65.0%) reported that they recognized the harmfulness of ETS; however, only 39 (35.1%) could describe possible ways to decrease it, and 72 (64.9%) were unable to identify any ways to reduce its. The most common suggestion of decreasing ETS, as identified by the mothers, was to advise their husbands not to smoke (64.1%) or to voluntarily try to reduce their cigarette consumption (33.3%). It is well known, however, that it is difficult to quit smoking. It may be feasible to reduce the children's exposure to ETS by advising the father to avoid his children when he smoked, to smoke outside of the home, or to try reducing the number of cigarettes smoked per day.

Smoking was a major problem in rural communities, where a majority of the men smoked. Reynolds (1998) reported that smoking participation rates range from 50-85% in Indonesia, particularly among men. Men have more power than women, are a key financial source for the family and may also be a key decision maker for health. Mothers may not feel confident to advise fathers not to smoke or prohibit them from doing so. The dangers of smoking are not well known in Indonesia. Little research has been carried out on smoking cessation in Indonesia. Indonesia anti-tobacco activities still face an uphill battle against the industry. They need increasing publicity and international pressure. Therefore, further study about quit-smoking projects is warranted.

One such study of interest would be to examine the effectiveness of a health education program about the harmfulness of ETS in an effort to reduce the frequency of ARI in children under five years of age. Community approaches involving men as the main target and entry points may be important for health care providers (PPM & PLP, 1998). To address cultural barriers to health-promoting behaviours, the health care provider team may collaborate with key persons in the community to ask for their participation in the program. This is especially important at the program preparation stage in a discussion of the objectives, the materials, and the strategies that will be used in the program and provide a sense of ownership or belonging to a program. Key persons would include community leaders, the Posyandu leaders, neighborhood leaders, religious leaders, and cadres. Empowering these resources who have the same ethnicity, race, culture, language, and religion as the rest of the neighborhood or community can help in achieving optimal results. Discussion strategies may be more appropriate for adult learning in the health education program since they are perceived to exist in the program. The time, the place, and the schedule of this program would be discussed with the key community people.

3.4. Modifying Transmission of Communicable Disease

About 72.5% of the mothers could not separate a sick child from the other children when the child is sleeping. If the reason was that there were no other rooms, a suggestion may be to move to another house such as the grandparents' house or a relative's house. Only five mothers (4.2%) stated that it was possible to separate their sick children from the other children. For these mothers, the health care provider may suggest that they segregate a sick child in a separate room. However, modifying situational influences such as separating a sick child from another child is not the only solution in preventing the transmission of a disease. Indirect transmission of ARI may occur via contaminated hands. This study found that most of the mothers (78.3%) washed their hands before eating, cooking, and sleeping, while some only washed before eating or when their hands were dirty (21.7%). The mothers may lack of information about the purpose and usefulness of hand washing. Consequently, health education in terms of hand hygiene is very important.

3.5. Modifying Utilization of Health Care Services

A total of 85.0% families utilized the Posyandu services. The most common reason given by the mothers who did not take their children to the Posyandu was that they were busy working, (33.3%); they also may not know the purposes of the Posyandu programs, so they were not concerned about taking their child there. The second reason given was that child and mother did not want to go to the Posyandu (27.8%). A qualitative approach may be needed to explore why they did not go to the Posyandu. Other reasons include: their children were older or healthy children do not need go to the Posyandu (16.7%), and a lack of information about the Posyandu's hours of operation (11.1%). For these participants, information that the Posyandu's programs are for both healthy and sick children may be useful. In addition, the operating hours of the Posyandu could be posted and the cadres informed. Finally, some mothers noted that they were worried about fever after immunization (5.6%), and some stated that their child was too ill to travel to the Posyandu (5.6%). Information about the side effects of immunization and the management of fever may be needed by participants. Health teaching about the actions that have to be taken by mothers before their children are too ill to travel is also important.

Most of the mothers (87.5%) used non-prescription medicines for children with a common cold. They also may not know that the cause of a common cold is a virus, and is not treatable with antibiotics. There was no correlation between incidence of ARI and children's use of non-prescription medicines such as anti pyretics or decongestants. Use of a non-prescription medicine may be appropriate treatment and can also save the parents the cost of a visit to the physician. However, when a child is young or has a weak defense mechanism, it may be possible that the common cold could became more serious. A viral infection may initiate a secondary infection such as pneumonia or diarrhea. Although most of the mothers used the following health care services for serious illnesses-- Puskesmas (57.5%), physician (19.2%), hospital (13.3%), and midwife (6.7%) -- they may not know or recognize the types as well as the signs and symptoms of a serious illness. Therefore, early detection information about the signs and symptoms for some serious illnesses such as pneumonia and diarrhea may be needed. Health education may improve a mother's knowledge. The poster exhibit is an efficient and effective educational tool, which also should be easily understood in about five minutes or less (McCann, Sramac, Rudy, 1990). Poster are viewed as visual aids that are well suited to use as independent sources of information or as support for other presentation formats (Duchin & Sherwood, 1990). In addition to providing information by using pictures or audio-visual learning media, using the parents' experience may assist the educator in helping the parents understand the signs and symptoms of a serious illness. Such a learning experience for an adult may be effective enough to change a parent's behaviour.

4. The Strengths and Limitations of the Study

The main strength of this study was that it addressed issues not previously researched: risk factors for ARI in Indonesia and the modifiability of those risk factors. Most of the children (80.0%) in this study had symptoms of ARI at the time of the interview and 73.3% reported at least one episode of serious illness in the six months prior to the interview. This is a considerable health problem in children under five years of age in Indonesia. Children are important as the next generation of the country, and appropriate management of this problem is crucial.

This study has found that ventilation for the stove, exposure to kitchen smoke, kitchen design, the hours the children are carried when their mothers are cooking, more than four people sharing a bedroom with a child, and low maternal education were risk factors for a high frequency of ARI. However, this study did not find some of the previously identified risk factors for a high frequency of ARI. This study found that the children had more upper respiratory tract infections (such as the common cold), rather than lower respiratory tract infections (such as pneumonia) which were the focus of studies conducted outside of Indonesia. An upper respiratory infection caused by a virus could initiate a secondary bacterial infection such as pneumonia if there was inappropriate management. The results of this recent study were important as a basis for health education programs in rural communities especially in the Indonesian province of West Java. Health education is one of the health promotion strategies which may be used effectively to inform the parents of risk factors that place a child at increased risk for ARI. pneumonia and behaviours associated with reduced risk. For example, after participating in a health education program, the mothers' healthy behaviour may include avoiding carrying their children when they are cooking.

This study has also found that the feasibility of modifying risk factors for ARI that involve host, environment, and behavioural factors based on the HPM could facilitate an effective strategy for health education and promotion in the villages. For example, to modify the host factor, information about the age requirements for vitamin A supplementation and immunization may be provided in health education programs. A smoke-filled environment may be reduced by opening a kitchen door or by making a new ventilation opening. Discouraging mothers from carrying their children during cooking may reduce the incidence of ARI in children under five years of age. Finally, if there is a sick child home, taking the healthy child to the grandparents' house removes that healthy child from the environment of risk, decreasing exposure. Therefore, the risk factors for ARI can be controlled. This study did not examine hand washing practices but this may be an area for further study.

A cross-sectional study design allowed the investigator to avoid costly and time consuming steps in the research process (Nieswiadomy, 1993; Polit & Hungler, 1999). Another strength of this study was the use of the interview, since the investigator was able to explore answers more easily than with close-ended questions, and was also able to validate that the participants understood the questions.

The small sample size was the chief limitation of the study; as there was no prevalence data of the risk factors for ARI in Indonesia, the sample size was calculated based on a case-control study by O'Dempsney et al. (1996). Actually, a larger sample size may have been possible with this present study, but the time for data collection was the problem for the investigator. In addition, this study is an exploratory study, so there is no hypothesis testing. Convenience sampling was chosen instead of random sampling, since the phenomena under study were fairly homogeneous within the children's population, and the risk of bias was minimal (Polit & Hungler, 1999).

Another limitation was related to the survey questions, specifically those used to study the medical history of the children. For example, questions addressing signs and symptoms of ARI such as cyanosis, wheezing, and chest indrawing did not have established validity and no measure of reliability was made. Therefore, the creation of simple questions usable in communities in rural areas may be useful. Further asking participants to recall events from the previous year or related to general practices, rather than a specific episode of ARI, may also have resulted is some inaccuracy of the data. There is no evidence to suggest, however, that the resulting bias would be consistently in one direction or the other.

Using a cross-sectional design and a convenience sample may also limit the possibility of generalizing the results of the study to all villages in Indonesia (Polit & Hungler, 1999). For example, this study has a sample size that is not representative; therefore, it is not possible to generalize. In using this design, it was also difficult to separate cause and effect because the measurement of exposure and disease were made at one point in time (Kelsey, 1986). For example, the investigator obtained the risk factors and the incidence of ARI data at the same time. Thus, it is not known which came first, the risk factors or the incidence of ARI.

Chapter 6: Conclusion and Nursing Implications

This chapter contains the conclusion and the implications for nursing education, practice, and research that arise from the results presented in this study.

1. Conclusion

The high level of morbidity and mortality of which the primary cause is ARI in children under five years of age is a major problem in Indonesia. The interaction of the host, the agent, and the environment determines the incidence of ARI. A national ARI programme has been implemented using strategies aimed at solving this problem, such as case finding, case management of ARI, and the dissemination of ARI information to all communities, albeit with sub-optimal results (PPM & PLP, 1998). As these strategies are costly and not feasible for rural communities, long-term solutions are more dependent on the control of risk factors. The common risk factors for ARI in children under five years of age in most developing countries include young age, malnutrition, low birth weight, lack of breast feeding, over crowding, incomplete childhood immunization, vitamin A deficiency, and exposure to ETS and household smoke. However, only some of these risk factors can be easily modified.

Based on the findings of this study, descriptive statistical analysis demonstrates that infants younger than one year of age are at higher risk for ARI than those older than one year of age (OR = 3.03, 95% CI = 0.81 - 11.27); furthermore, children with asthma have 2.22 times the risk of developing ARI than those without asthma (OR = 2.22, 95% CI = 0.87 - 5.63). In addition, the number of people sharing a bedroom with a child was significantly related to a high frequency of ARI in children under five years of age (p = .039). Children who lived in houses where the kitchen was not a separate room and thus were more frequently exposed to kitchen smoke tended to have more ARIs than those who lived in houses with a separate kitchen and who were less exposed to kitchen smoke (p = .040 and p = .002, respectively). In addition, the ventilation for the stove was significantly related to a high frequency of ARI (p = .019). Logistic regression analysis indicates that three risk factors remain in the model and have a strong association for a high frequency of ARI: a low level of maternal education, the duration of time mothers carried their children while cooking, and the availability of ventilation for the kitchen stove (p = .0167, p = .0498, p = .0378, respectively).

The HPM was used as the framework for altering the feasibility of modifying risk factors that involve biological (host), situational (environmental), and behavioural factors (Pender, 1996). Five risk factors were identified as feasible to be modified: the mother's education, the number of people sharing a bedroom, exposure to kitchen smoke, ventilation for the kitchen stoves, and hours the child was carried while the mother cooked. Only one risk factor may not feasible to be modified: kitchen design. More health education intervention strategies are used in modifying these risk factors in the community than other interventions. For example, a mother's habit of always bringing her child into the kitchen while she cooks, poor ventilation for the stove, and lack of information about immunization specifically for infants younger than one year of age could be positively changed with the implementation of a health teaching strategy. A health education program emphasizes control of risk factors in preventing or reducing the incidence of ARI. In comparison, case finding and case management strategies reduce the severity of illness and mortality.

2. Nursing Implications

2.1. Nursing Education

Regardless of whether nurses work on pediatric units or in community settings, they need knowledge about the risk factors for ARI, especially pneumonia. Many factors facilitate the incidence of ARI and the modifiability of the many related risk factors. This knowledge would be useful for nurses working with mothers of children with ARI to provide information on intervention strategies. In Indonesian rural areas, there is a limited number of community health nurses (CHNs). Empowering a nurse midwife is a one solution to supplementing CHN services. However, to assume additional responsibilities, a nurse midwife needs more knowledge because she has only grade 13 education. A continuing education program is one strategy that can be introduced to improve the knowledge of nurses already in practice and would provide a mechanism to disseminate the latest results on modifiable risk factors for ARI. Through this program, nurses could share and discuss the results of recent studies in relation to current health practices. They could then be assured that educational and supportive nursing interventions to be used in hospitals and community settings might aid in the reduction of ARI incidence in children under five years of age. Furthermore, nurses' beliefs about their roles may also influence their interventions.

A nurse in a master's program might possibly develop a program such as the parent education program and the content of education based on the result of this study to support health promotion programs at the village level. The program could target parents or mothers who have children under five years of age who are vulnerable to ARI, particularly those in community or hospital settings. Knowles (1980) described adult learning principles whereby the educator is facilitator of learning. There are four reasons to explain this: an adult is an independent person and can control his/her learning, adult experience can be a source of learning, readiness to learn is a life developmental phase, and adult learning is task oriented. In 1996, a community-based intervention study provided health education of mothers on childhood pneumonia and training of health staff on case management; this intervention significantly reduced the severity of ARI in Malaysia (Lye, Nair, Choo, Kaur & Lai, 1996).

2.2. Nursing Practice

Based on the results of this study, nurses in hospitals and community settings could implement more health education and promotion strategies to decrease the incidence of ARI in children under five years of age. Nursing interventions should be planned and prepared based on the needs of parents and children as well as from research findings, thus ensuring a movement toward more optimal results. Health education, for example, could be provided to parents in both inpatient and outpatient hospital units. A nurse could provide teaching sessions where recurrent ARI prevention and ARI complications are emphasized. Nasal discharge and coughs related to URTIs are the most common reasons why parents take their children to the hospital. In fact, these symptoms may initiate the incidence of LRTIs. Therefore, nurses should also inform parents about the signs and symptoms of ARI before they progress to a more serious illness (such as pneumonia), in order to reduce the mortality of children under five years of age. Another strategy to prevent recurrent ARIs include helping mothers to understand the need for complete immunization and vitamin A supplementation for their children. The mothers could be informed that children with ARI should avoid smoke-filled environments (such as ETS and kitchen smoke) that may influence the severity of illness. Finally, nurses can encourage mothers to not carry their children while cooking and help them identify alternatives.

Community health nurses (CHNs) can benefit by learning about the modifiability of risk factors for ARI in children under five years of age. They provide health education as a preventive step against the incidence of ARI. Health education is one health promotion strategy that could be based on the results of this study and used to effectively inform parents of the risk factors that place a child at increased risk for ARI and pneumonia. In terms of a limited number of CHNs, empowering members of the community, such as cadres, to conduct health teaching and to inform mothers when the clinics will be held may aid in the prevention of ARI. In Indonesia, the training of cadres to become educators for ARI prevention may be conducted using a guide similar to the one published by the Department of Health (PPM & PLP, 1993b). However, this guide for educating cadres has not yet been evaluated. Furthermore, empowerment through education in partnership with scientists and health care providers including cadres will result in a better quality of life for children and communities in general (Claudio, Torres, Sanjurjo, Sherman & Landrigan, 1998). The cadres know the context of the health problem; they are easy to recruit and cost little (Hill, Bone & Butz, 1996). Trained cadres have been effective in reducing morbidity in asthmatic African-American children (Butz et al., 1994). Kresno (1999) also reported that using cadres as educators has succeeded in improving health care visits and health care for children with pneumonia in Indonesia.

In community settings, CHNs and cadres could teach all modifying risk factors for ARI that have been identified by this study. Incomplete immunization status for specific age groups has been reported to be more likely in infants younger than one year of age compared to children older than one year of age. CHNs should explain to mothers the benefits of immunization for their children especially for infants younger than one year of age. In health education programs, CHNs or cadres could also teach the mothers about healthy child care practices, in particular the appropriate care of a child with an ARI. Hand washing habits can be reinforced to prevent the transmission of ARI to other children. The mothers who have children with asthma can be informed that their children are more vulnerable to ARI than healthy children and that they can provide a healthier environment for their children by avoiding indoor or outdoor pollution. Furthermore, CHNs or cadres can suggest ways to reduce the number of people sharing a bedroom with a child. In addition, separating sick from well children may also reduce the possibility of ARI transmission. In terms of a lack of space in the household, suggestions to move well children to a relative's house for a period of time may be helpful. This intervention may be feasible when their houses are close to one another and it is a usual cultural practice.

To solve the problem of harmful kitchen smoke, CHNs or cadres could encourage mothers to improve ventilation by opening a kitchen door; this helps to reduce indoor pollution during cooking. To reduce the incidence of ARI in children, CHNs or cadres may advise mothers not to bring their children in the kitchen while they are cooking. This study found a strong relationship between the high exposure to kitchen smoke and the high incidence of ARI, even though the households had ventilation or open windows. O'Dempsney et al. (1996) supports the recommendation that improving ventilation in the kitchen and keeping children in a smoke-free environment should reduce pneumococcal disease in children under five years of age.

Several strategies could be used by CHNs or cadres in health education programs including individual or group health education approaches based on community conditions. Focus group discussions may be more effective than other methods since members of the target audience are all adults. In addition, innovative methods using story telling and kits may be helpful. Community campaigns can be carried out in collaboration with higher levels of government, especially the Department of Health, by using posters, leaflets, radio, television, or film entertainment. In this way, politicians and administrators may be made aware of the concern about the high incidence of ARI in children under five years of age. Education alone may not be sufficient. It is important to change attitudes, beliefs and the environment, not all of which is within the scope of nursing. Dissemination of the result of this study specifically to the politicians and administrators may be therefore important to promote collaboration in establishing new policies to assist in reducing ARI incidence. They may be able to help the communities modify some of the risk factors for ARI, primarily those related to low socio-economic status, such as building a chimney to keep out the kitchen smoke, and reducing exposure to chemical substances that facilitate ARI in children under five years of age.

2.3. Nursing Research

The main recommendation for future researchers is to use the results of this study to change or modify already identified risk factors and to evaluate the usefulness of these changes. In addition, researchers should use standard reliable and valid instruments to collect data, which can then be compared to data from other studies. It may be possible to utilize more advanced inferential statistical procedures to determine the factors most affecting the incidence of ARI. Moreover, a more qualitative approach to explore the villagers' understanding about ARI may facilitate determining the content of health education program, so the incidence of ARI in the village can be reduced.

One additional suggestion is that future researchers use the results of this study to implement and evaluate the effectiveness of intervention programs aimed at modifying risk factors. Kresno (1999) recommended that to promote effectiveness of health education, a researcher needs to focus on: 1) developing health education programs that are based in local culture, 2) improving the number of CHNs with appropriate educational preparation, 3) improving health professionals' knowledge of socio-cultural aspects of health, and 4) involving the husband and the mother's parent in the health education program. Using a strong design is encouraged as it improves the quality of the results. Using a large sample size and random sample selection would also be a useful research strategy to achieve a more representative sample. In subject recruitment, researchers are also recommended to choose a specific age group such as infants (0-1year), children under three years (1-3 years), or children under five years (1-4 years); this is especially true for Indonesian researchers because the data showed three distinct age groups of classification in disease patterns in children under five years of age.

References

Aaby, P., & Clements, C. J. (1989). Measles immunization research: A review. *Bulletin WHO, 67*, 443-448.

Abrams, G. D. (1992). Response of the body to infectious agents. In S. A. Price & L. M. C. Wilson, *Pathophysiology: Clinical concepts of disease process* (4th ed.) (pp. 64-71). St. Louis: Mosby Year Book.

Armstrong, J. R. M., & Campbell, H. (1991). Indoor air pollution exposure and lower respiratory infections in young Gambian children. *International Journal of Epidemiology, 20*, 424-429.

Azizi, B. H., & Henry, R. L. (1991). The effects of indoor environmental factors on respiratory illness in primary school children in Kuala Lumpur. *International Journal of Epidemiology, 20*, 144-150.

Berman, S. (1991a). Epidemiology of acute respiratory infections in children of developing countries. *Reviews of Infectious Diseases, 13*, Supplement 6, S454-462.

Berman, S. (1991b). Acute respiratory infection. *Infectious Disease Clinics of North America, 5*, 319-337.

Bluestone, C. D. & Klein, J. O. (1995). *Otitis media in infants and children* (2nd ed.). Philadelphia: W.B. Saunders Company.

Bloem, M. W., Wedel, M., Egger, R. J., Speek, A. J., Schrijver, J., Saowakontha, S., & Schreurs, W. H. P. (1990). Mild vitamin A deficiency and risk of respiratory tract diseases and diarrhea in preschool and school children in Northeastern Thailand. *American Journal of Epidemiology, 131*, 332-339.

Bowden, V. R., Dickey, S. B., & Greenberg, C. S. (1998). *Children and their families.: The continuum of care.* Philadelphia: W.B. Saunders Company.

BPS [Central Bureau of Statistics] & Bappeda [Managerial District Board]. (1999). *Kecamatan Parung dalam angka [Parung sub district in the number].* Bogor: Central Bureau of Statistics Bogor District.

BPS-Depkes-BKKBN [Central Bureau of Statistics-Department of Health-National Family Planning Coordinating Board] (1991). *Indonesia Demographic and Health Survey* Jakarta: Central Bureau of Statistics-Department of Health-National Family Planning Coordinating Board.

Butz, A. M., Malveaux, F. J., Eggleston, P., Thompson, L., Schneider, S., Weeks, K., Huss, K., Murigande, C. & Rand, C. S. (1994). Use of community health workers with inner-city children who have asthma. *Clinical Pediatrics, 33(3)*, 135-141.

Cerqueiro, M. C., Murtagh, P., Halac, A., Avila, M., & Weissenbacher, M. (1990). Epidemiologic risk factors for children with acute lower respiratory tract infection in Buenos Aires, Argentina: A matched case-control study. *Reviews of Infectious Diseases, 12*. Supplement 8, S1021-1028.

Chen, Y., Li, W., Yu, S. & Qian, W. (1988). Chang-Ning epidemiological study of children's health: I: Passive smoking and children's respiratory disease. *International of Epidemiology, 17*, 348-355.

Cherry, D. J. (1998a). The common cold. In R. D. Feigin & J. D. Cherry, *Textbook of pediatric infectious diseases* (3rd ed., Vol.1). (pp. 128-133). Philadelphia: W.B. Saunders Company.

Cherry, D. J. (1998b). Pharyngitis. In Feigin, R. D. & Cherry, J. D. *Textbook of pediatric infectious diseases* (3rd ed., Vol.1), (pp. 148-155). Philadelphia: W.B Saunders Company.

Chytil, F. (1996). Molecular mechanisms of vitamin A action and their relationship to immunity. In C. Kjolhede & W. R. Beisel (Eds.), *Vitamin A and the immune function: A symposium* (pp. 35-46). NewYork: The Haworth Medical Press.

Claudio, L., Torres, T., Sanjurjo, E., Sherman, L. R. & Landrigan, P. J. (1998). Environmental health sciences education: A tool for achieving environmental equity and protecting children. *Environmental Health Perspectives, 106*, Supplement 3, 849-854.

Deb, S. K. (1998). Acute respiratory disease survey in Tripura in the cases of children below five years of age. *Journal of the Indian Medical Association, 96(4)*, 111-116.

De Fransisco, A. M., Hall, A. J., Armstrong, S. J. R. M. & Greenwood, B. M. (1993). Risk factors for mortality from acute lower respiratory tract infections in young Gambian children. *International Journal of Epidemiology, 22*, 1174-1182.

Departemen Kesehatan [Department of Health]. (1995). *Household survey*. Jakarta: Department of Health Republic of Indonesia.

Departemen Kesehatan [Department of Health]. (1999a). *Profil Indonesia [Indonesian profile]*. Jakarta: Department of Health Republic of Indonesia.

Departemen Kesehatan [Department of Health]. (1999b). *Buku kesehatan ibu dan anak [The health of mother and child book]*. Jakarta: Departement of Health & JICA (Japan International Cooperation Agency).

Duchin, S., & Sherwood, G. (1990). Posters as an educational strategy. *The Journal of Continuing Education in Nursing, 21 (5)*, 205-208.

Dudley, L., Hussey, L., Huskissen, J., & Kessow, G. (1997). Vitamin A status, other risk factors and acute respiratory infection morbidity in children. *South-African-Medical-Journal, 87(1)*, 65-70.

Edmondson, M. E., & Williamson, G. C. (1998). Environmental health education for health professionals and communities. *AAOHN Journal, 46*, 14-19.

EPA. (1992). *Respiratory health effects of passive smoking: lung cancer & other disorders*. Washington, DC: US EPA.

Evans, P., & Misser, W. F. (1999). Sinusitis and pharyngitis. In R. B. Taylor (Ed.), *Fundamentals of family medicine: The family medicine clerkship textbook* (2nd ed.) (pp. 188-205). New York: Springer.

Federal, Provincial and Territorial Advisory Committee on Population Health. (1994). *Strategies for population health: Investing in the health of Canadians*. Ottawa: Minister of Supply and Services Canada.

Garenne, M., Ronsman, C., & Campbell, H. (1992). The magnitude of mortality from acute respiratory infections in children under 5 years in developing countries. *World Health Statistics Quarterly, 45*, 180-192.

Ghafoor, A., Nomani, N. K., Ishaq, Z., Zaidi, S. Z., Anwar, F., Burney, M. I., Qureshi, A. W., & Ahmad, S. A. (1990). Diagnoses of acute lower respiratory tract infections in children in Rawalpindi and Islamabad, Pakistan. *Reviews of Infectious Diseases, 12,* Supplement 8, S907-S914.

Godfrey, S. (1993). Lung function in infants and children and the effect of asthma. In D. G. Tinkelman & C. K. Naspitz (Eds.), *Childhood asthma: Pathophysiology and treatment* (2nd ed.) (pp. 41-70). New York: Marcel Dekker, Inc.

Grace, J. (1998). The treatment of infants and young children suffering from respiratory tract infection and diarrhoeal disease in a rural community in Southeast Indonesia. *Social Science Medicine, 40(10),* 1291-1302.

Green, L. W., & Kreuter, M., W. (1991). *Health promotion planning: An educational and environmental approach.* Mountain P. A.: Mayfield.

Harkness, G. A. (1995). *Epidemiology in nursing practice.* St. Louis: Mosby.

Henderson, R. H., Keja, J., Hayden, G., Galazka, A., Clements, J., & Chan, C. (1988). Immunizing the children of the world: progress and prospects. *Bulletin WHO, 66,* 535-543.

Hill, M. N., Bone, L. R., & Butz, M. (1996). Enhancing the role of community-health workers in research. *Image: Journal of Nursing Scholarship, 28(3),* 221-226.

Honicky, R. E., Osborne, J. S., & Akpom, A. C. (1985). Symptoms of respiratory illness in young children and the use of wood burning stoves for indoor heating. *Pediatrics, 75,* 587-593.

Hortal, M., Benitez, A., Contera, M., Etorena, P., Montana, A., & Meny, M. (1990). A community-based study of acute respiratory infections in children in Uruguay. *Reviews of Infectious Diseases, 12,* Supplement 8, S966-S973.

Hussey, G. D., Apolles, P., Arendse, Z., Yeates, J., Robertson, A., Swingler, G., & Zar, H. J. (2000). Respiratory syncytial virus infection in children hospitalized with acute lower respiratory tract infection. *South African Medical Journal, 90(5),* 509-512.

IOMC. (1999). *Environmental health criteria 21: Health effects of interactions between tobacco use and exposure to other agents.* Geneva: WHO.

Jin, C., & Rossignol, A. M. (1993). Effects of passive smoking on respiratory illness from birth to age eighteen months, in Shanghai, People's Republic of China. *The Journal of Pediatrics, 123*, 553-558.

John, T. J., Cherian, T., Steinhoff, M. C., Simoes, E. A. F., & John, M. (1991). Etiology of acute respiratory infections in children in tropical Southern India. *Reviews of Infectious Diseases, 13*, Supplement 6, S463-S469.

Johnson, D. R., Kaplan, E. F., Sramek, J., Bicova, R., Havlicek, J., Havlickova, H., Motlova, J., & Kriz, P. (1996). *Laboratory diagnosis of group A streptococcal infections.* Geneva: WHO.

Kelsey, J. L., Thompson, W. D., & Evans, A. S. (1986). *Methods in observational epidemiology*. New York: Oxford University Press.

Khan, M. A., Rehman, G. N., & Qazi, S. A. (1990). *Control of acute respiratory infection in Pakistan: Present status and future developments*. Islamabad: Federal ARI Cell, Children's Hospital, Pakistan Institute of Medical Science.

Klein, J. O. (1998a). Bacterial pneumonia. In R. D. Feigin & J. D. Cherry, *Text book of pediatric infectious diseases* (3rd ed., Vol.1), (pp. 273-283). Philadelphia: W.B. Saunders Company.

Klein, J. O. (1998b). Otitis media. In S. L. Katz, S. L., A. A. Gershon & P. J. Hotez, *Krugman's infectious disease of children* (10th ed.) (pp. 302-310). St. Louis: Mosby Company.

Knowles, M.S. (1980). *The modern practice of adult education: From pedagogy to andragogy* (2nd ed.). New York, NY: Cambridge, The Adult Education Company.

Kresno, S. (1999). *Pengaruh pendidikan kesehatan terhadap penggunaan pelayanan kesehatan dan perawatan anak balita dengan pneumonia [The effect of health education toward utilization of health care services and caring for children with pneumonia]*. Unpublished doctoral dissertation, University of Indonesia, Jakarta.

Kresno, S., Harrison, G., Sutrisna, B., & Reingold, A. (1994). Acute respiratory illnesses in children under five years in Indramayu, West Java, Indonesia: A rapid ethnographic assessment. *Medical Anthropology, 15*, 425-434.

Lusk, S. L., Ronis, D. L., Kerr, M. J., & Atwood, J. R. (1994). Test of the health promotion model as a causal model of workers' use of hearing protection. *Nursing Research, 43*, 151-157.

Lye, M. S., Nair, R. C., Choo, K. E., Kaur, H., & Lai, K. P. (1996). Acute respiratory tract infection: A community-based intervention study in Malaysia. *Journal of Tropical Pediatrics, 42*, 138-143.

McCann, S. A., Sramac, R. S., & Rudy, S. J. (1994). The poster exhibit: planning, development, and presentation. *Orthopaedic Nursing, 113* (3), 43-49.

McIssac, W. J. & Tannenbum, D. (1998). A clinical score to reduce unnecessary antibiotic use in patients with sore throats. *Canadian Medical Association Journal, 158*, 75-83.

Mims, C. A., Playfair, J. H. L., Roitt, I. M., Wakelin, D., & Williams, R. (1993). *Medical microbiology*. St. Louis: Mosby.

Morris, S. K., Morganlanders, M., Coulehan, J. L., Gahagen, S., & Arena, V. C. (1990). Wood burning stoves and lower respiratory tract infections in American Indian children. *AJDC, 144*, 105-108.

Mutius, E. V., & Martinez, F. D. (1999). Epidemiology of childhood asthma. In S. Murphy & H. M. Kelly (Eds.), *Pediatric asthma* (Vol. 26) (pp.1-40). New York: Marcel Dekker, Inc.

Nieswiadomy, R.S. (1993). *Foundations of nursing research* (2nd ed.). Connecticut: Appleton & Lange.

O'Dempsney, T. J. D., McCordle, T. F., Morris, J., Evans, N. L., Baldeh, I., Laurence, B. E., Secka, O., & Greenwood, B. M. (1996). A study of risk factors for pneumococcal disease among children in a rural area of West Africa. *International Journal of Epidemiology, 25*, 885-893.

Oyejide, C. O. (1986). Review of epidemiological risk factors affecting the pathogenesis of ARI. *Report of the conference on pathogenesis of acute respiratory infections in developing world* (pp. 33-35). Washington, DC: BOSTID Research Program- US.

Oyejide, C. O., & Osinusi, K. (1990). Acute respiratory tract infection in children in Idikan community, Ibadan, Nigeria: Severity, risk factors, and frequency of occurrence. *Reviews of Infectious Diseases, 12*, Supplement 8, S1042-1046.

Pandey, M. R., Boleij, J. S. M., Sramek, J., & Kriz, P. (1989). Indoor air pollution in developing countries and acute respiratory infection in children. *The Lancet, 1*, 427-429.

Pender, N. J. (1987). *Health promotion in nursing practice* (2nd ed.). Connecticut: Appleton & Lange.

Pender, N. J. (1996). *Health promotion in nursing practice* (3rd ed.). Connecticut: Appleton & Lange.

Phelan, P. D., Olinsky, A., & Robertson, C. F. (1994). *Respiratory illness in children.* Oxford: Blackwell Scientific Publications.

Polit, D. F., & Hungler, B. P. (1999). *Nursing research: Principle and methods* (6th ed.). Philadelphia: J.B. Lippincott Company.

PPM and PLP [Center for Disease Control and Environmental Health]. (1993a). *Bimbingan ketrampilan dalam tatalaksana penderita ISPA pada anak [Skill training in management of children with ARI].* Jakarta: Department of Health Republic of Indonesia.

PPM and PLP [Centers for Disease Control and Environmental Health]. (1993b). *Buku pedoman peberantasan penyakit infeksi saluran pernafasan akut untuk kader [ARI prevention book for cadres].* Jakarta: Department of Health Republic of Indonesia.

PPM and PLP [Center for Disease Control and Environmental Health]. (1998). *Pedoman program pemberantasan penyakit infeksi saluran pernafasan akut untuk penanggulangan pneumonia pada balita [ARI prevention book for children under five years of age].* Jakarta: Department of Health Republics of Indonesia.

Puhlman, M. (2000). Infectious process. In L. C. Copstead & J. L. Banasik, *Pathophysiology: Biological and behavioral perspectives* (2nd ed.) (pp. 164-182). Philadelphia: W.B. Saunders Company.

Rahman, M. M., & Rahman, A. M. (1997). Prevalence of acute respiratory tract infection and its risk factors in under five children. *Bangladesh Medical Research Council Bulletin, 23(2)*, 47-50.

Reynolds, C. (1998). The tobacco industry keeps the government afloat, but at a huge, cost in ordinary lives. *Inside Indonesia, 56.* Available at http://www.insideindonesia.org/edit56/reynld.htm.

Robin, L. F., Lees, P. S. J., Winget, M., Steinhoff, M., Moulton, L. H., Santoshan, M., & Correa, A. (1996). Wood-burning stoves and lower respiratory illness in Navajo children. *Pediatric Infectious Disease Journal, 15(10)*, 859-865.

Ross, A. C. (1996). Vitamin A status and the antibody response to bacterial antigens. In C. Kjolhede & W. R. Beisel (Eds.), *Vitamin A and the immune function.* (pp. 47-75). New York: The Haworth Medical Press.

Sciortino, R. (1995). *Care-takers of cure: An anthropological study of health centre nurses in rural Central Java.* Yogyakarta: Gajah Mada University Press.

Selwyn, B. J. (1990). The epidemiology of acute respiratory tract infection in young children: Comparison of findings from several developing countries. *Reviews of Infectious Diseases, 12,* Supplement 8, S870-S888.

Semba, R.D. (1999). Vitamin A and immunity to viral, bacterial and protozoan infections. *The Proceedings of the Nutrition Society, 58*, 719-727.

Shann, F., Gratten, M., Germer, S., Linneman, V., Hazlett, D., & Payne, R. (1984). Aetiology of pneumonia in children in Goroka hospital, Papua New Guinea. *The Lancet, 2*, 537-541.

Sharma, S., Sethi, G. R., Rohtagi, A., Chaudhary, A., Shankar, R., Bapna, J. S., Joshi, V., & Sapir, D. G. (1998). Indoor air quality and acute lower respiratory infection in Indian urban slums. *Environmental health perspectives, 106*, 291-297.

Sommer, A., Katz, J., & Tarawotjo, O. I. (1984). Increased risk of respiratory disease and diarrhea in children with pre-existing mild vitamin A deficiency. *American Journal of Clinical Nutrition, 40*, 1090-1095.

Sommer, A., Tarawotjo, I., & Hussaini, G. (1983). Increased mortality in mild vitamin A deficiency. *The Lancet, 2*, 583-588.

Staf Pengajar Ilmu Kesehatan Anak [Staff teacher in pediatric health science]. (1985). *Buku Ilmu Kesehatan Anak [Pediatric health science book]*. Jakarta: Fakultas Kedokteran Universitas Indonesia [Faculty of Medicine University of Indonesia].

Statacorp. (1997). *Stata statistical software release 5.0*. College Station, TX: Stata Corporation.

Steele, R. W. (1999). Group A streptococcal infections in toddlers. *Clinical Pediatrics, 38*, 365-366.

Stewart, M. K., Parker, B., Chakraborty, J., & Begun, H. (1994). Acute respiratory infection (ARI) in rural Bangladesh: perceptions and practices. *Medical Anthropology, 15*, 377-394.

Sutrisna, B. (1993). *Faktor risiko pneumonia pada Balita dan model pemberantasannya [Risk factors and management of pneumonia in children under five years of age]*. Unpublished doctoral dissertation, University of Indonesia, Jakarta

Sutrisna, B., Reingold, A., Kresno, S., Harrison, G., & Utomo, B. (1993). Care-seeking for fatal illnesses in young children in Indramayu, West Java, Indonesia. *The Lancet, 342*, 787-789.

Tupasi, T. E., Leon, L. E., Lupisan, S., Torres, C. U., Leonor, Z. A., Sunico, E. S., Mangubat, N. V., Miguel, C. A., Medalla, F., Tan, S. T., & Dayrit, M. (1990). Patterns of acute respiratory tract infection in children: A longitudinal study in a depressed community in Metro Manila. *Reviews of Infectious Diseases, 12*, Supplement 8, S940-949.

Tupasi, T. E., Lucero, M. G., Magdangal, D. M.., Mangubat, N. V., Sunico, M. E. S., Torres, C. U., deLeon, L. E., Paladin, J. F., Baes, L., & Javato, M. C. (1990). Etiology of acute lower respiratory tract infection in children from Alabang, Metro Manila. *Reviews of Infectious Diseases, 12*, Supplement 8, S929-939.

Tupasi, T.E., Mangubat, N.V., Sunica, M.E.S., Magdangal, F., Navarro, E.E., Leonor, Z.A., Lupisan, S., Medalla, F., & Lucero, M.G. (1990). Malnutrition and acute respiratory tract infections in Filipino children. *Reviews of Infectious Diseases, 12*, Supplement 8, S1047-1054.

United Nations (1998). *Women in Indonesia: A country profile*. New York: United Nations Publication.

Vathanophas, K., Sangchai, R., Raktham, S., Pariyanonda, A., Thangsuvan, J., Bunyaratabhandu, P., Athipanyakom, S., Suwanjutha, S., Jayanetra, P., Wasi, C., Vorachit, M., & Puthavathana, P. (1990). A community-based study of acute respiratory tract infection in Thai children. *Reviews of Infectious Diseases, 12*, Supplement 8, S957-S965.

Weissenbacher, M., Carballal, G., Avila, M., Salomon, H., Harisiadi, J., Catalano, M., & Cerqueiro, M. C. (1990). Etiologic and clinical evaluation of acute lower respiratory tract infections in young Argentinian children: An overview. *Reviews of Infectious Disease, 12*, Supplement 8, S889-S898.

Wesley, A. G., & Loening, W. E. R. (1996). Assessment and 2-year follow-up of some factors associated with severity of respiratory infections in early childhood. *South African Medical Journal, 86*, 365-368.

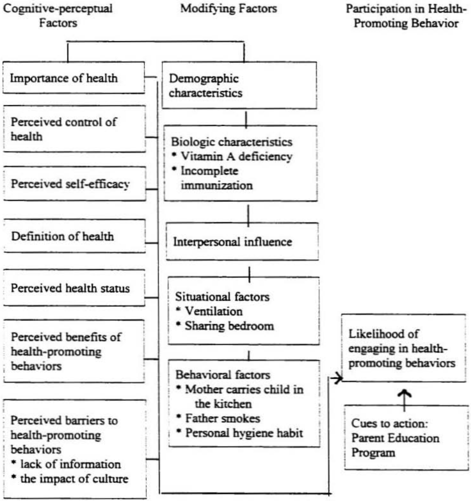
West, K. P. Jr., Howard, G. H., & Sommer, A. (1989). Vitamin A and infection: Public health implications. *Annual Review of Nutrition, 9*, 63-86.

WHO (1983). *Acute respiratory infection*. Global Medium-term Program 13.7. Document TRI/ ARI/ MTP/ 83.1. Geneva: WHO.

Yoon, P. W., Black, R. E., Moulton, L. H., & Becker, S. (1997). The effect of malnutrition on the risk of diarrheal and respiratory mortality in children <2 years of age in Cebu, Philippines. *The American Journal of Clinical Nutrition, 65(4)*, 1070-1077.

Appendix A

Health Promotion Model
(Adapted from Health Promotion in Nursing Practice. Pender, N.J. ([1996], p.52)



DIREKTORAT SOSIAL POLITI

Jl. Taman Sari No. 55 Telp. 2501678 - 2503206 FAX. 2512150 Kode Pos 40

BANDUNG

Bandung, 5 Pebruari 2001

Sifat :
Derajat :
Nomor : 070.3/4457
Lampiran :
Perihal : Pemberitahuan Survey/Riset

Kepada Yth.
Bupati Bogor
Up.Kepala Kantor Sospol,
di
CIBINONG.

Dengan ini dipermaklumkan bahwa dengan surat tanggal 25 Januari 2001 Nomor 196/PT02.H.14FIK/I/2001 dari Dekan Fak.Ilmu Keperawatan UI. kami telah menerima pemberitahuan rencana survey / riset oleh :

Nama	:	WIWIN WIARSIH.
Alamat	:	Utan Panjang III Rt 14/06 Kemayoran Jkt.
Pekerjaan	:	Mahasiswa.

Yanga akan dilakukan di daerah / kantor Saudara dari tanggal 5 Pebruari 2001 s/d 5 Mei 2001 dengan judul / masalah :

EMPOWERMENT AS A WAY TO IMPROVE NUTRITION IN PREGNANCY
IN WARU JAYA, WEST JAVA.

Sesuai dengan Surat Keputusan Gubernur Propinsi Jawa Barat No. 300/Sk. 1215-Huk/1990 tanggal 14 Agustus 1990 kami lanjutkan kepada Saudara dan apabila situasi / kondisi memungkinkan kami tidak berkeberatan dilaksanakan.

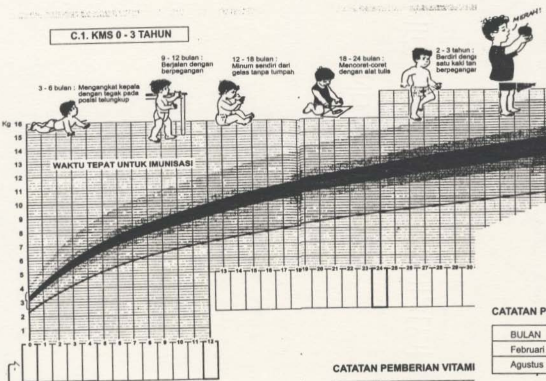
An. GUBERNUR PROPINSI
JAWA BARAT
Kepala Direktorat Sosial Politik
u.b.
Kasubdit Ketertiban Umum,

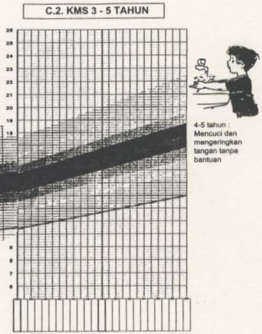
H. PERMADI, SH
Pembina
NIP.480 053 257

TEMBUSAN disampaikan kepada :
1. Asstapra pada Setda Jabar.
2. Ketua Bappeda Jabar.
3. Dekan Fak.Ilmu Keperawatan UI.
4. Yang bersangkutan.

Appendix B

The Children's Weight Curve, Health Welfare Card





Periode pemberian ASI Eksklusif

Isilah kolom ini dengan bulan dan tahun kelahiran anak.
Isilah kolom-kolom berikutnya dengan bulan-bulan selanjutnya.

CATATAN PEMBERIAN VITAMI

BULAN	Umur 6 - 12 Bulan	U
Februari	Tanggal:	Ta
Agustus	Tanggal:	Ta

CATATAN PEMBERIAN VITAMIN A

BULAN	Umur 3 - 4 Tahun	Umur 4 - 5 Tahun
Februari	Tanggal :	Tanggal :
Agustus	Tanggal :	Tanggal :

22

Appendix C

Village Profile

Cibentang and Kuripan are two of seven villages under the management of Putat Nutug Puskesmas, Parung sub-district, Bogor district, West Java. These villages are considered economically depressed and so receive funding for health from government subsidies, which are administered by the Puskesmas. The population of Cibentang and Kuripan is approximately 5,541 consisting of 2,649 males and 2,892 females, and 7,578 consisting of 3,959 males and 3,619 females, respectively. There are 1,003 and 1,105 households in Cibentang and Kuripan, with a population density of 1,805 and 1,383 per square kilometers, respectively. Ninety-nine percent (13,011 of 13,119) of the population in these villages are Moslem, followed by Christian (0.7%), and Buddhist (0.1%). The average education level in Cibentang and Kuripan is less than grade 6, 42.7% (1,434 of 3360), and 46.0% (2,708 of 5883), respectively. A few of the people have more than grade 15 education, 0.8% and 0.08% in Cibentang and Kuripan, respectively. About 42.7% of the population in these two villages have no permanent jobs. The remaining people are farmers (40.9%), sellers (4.8%), drivers (0.6%), and laborers (0.5%) (Bapeda and BPS, 1999). The poorly maintained roads in Cibentang and in Kuripan make it very difficult for people to utilize the Puskesmas as a center of health services.

Appendix D

Participant Identity

Name of parent:

Mother: ________________________________

Father: ________________________________

Name of child: ____________________________Female __ Male __

Address of household: RT_____RW_____ # home ___________

Village name ____________________________

Parents' Code __________

Child's Code ____________

Appendix E

Demographic Data Questionnaire

1. Person being interviewed: father ___ mother ___

2. Mother's age _____

3. Father's age _____

4. Religion: Moslem ___ Christian ___ Other ______________

5. Race: Sunda ___ Java ___ Other _____________

6. What is the father's education: grade ___________ none _____

7. What is the mother's education: grade ___________ none _____

8. What is the father's occupation: none___farmer___ seller___ teacher___
other ___________

9. What is the mother's occupation: none ___ farmer___ seller___ teacher ___
other ___________

10. What is the income of family/ month:
< Rp 200.000 ___ Rp 200-399.000 ___ Rp 400-600.000 ___ >Rp.600. 000___

Appendix F

Medical History and Physical Examination Questionnaire

1. Date of birth: _____/ ______/ ______ Year __ months__
   Day Month Year

2. Number of sibling: _______ Age of siblings ___________

3. Vitamin A supplement: _______ Yes ___ No ____

4. If yes, why? ____

5. If yes, doses: 100,000 IU___ 200,000 IU___ Other __________________

6. Frequency during past year: _______times

7. If no, explain why not? ___________________________

8. The child's immunization status: DPTI __: DPTII __: DPTIII __: Measles ____
   Other _______________

9. If complete, why? __________________

10. If incomplete, why not? ____

11. Body weight: ________kg ; if infant, Birth Weight: _________kg

12. Vital signs:
    Temperature (C): _______
    Respiration rate (breaths/minute): _______

13. General appearance:
    ____

    ____

Signs of ARI	Now	Past month	Frequency in past month
Nasal discharge			
Cough • Productive • Not productive			
Sore throat			
Cervical lymph node enlarged and tender			
Ear pain/ earache			
Ear drainage			
Hoarseness			
Chest indrawing			
Cyanosis			
Lung sounds • Crackles • Wheeze			

14. Any serious illness in the past six months: Yes ___ No ___

If yes, what kind of disease :

pneumonia ___ how many times ___ when ________________
diarrhea ___ how many days ___ when ________________
fever ___ how many days ___ when ________________
seizure ___how long duration of seizure __minutes when ___________
asthma ___ how many times ___ when ________________
other ____________________ when ________________

15. If child had pneumonia, explain the history of the illness (What were the early signs and symptoms? What were the dangerous sign according to you? What did you do? Where did you go? When did you seek health care?)

____

____

16. How many times did the child suffer ARI in the past year (including past month)?

____

____

Appendix G

Environmental Questionnaire

1. Current smoking habits: father ___ mother___ other living with family ______
   2. If yes, how many cigarettes per day?

Subject	< 10 cigarettes	10-20 cigarettes	> 20 cigarettes
Mother			
Father			
Other			

3. Do you know about harmfulness of smoking? Yes _____ No _____ Describe
____

4. Is it possible to decrease cigarette or smoke out of presence of children? Yes____No ____

5. If yes, how? ____

6. If no, why not? ____

7. How many hours does the parent spend with the children when smoking? ________

8. Mother carries child while cooking? Yes _____ No____

9. If yes, how many hours /day: _________

10. If yes, who could look after while child instead? ____________________

11. If no, who looks after? ____________________

12. Type of fuel used for cooking: kerosene ___ firewood ___ other _________

13. Type of stove: kerosene ___ open stove/fire ___ other _______________

14. Why do you use this type? ______________________________________

15. The ventilation for stove: Yes_____ No _____ Describe ____________________

16. If yes, why? ____

17. If no, why not? ____

18. What could you do to improve ventilation?

____

19. Kitchen design: attached ___ separated ___ Describe ______________________

20. Kitchen opens into living space? _____________

21. What is the floor material: dirt ___ poured cement ___ tile/brick ___ bamboo ___ other _____

22. How many windows in household: _______ Kitchen _______

23. Do you keep window open per day? Yes _____ No _____

24. If yes, how many hours is the window opened? _______ kitchen window? _______ other _______________

25. If no, why is the window always closed? ________________________________

____

26. How many people live in the same house? _______

27. How many rooms does the household have? _____

28. Do adults share sleeping room with children? Yes ___ No ___

29. Total number of people sharing same child's bedroom _______

30. What is the possibility that a sick child can sleep separately? ____________

31. Describe hand-washing practices of you and your family. ___________

32. Describe routine for cleaning house. ______________________________

Appendix H

Utilization of Health Care Services Questionnaire

1. Who is the decision maker in the family related to health : father ___ mother ___ other ___________

2. Who do you contact first when your child has ARI?
Grandparent ____ Elder people ____ Friend ____ Cadre ____
Midwife ____ Dukun _____ Others ____ If yes, who are they? _______

3. Who do they contact for other illnesses?
Grandparent ____ Elder people ____ Friend ____ Cadre _____ Midwife ____
Dukun ______ Other_____ If yes, who are they? ________________
What illness ________________

4. Where does the parent get health information? _____________

5. Would you take a child (sick or healthy) to Posyandu every month? Yes ___ no ___

6. If yes, why? ____

7. If no, explain why not? ______________________________________

8. Would you take an ill child to CHC? Yes ___ no ___

9. If yes, why? ____

10. If no, explain why not? ______________________________________

11. When do you take your children to health care services?
____

12. Is CHC easily accessible? Yes ___ no ___

13. If no, explain why not? ______________________________________

14. Could you describe your experience when the child gets the common cold?

- ➢ Sign and symptoms? ____________________
- ➢ Actions taken? ____________________

15. Could you describe what you do when a child's cold becomes more serious?

- ➢ Signs and symptoms? ____________________
- ➢ Actions taken? ____________________

Appendix I

Pilot Study Report

Acute respiratory infection (ARI) is a major cause of morbidity and mortality in Indonesian children under five years of age. The proportion of deaths caused by ARI in 1992 was 36.4% for infants (0-1 year) and 18.2% for children under five years of age (1-4 years) (PPM & PLP. 1998). This is of great concern in the province of West Java as the case fatality rate in hospital-treated ARI. primarily. pneumonia. was 18.4% (Departemen Kesehatan. 1999). Efforts to reduce fatalities from pneumonia have been made through Indonesian National programmes. and have included case finding. management of ARI. and sending ARI information to all communities (PPM & PLP. 1998). Immunization. case identification. and case management approaches are partially effective in reducing ARI morbidity and mortality (Pandey. Boleij. Scramec & Krioz. 1989). but are expensive and may not be feasible in villages with limited access to health care services and resources. Long-term solutions will depend more on the control of risk factors than on management. A number of risk factors have been identified such as young age. malnutrition. incomplete childhood immunization. exposure to environmental tobacco smoke (ETS). and exposure to household smoke. A number of these risk factors may be modifiable. This study describes the feasibility of modifying certain risk factors for ARI in children under five years of age. The results of this study can serve as a basis for planning the content of health education or other community promotion programmes that focus on modifiable key risk factors. It is assumed that reducing the exposure to risk factors will decrease the frequency of ARI episodes in children.

The research questions for this study are:

1. What is the relationship between the risk factors for ARI and the frequency of ARI in children under five years of age?

2. What is the relationship between the utilization of health services and the frequency of ARI in children under five years of age?

3. What is the feasibility of modifying certain risk factors for ARI in children under five years of age?

A pilot study was done on February 2001 in Iwul village. The purpose of the pilot study was to verify the appropriateness of the instruments and the appropriateness of the categorization of the children with high and low frequencies of ARI. This trial study was also to determine the amount of the time that will be needed for recruitment and data collection including an interview, child assessment, and observation of a child's home.

The following method was used by the investigator for this pilot study:

1. Explain the study and ask permission of the physician, who is the director of the community health services (Puskesmas).

2. Explain the study to the midwife and ask her to communicate to the village health worker (Cadre) about the study.

3. Ask the cadre to choose respondents using the established criteria.

4. Ask the cadre to contact the respondents and ask their permission to see the researcher at a mutually convenient time.

5. The researcher visits the home of respondents who have agreed to see the researcher with the cadre as a translator.

6. The researcher informs the respondents of the purpose of the study and obtains consent. The researcher also encourages the respondents to ask questions if they did not understand anything that related to the data collection procedure. There were no problems during data collection. As translator, the cadre was helpful to the researcher and the respondents. The children's physical assessment proceeded as planned. The children were cooperative and the respondents gave the researcher permission to observe their house, with a focus on the kitchen. The researcher communicated easily with the respondents and the cadre.

The pilot study used three mothers as respondents who were recruited by the cadre. Recruitment was based on previously determined criteria. The cadre had no difficulty in recruiting respondents. The results of this study indicated that the educational background of the respondents varied: grades 2, 6, and 12. Their family income ranged from Rp. 200.000 to Rp. 600.000. Most of the fathers worked as laborers and did not have permanent employment. The ages of the children were 14, 27, and 38 months. They received complete immunization for their specific age group and the mothers knew that the purpose of immunization was to prevent illness. When the investigator collected the data, all of the children had coughs and a cold, which the mothers believed were caused by changes in the weather. They also knew that smoking could cause pulmonary disease but that it was difficult to stop their husbands from smoking. Furthermore, most of the mothers used kerosene or wood stoves for cooking and they carried their children about 30 minutes to one hour while cooking. They had ventilation for their stoves but there were no windows in their kitchens. Most of the respondents had a closed window design (the windows could not be opened). They said that it was too expensive to buy a window which opened. The kitchen had dirt floors; however, the living room floors were made of cement or tile. The frequency of ARI in children under five years of age in this pilot study was eight to twelve episodes per year.

The data collection procedures required almost one hour for every respondent. The mothers understood and could answer all the questions. The cadre acted as translator which helped the investigator and the respondents. Based on the results of this pilot study, there were no changes for the planned data collection procedures.

Appendix J

SCHOOL OF NURSING MEMORIAL UNIVERSITY OF NEWFOUNDLAND

Consent to participate in Nursing Research

TITLE: Assessment of the feasibility of modifying risk factors for acute respiratory infection (ARI) in children under five years of age in West Java, Indonesia.

PROTOCOL : N/A

INVESTIGATOR: Nani Nurhaeni

SPONSOR: AUCC/ CIDA through a Tier II Linkage Project, "Nursing, Women's Health & Community Outreach in Indonesia" between the School of Nursing, Memorial University of Newfoundland, St. John's, Newfoundland, Canada and the Faculty of Nursing, University of Indonesia, Jakarta, Indonesia.

You have been asked to take part in a research study. It is up to you to decide whether to be in the study or not. Before you decide you need to understand what the study is for, what risks you might take and what benefits you might receive. This consent form explains the study. The researcher will:

- discuss the study with you
- answer your questions
- keep confidential any information which could identify you personally
- be available during the study to deal with problems and answer questions

If you decide not to take part or to leave the study this will not affect your health care.

1. Introduction

Acute respiratory infection (ARI), especially pneumonia, is a major cause of sickness and death in Indonesian children under five years of age. Risk factors include nutrition status, immunization status, environmental tobacco smoke, household smoke, crowding, and poor personal hygiene and sanitation. Some of these factors can be changed by parents and relatives. The results of this study can serve as a basis for planning the content of education or other community health promotion programs focusing on important risk factors.

2. Purpose of study

The aim of this study is to describe possible ways of changing some of the common risk factors for ARI in children under five years of age.

3. Description of the study procedures

The investigator will meet with you in your home at a time that is convenient for you. During this visit:

- The investigator will ask you some questions about your home environment, your child's medical history and certain habits or activities of your family. The investigator will also ask you to describe your experience when your child has a respiratory infection such as the common cold.
- The investigator will do a brief assessment of your child: take his/her weight and temperature and listen to his/ her lungs.

- The investigator will be concerned with the safety and comfort of your child during the physical examination and will ask for your assistance. During the procedure, for example, you may hold the child in your lap. The investigator may give the child a toy or pacifier for distraction.

4. Length of time

Your participation involves a single visit, approximately one hour in duration.

5. Possible risks and discomforts

This study will not put you at risk or harm, and discomfort will be limited to that usually associated with a normal physical examination. The entire visit will be scheduled at your convenience. You do have the right to withdraw as a participant at any time.

6. Benefits

At the end of the data collection, the investigator will answer your questions related to ARIs. If your child appears to have an acute illness, the investigator will refer you to the appropriate health care services.

7. Liability statement

Signing this form gives us your consent to be in this study. It tells us that you understand the information about the research study. When you sign this form, you do not give up your legal rights. Researchers or agencies involved in this research study still have their legal and professional responsibilities.

Signature Page

Study title: Assessment of the feasibility of modifying risk factors for acute respiratory infection (ARI) in children younger than five years of age in West Java, Indonesia.

Name of Principal Investigator: Nani Nurhaeni

To be filled out and signed by the participant:

	Please check as appropriate
I have read the consent.	Yes ___ No ___
I have had the opportunity to ask questions/ to discuss this study.	Yes ___ No ___
I have received satisfactory answers to all of my questions.	Yes ___ No ___
I have received enough information the about study.	Yes ___ No ___
I understand that I am free to withdraw from the study:	Yes ___ No ___

- at any time
- without having to give a reason
- without affecting my future care

I understand that it is my choice to be in the study and that I may not benefit.	Yes ___ No ___

I agree to take part in this study.

______________________________	____________
Signature of participant	Date
______________________________	____________
Signature of witness	Date

To be signed by the investigator:

I have explained this study to the best of my ability. I invited questions and gave answers. I believe that the participant fully understands what is involved in being in the study, any potential risks of the study and that he or she has freely chosen to be in the study.

__________________________________ _____________

Signature of investigator Date

Telephone number: __________________

Appendix K

Procedure for Physical Examination

1. The procedure of physical examination will be determined by the age of the infant or child.

2. The procedure for the physical examination is as follows:

   - The parent will hold the infant or child in his/her lap during the examination
   - Young infants will be wrapped to maintain warmth and security during examination.
   - A pacifier will be used to calm a fussy infant.
   - The investigator will use eye contact and speak softly to the infants during the examination.
   - The investigator will ask the parent for help during the examination.
   - The investigator will use toys to gain attention and to distract the toddler during examination.
   - The investigator will explain the procedure to the child by using simple terms that the child understands.
   - The procedure will begin with less intrusive aspects proceeding to the more intrusive aspects.

3. The investigator will begin by examining general appearance (nose, neck, ear, chest, and skin), and then proceed to anthropometric measures (weight by kg), vital signs (temperature by electronic thermometer, respiration rate for 1 full minute), and finally lung auscultation.

Appendix L

Ethical Approval from Memorial University of Newfoundland

Memorial
University of Newfoundland

Human Investigation Committee
Research and Graduate Studies
Faculty of Medicine
The Health Sciences Centre

November 16, 2000

TO: **Ms. N. Nurhaeni**

FROM: Dr. F. Moody-Corbett, Assistant Dean
Research & Graduate Studies (Medicine)

SUBJECT: Application to the Human Investigation Committee - #00.169

//

The Human Investigation Committee of the Faculty of Medicine has reviewed your proposal for the study entitled "**Assessment of the feasibility of modifying risk factors for acute respiratory infection in children under five years of age in West Java, Indonesia**".

Full approval has been granted for one year, from point of view of ethics as defined in the terms of reference of this Faculty Committee.

For a hospital-based study, it is **your responsibility to seek necessary approval from the Health Care Corporation of St. John's**.

Notwithstanding the approval of the HIC, the primary responsibility for the ethical conduct of the investigation remains with you.

F. Moody-Corbett, PhD
Assistant Dean

cc: Dr. K.M.W. Keough, Vice-President (Research)
Dr. R. Williams, Vice-President, Medical Services, HCC
Dr. D. Moralejo, Supervisor
Ms. K. Webber, Supervisor

St. John's, NF, Canada A1B 3V6 • Tel.: (709) 737-6974 • Fax: (709) 737-5033

Appendix M

Ethical Approval from University of Indonesia

DEPARTEMEN PENDIDIKAN DAN KEBUDAYAAN
UNIVERSITAS INDONESIA
FAKULTAS KEDOKTERAN
Jalan Salemba Raya 6 Jakarta Pusat - Telp. 330371, 330373
Fax. 330372 Pos Box 1358 Jakarta 10430

No: 06 /PT02.FK/ETIK/2001

KETERANGAN LOLOS KAJI ETIK
ETHICAL CLEARANCE

Panitia Tetap Penilai Etik Penelitian, Fakultas Kedokteran Universitas Indonesia dalam upaya melindungi hak asasi dan kesejahteraan subyek penelitian kedokteran, telah mengkaji dengan teliti protokol berjudul:
The Committee of The Medical Research Ethics of the Faculty of Medicine, University of Indonesia, with regards of the protection of human rights and welfare in medical research, has carefully reviewed the proposal entitled :

"PENGKAJIAN FAKTOR-FAKTOR RESIKO YANG BISA DIMODIFIKASI UNTUK INFEKSI SALURAN PERNAFASAN AKUT (ISPA) PADA ANAK BALITA".

Nama peneliti utama
Name of the principal investigator : NANI NURHAENI,SKp

Nama institusi
Name of institution : FAKULTAS ILMU KEPERAWATAN UI

dan telah menyetujui protokol tersebut di atas.
and approved the above mentioned proposal.

Jakarta, 5 FEBRUARI 2001

Dekan
Dean

Ketua
Chairman

DEPARTEMEN PENDIDIKAN DAN KEBUDAYAAN
UNIVERSITAS INDONESIA
FAKULTAS KEDOKTERAN
Jalan Salemba Raya 6 Jakarta Pusat - Telp. 330371, 330373
Fax. 330372 Pos Box 1358 Jakarta 10430

08 FEB 2001

Nomor : 515 /PT02.H4.FK/N/2001
Lampiran :
Perihal : Permohonan approval
uji klinik

Kepada : Yth. Dra. Elly Nurachmah,D.N.Sc
Dekan Fakultas Ilmu Keperawatan
Universitas Indonesia
Jakarta,-

Membalas surat Saudara No. 32104/PT02.H4.FIK/U/2000 tanggal 16 Nopember 2000 perihal pada pokok surat tersebut diatas, dengan ini kami beritahukan bahwa kami dapat menyetujui Nani Nurhaeni,SKp untuk melakukan penelitian berjudul:

"Pengkajian faktor-faktor resiko yang bisa dimodifikasi untuk infeksi saluran pernafasan akut (ISPA) pada anak balita".

Atas perhatian Saudara diucapkan terima kasih.

Dekan,

Prof.dr. Ali Sulaiman,PhD
NIP. 140 025 029

Tembusan :
1. Pudek I FKUI
2. Kabag. Taus FKUI
3. Kasubag. Pendidikan FKUI
4. Yang bersangkutan

Appendix N

Letter of permission from West Java Province

PEMERINTAH DAERAH KHUSUS IBUKOTA JAKARTA

DIREKTORAT SOSIAL POLITIK

Jl. Medan Merdeka Selatan 8 - 9 Telp. 3822170

JAKARTA

Nomor : 760/-1.5 81.8

31 Januari 2001

Lampiran :

Perihal : Rekomendasi.

Yang terhormat.

Gubernur KDH Prop DT I Jawa Barat
Up. Kadit Sospol
di -
Bandung

Sehubungan dengan surat dari : Dekan Ilmu Keperawatan UI No.196/PT02.H.14.FIK/I/2001 tanggal 25 Januari 2001.

Nama	:	Nani Nurhaeni, SKP
Alamat	:	Jl. Percetakan Negara I Rt 01/7 Jak-Pus
Pekerjaan	:	Mahasiswi
No. Mahasiswa / KTP	:	09.5008.650568.2003
Fakultas	:	Ilmu Keperawatan
Tingkat	:	Akhir
Tujuan	:	Penelitian : "Assessment of the feasibility of modifying risk factors for acute respiratory infection in children under five years of age in west java".
Lamanya	:	31 January s.d. 31 April 2001
Peserta	:	1 orang
Lokasi	:	Parung, Propinsi Jawa Barat
Penanggung Jawab	:	Dra. Elly Nurachmah, D.N.Sc

Maka perlu dijelaskan bahwa kami tidak berkeberatan dilakukan Penelitian

dimaksud. sepanjang dipenuhinya ketentuan dan persyaratan yang berlaku di daerah setempat.

Demikian agar menjadi maklum.

A.N. GUBERNUR KEPALA DAERAH KHUSUS IBUKOTA
JAKARTA
KEPALA DIREKTORAT SOSIAL POLITIK
U.b.
KEPALA SUB. DIT KETERTIBAN UMUM

DIREKTORAT SOSIAL POLITIK

Appendix O

Letter of permission from Bogor District

PEMERINTAH PROPINSI JAWA BARAT

DIREKTORAT SOSIAL POLITIK

Jl. Taman Sari No. 55 Telp. 2501678 - 2503206 FAX. 2512150 Kode Pos 40132
BANDUNG

Bandung, 5 Pebruari 2001

Sifat :
Derajat :
Nomor : 070.3/4458
Lampiran :
Perihal : **Pemberitahuan Survey/Riset**

Kepada Yth.
Bupati Bogor
Up.Kepala Kantor Sospol,
di
CIBINONG.

Dengan ini dipermaklumkan bahwa dengan surat tanggal 25 Januari 2001 **Nomor** 196/PT02.H.14.FIK/I/2001 **dari** Dekan Fak.Ilmu Keperawatan UI. **kami telah menerima pemberitahuan rencana survey / riset oleh :**

Nama : NANI NURHAENI,SKP.

Alamat : Jl.Percetakan Negara I Rt 01/7 Jakpus.

Pekerjaan : Mahasiswa.

Yanga akan dilakukan di daerah / kantor Saudara dari tanggal 5 Pebruari 2001 **s/d** 5 Mei 2001 **dengan judul / masalah :**

ASSESMENT OF THE FEASIBILITY OF MODIFYING RISK FACTORS FOR
ACUTE RESPIRATORY INFECTION IN
CHILDREN UNDER FIVE YEARS OF AGE IN WEST JAVA

Sesuai dengan Surat Keputusan Gubernur Propinsi Jawa Barat No. 300/Sk. 1215-Huk/1990 tanggal 14 Agustus 1990 kami lanjutkan kepada Saudara dan apabila situasi / kondisi memungkinkan kami tidak berkeberatan dilaksanakan.

An. GUBERNUR PROPINSI
JAWA BARAT
Kepala Direktorat Sosial Politik
u.b.
Kasubdit Ketertiban Umum,

PEMERINTAH PROPINSI DAERAH TINGKAT I JAWA BARAT
DIT. SOSPOL

H. PERMADI,SH
Pembina
NIP 480 053 857

TEMBUSAN disampaikan kepada :
1. Asstapra pada Setda Jabar.
2. Ketua Bappeda Jabar.
3. Dekan Fak.Ilmu Keperawatan UI.
4. Yang bersangkutan.

Appendix P

Letter of permission from Parung sub-district

PEMERINTAH KABUPATEN BOGOR

KANTOR SOSIAL POLITIK

KANTOR : DESA TENGAH CIBINONG TELP. (021) 8073965

Cibinong, 19 Januari 2001

Klasifikasi	:	Biasa
Sifat	:	Terbatas
Nomor	:	070.1/46 - Sospol
Lampiran	:	
Perihal	:	Surat Ijin/Pemberitahuan kegiatan

Kepada,

Yth. : Camat Parung

Kabupaten Bogor

di-

BOGOR

I. Dasar :

1. Surat Keputusan Menteri dalam Negeri No 134 Tahun 1978, tentang Susunan Organisasi dan tata Kerja Direktorat Sosial Politik dan Kantor Sosial Politik Kabupaten/Kotamadya ;
2. Surat Keputusan Gubernur Propinsi jawa Barat No. 300/SK/1215/Huk/1990, tanggal 14 Agustus 1990 tentang Tata cara memperoleh Ijin atau Rekomendasi Kegiatan yang berkaitan dengan Pembinaan Ketentraman dan Ketertiban Umum .
3. Surat Keputusan Bupati Bogor No. 300/931/Kpts/Huk/1990, tentang Tata cara memperoleh Ijin/Rekomendasi kegiatan yang berkaitan dengan Pembinaan Ketentraman dan Ketertiban Umum di Kabupaten Bogor.

II. Memperhatikan : Surat Fak. I. Keperawatan UI No. 161/PT 02.H4.FIK/I/ 2001, tgl. 19 Januari 2001

III. Atas dasar tersebut, dengan ini kami memberikan Ijin / pemberitahuan dilaksanakannya kegiatan: Penelitian
oleh :

Nama	:	NANI NURHAENI, SKp
Alamat	:	Jl. Salemba Raya 4 Jakarta
Tema/Judul	:	Penelitian
Peserta	:	1 orang
Penanggung Jawab	:	Dekan (Dra. ELLY NURACHMAH, D.N. Sc)

IV. Yang akan dilaksanakan tanggal Januari 2001 s/d April 2001 dengan ketentuan :

1. Dalam pelaksanaan kegiatan tersebut agar tidak mengganggu keamanan dan ketertiban ;
2. Sebelum melakukan kegiatan, wajib lapor kepada Kepala Wilayah setempat dan Instansi terkait dengan menunjukan surat ijin ;
3. Mentaati ketentuan-ketentuan yang berlaku dalam wilayah setempat .
4. Sesudah selesai melakukan kegiatan, wajib melaporkan hasilnya kepada Kepala Kantor Sospol Kabupaten Bogor.

Demikian agar menjadi maklum.

An. BUPATI BOGOR
KEPALA KANTOR SOSIAL POLITIK,

PEMERINTAH KABUPATEN BOGOR
KANTOR SOSIAL POLITIK

Drs. H. HA[illegible]N, MM
Pembina
NIP. 010 081 031

Tembusan Yth

1. Bupati Bogor (sebagai laporan) .
2. Kapolres Bogor ;
3. Ketua Bappeda Kab. Bogor ,
4. Pemohon.