

## Chapter 3

### Preliminary Data Analysis

In this chapter we describe the preliminary data analysis for our study. We begin with a description of the database structure. Next we show frequency distributions of the basic variables of interest. Finally we show graphs and tables summarizing the associations between the determinants and the outcomes.

#### 3.1 Description of the Database

Figure 3.1 shows the structure of the data. The data are stored in Ms Access as eight tables, *socio-demographic*, *environment*, *knowledge1*, *knowledge2*, *behavior*, *breastmilk*, *canmilk*, and *freshmilk*. The *socio-demographic* table has a record for each subject, indexed by an ID field, and contains demographic information. The *environment* table contains the subjects' responses to a 9-item multiple-response questionnaire, giving information about risk factors related to their living quarters. The *knowledge1* table contains their responses to a 15-item questionnaire giving the extent of their knowledge concerning risk factors for diarrhea. Each item has five possible responses, and the subject could choose only one response. The *knowledge2* table contains five binary-response items giving information about the subjects' understanding of the need for a diarrhea patient to be referred to hospital. The *behavior* table contains the subjects' responses to 8 items, each having five response levels, indicating their behaviour patterns with respect to methods for preventing diarrheal disease. The remaining three tables give information concerning the respondents' hygiene with respect to each of the three possible milk sources available to the child (breast, fresh and canned). Since the children were classified by the type of milk they were given (119 breast milk, 40 fresh milk, and 45 canned milk), this information is most conveniently stored in separate database tables. The complete questionnaire is shown in Appendix 1. The data in the seven tables apart from *socio-demographic* are stored as separate records for each combination of the subject and item, and thus have the composite index (ID, item).

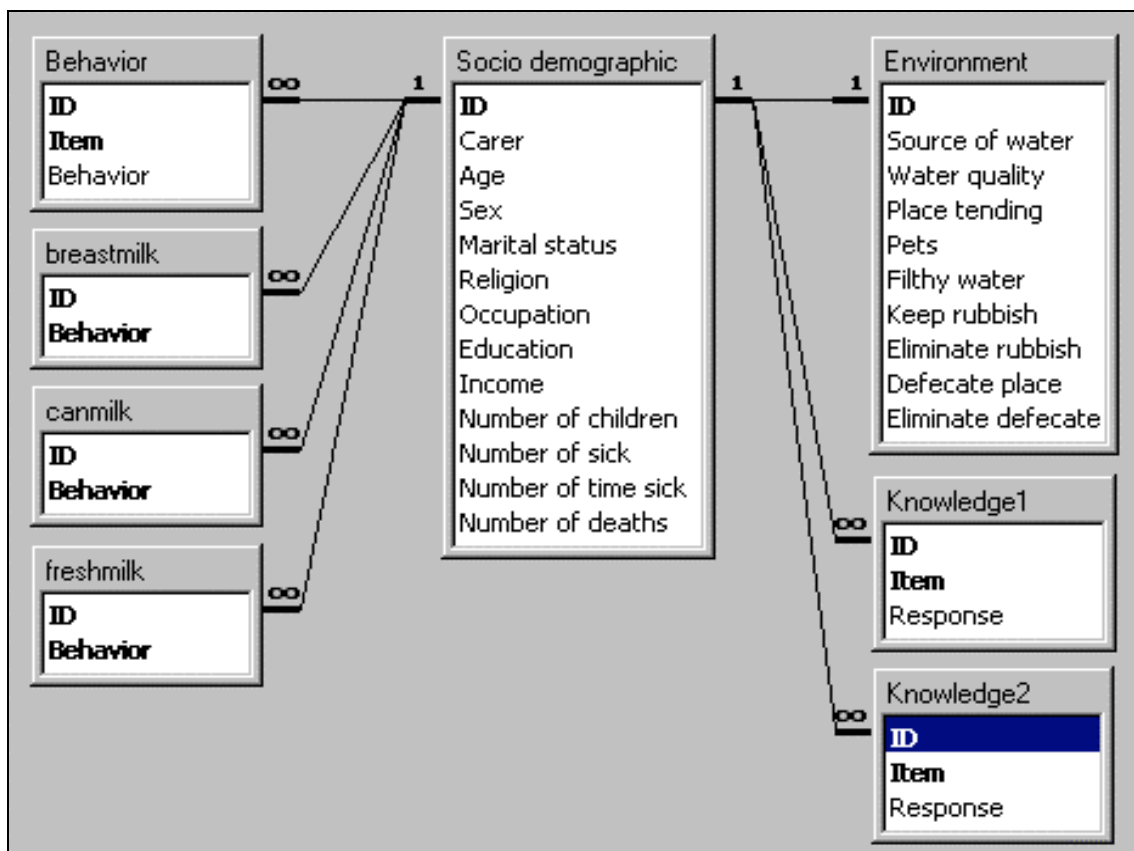


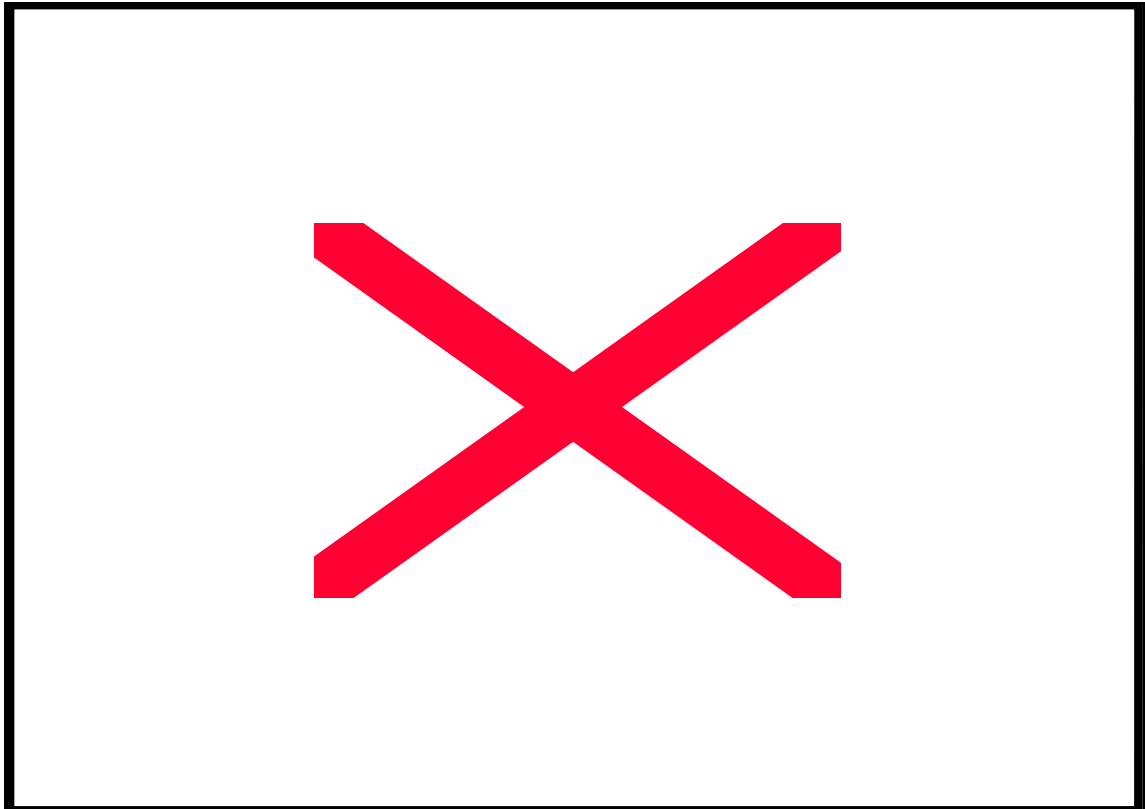
Figure 3.1: The structure of the database

### 3.2 Frequency Distributions of the Socio-demographic and Environmental Factors

The variables in the *socio-demographic* table are coded as follows:

Child carer	1 = Mother, 2 = Other
Sex	1 = Female, 2 = Male
Marital status	1 = Single, 2 = Married, 3 = Other
Religion	1 = Buddhist, 2 = Muslim
Occupation	1 = Agriculture, 2 = Employee, 3 = Commerce, 4 = Official, 5 = Housewife, 6 = Other
Education	1 = None, 2 = Primary, 3 = Secondary, 4 = Diploma, 5 = Bachelor, 6 = Other
Sick	1 = Yes, 2 = No

Figure 3.2 shows histograms and basic numerical summaries of these variables for the 220 child carers. The numerical summaries for ID are not meaningful, but are useful for data checking purposes. The mean for the nominal variables marital status, occupation, and education are not meaningful.



*Figure 3.2: Histograms and numerical summaries of socio-demographic factors*

Figure 3.3 shows histograms and numerical summaries of the environmental variables. The size, mean, standard deviation, minimum and maximum of each variable together with frequency plots for this sample of 220 carers are presented.

The variables in the *environment* table are coded as follows:

Source of water	1 = Well water, 2 = Reservoir, 3 = Rain water, 4 = Bottled water, 5 = Other
Water quality	1 = Boil, 2 = Filter, 3 = Chemical, 4 = Other, 5 = Improve
Area tending	1 = Raised on the ground, 2 = On the ground
Pets	1 = Yes, 2 = No
Filthy water	1 = Yes, 2 = No
Keep rubbish	1 = Yes, 2 = No
Remove rubbish	1 = Burn, 2 = Bury, 3 = Municipality, 4 = Other, 5 = Not done
Defecation place of child	1 = In the toilet, 2 = On the ground, 3 = In the forest, 4 = In the river, 5 = Other
Method for cleaning when child defecates on floor	1 = Wipe only, 2 = Wipe and wash with water, 3 = Wipe and wash with soap, 4 = Other, 5 = Not done

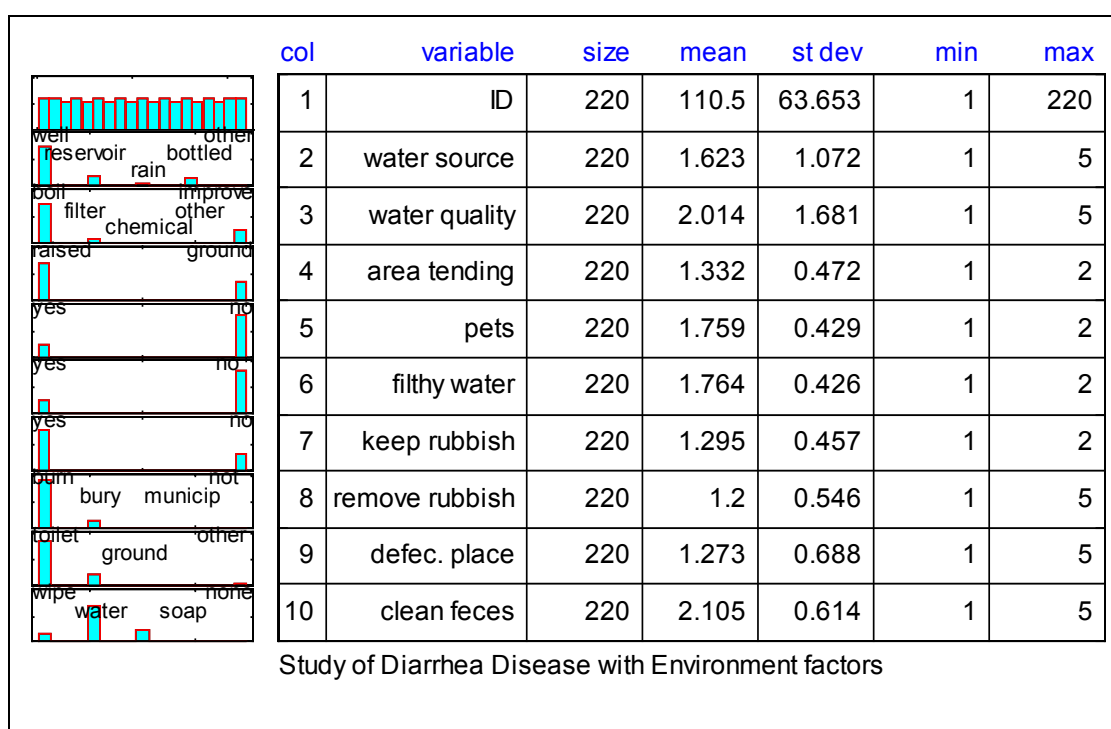


Figure 3.3: Histograms and numerical summaries of environmental risk factors

Table 3.1 shows the distributions of socio-demographic factors by each determinant. Eighty-two percent of child carers are the mothers, and eighteen percent are the others. Most of child carers are female (96%). Ninety-three percent of child carers are married. Three percent is single and the marital status is four percent. The proportion between Buddhist and Muslim groups are equal (50 % per group). Most of the carers have occupation as agriculture (34%), followed employee, housewife, commerce and official with percentage of 30, 24, 7 and 4 respectively. Very few of occupation is other (1%). Sixty-five percent of child carers have the education level at primary school, followed by secondary school (18%). Other education levels include no school (9%), diploma (5%), bachelor (2%) and other are (1%). Out of 220 children studied the number of cases with diarrhea sickness in the children under 5 years was found to be 84 (38 %).

From the total of 220 sample surveyed, sixty-eight percent of the carers had their child drinking water from well, fifteen percent from reservoir, twelve percent from bottle water and three percent from rainwater. A few of carers used other water for drinking (0.9%). Seventy percent of child carers improved water quality by boiling before giving their children for drinking. And five percent of child carers improved water quality by filtering. Very few of child carers improved water quality by using chemical and other method (1 and 0.4%). However, we found twenty-three percent of child carers not improving water quality before giving their children.

Rubbish elimination methods used most were burning (84%). Other methods used were burying (14%), municipality (1%), and not removing rubbish (1%). For the defecation place of child, eighty percent of carers used the toilet. Eighty- percent defecation on the ground and two percent used other method.

For the method for cleaning when child defecates on the floor, most of carers used the method of wiping and washing with water (65%). Twenty-two percent of child carers cleaned by wiping and washing with soap and thirteen percent cleaned by wipe only.

Determinant	Category	Count	Percentage
Child carers	Mother	181	82.27
	Other	39	17.73
Sex carers	Female	211	95.91
	Male	9	4.09
Marital status	Single	7	3.18
	Married	204	92.73
	Other	9	4.09
Religion	Buddhist	110	50.00
	Muslim	110	50.00
Occupation	Agriculture	75	34.09
	Employee	66	30.00
	Commerce	15	6.82
	Official	9	4.09
	Housewife	53	24.09
	Other	2	0.91
Education	None	20	9.09
	Primary	143	65.00
	Secondary	40	18.18
	Diploma	11	5.00
	Bachelor	5	2.27
	Other	1	0.45
Diarrhea disease	Sick	84	38.18
	Not sick	136	61.82

*Table 3.1: Distribution of socio-demographic factors*

The distribution of environmental factors by each determinant.

Determinant	Category	Count	Percentage
Water source	Well water	150	68.18
	Reservoir	34	15.45
	Rain water	7	3.18
	Bottled water	27	12.27
	Other	2	0.91
Water quality	Boil	154	70.00
	Filter	12	5.45
	Chemical	2	0.91
	Other	1	0.45
	Improve	51	23.18
Eliminatate rubbish	Burn	185	84.09
	Bury	30	13.64
	Municipality	3	1.36
	Other	0	0
	Not done	2	0.91
Defecation place of child	In the toilet	175	79.55
	On the ground	40	18.18
	In the forest	0	0
	In the river	0	0
	Other	5	2.27
Method for cleaning when child defecates on the floor	Wipe only	28	12.73
	Wipe and wash with water	143	65.00
	Wipe and wash with soap	48	21.82
	Other	0	0
	Not done	1	0.45

*Table 3.2: Distribution of environmental factors*

### 3.3 Frequency Distributions of the Knowledge Factors

The variables in the *knowledge1* are coded as follows:

Cause	1 = Eating food infected, 2 = Going to dirty areas without taking shoes on, 3 = Insect bite, 4 = Metabolism in children body, 5 = Not known
Carrier	1 = Fruit fly, 2 = Mosquito, 3 = Fly, 4 = Cockroach, 5 = Not known
Symptom	1 = Excrement water twice a day, 2 = Excrement blood more once a day, 3 = Excrement water more than 3 times or blood 1 time/day, 4 = Excrement is water more than 5 times or blood 2 time/day, 5 = Not known
Transfer	1 = By wound, 2 = By breath, 3 = By mouth, 4 = By touching the skin, 5 = Not known
Prevent	1 = Use toilet every time for eliminate the excrement, 2 = Take on the shoes and prevent insect bite, 3 = Washing hands before eat, 4 = Eating the fresh food and drink boil water, 5 = Not known
Heat food	1 = Disinfected, 2 = Make appetisingly, 3 = Make more delicious, 4 = Have more vitamin, 5 = Not known
Vaccine	1 = Pertussis, 2 = Diptheria, 3 = Polio, 4 = Measles, 5 = Not known
Wash soap	1 = Clear faeces, 2 = Perfume hands, 3 = Prevent dry skin, 4 = Eliminate germs, 5 = Not known
Cause dath	1 = High fever and shock, 2 = Weakness due to not eating, 3 = Abdominal pain and vomiting, 4 = Dehydration with diarrhea, 5 = Not known
Which way	1 = From faeces, 2 = From breath, 3 = From sweat, 4 = From urinate, 5 = Not known
What effect	1 = Poor Nutrition, 2 = Less resistance to disease easly for sick, 3 = Developing brain is impaired, 4 = Dehydration loss of minerals, 5 = Not known
How eat	1 = More than normal, 2 = Less than normal, 3 = Wait until getting well and give them food as normal, 4 = Not give any food, 5 = Not known
How drink	1 = More than normal, 2 = Less than normal, 3 = Wait until getting well and give them drink as normal, 4 = Not give any food, 5 = Not known
How ORS	1 = Use boil water 1 bottle (750 cc) , sugar 2 spoon, salt ½ teaspoon mix together, 2 = Use boil water 1 bottle (750 cc), sugar 5 spoon, salt 2 teaspoon mix together, 3 = Use boil water 1 bottle (350 cc) , sugar 2 spoon, salt ½ teaspoon mix together, 4 = Use boil water 1 bottle (350 cc), sugar 5 spoon, salt 1 teaspoon mix together, 5 = Not known
How long	1 = Not more than 24 hr, 2 = Not more than 2 days, 3 = Not more than 3 days, 4 = Not more than 1 wk, 5 = Not known



Figure 3.4 shows histograms and numerical summaries of these knowledge variables for 220 child carers. The responses were multiple choice. Item 7 (vaccine) has the highest mean value (4.277) while item 2 (cause of diarrhea disease) has the lowest mean (1.40).

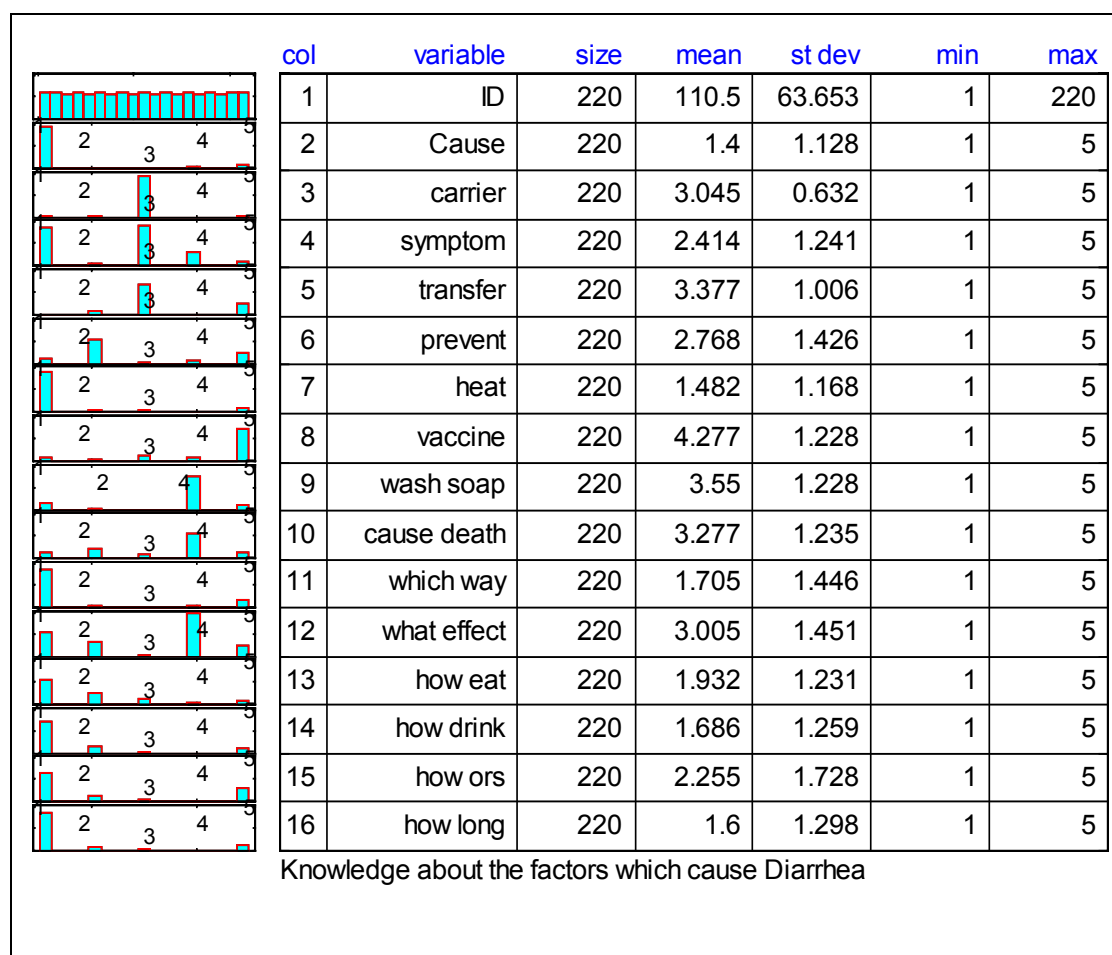
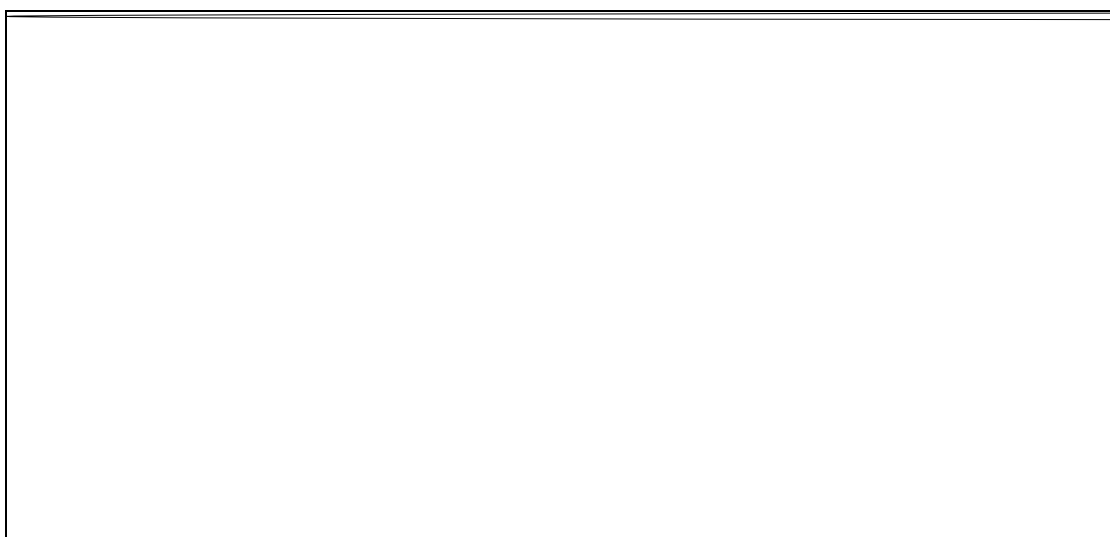


Figure 3.4: Histograms and numerical summaries of knowledge factors

The variables in the *knowledge2* table are coded as follows:

Heavy diarrhoea	0 = Not know, 1 = Know
Heavy vomiting	0 = Not know, 1 = Know
Can't eat	0 = Not know, 1 = Know
Blood in faeces	0 = Not know, 1 = Know
Heavy weakness	0 = Not know, 1 = Know

Figure 3.5 presents the histograms and numerical summaries of these danger signs for a diarrhea patient to be referred to hospital from 220 child carers. It was found that the item 1 : Knowledge of heavy diarrhea had the highest mean value (0.805) while item 3 : Knowledge of cannot eat has the least mean value (0.236).



*Figure 3.5: Histograms and numerical summaries of danger signs in diarrhea patient*

### **3.4 Frequency Distributions of the Behaviour Factors**

The histograms and numerical summaries of behaviour for prevention of diarrheal disease. are shown in Figure 3.6. This presents the size, mean, standard deviation, minimum, and maximum of each variable together with frequency plots for this sample of 220 child carers. The response were multiple choice, item 6: *food over night* had the greatest mean value (2.677) while item 3 : *reheat meal* had the least mean (1.736).

Similarly, the histograms and numerical summaries of breast milk for prevention of diarrhea disease are shown in Figure 3.7, including the two variables: *sick with diarrhea disease*, and carers using breast milk for the children. It gives the size, mean, standard deviation, minimum, and maximum of each variables together with frequency for this sample of 119 carers. The responses were again multiple choice.

The variables in the *behavior* are coded as follows:

Before cooking	1 = Wash with soap every time, 2 = Wash (water only) every time, 3 = Wash with soap sometimes, 4 = Wash (water only) sometimes, 5 = Do not wash
Before eat	1 = Wash with soap every time, 2 = Wash (water only) every time, 3 = Wash with soap sometimes, 4 = Wash (water only) sometimes, 5 = Do not wash
Reheat meal	1 = Every time, 2 = Often time, 3 = Sometime, 4 = Seldom, 5 = Never heat
After use toilet	1 = Wash with soap every time, 2 = Wash (water only) every time, 3 = Wash with soap sometimes, 4 = Wash (water only) sometimes, 5 = Do not wash
Clean feces	1 = Wash with soap every time, 2 = Wash (water only) every time, 3 = Wash with soap sometimes, 4 = Wash (water only) sometimes, 5 = Do not wash
Food over night	1 = Heat every time, 2 = Often heat, 3. Heat sometimes, 4 = Never heat, 5 = Never eat
Clean dress	1 = Boil and wash with soap, 2 = Wash with soap only, 3 = Wash with water only, 4 = Other, 5 = Do nothing
Fingernails	1 = Twice a week, 2 = once a week, 3 = Once a for twice week, 4 = Once a month, 5 = Other

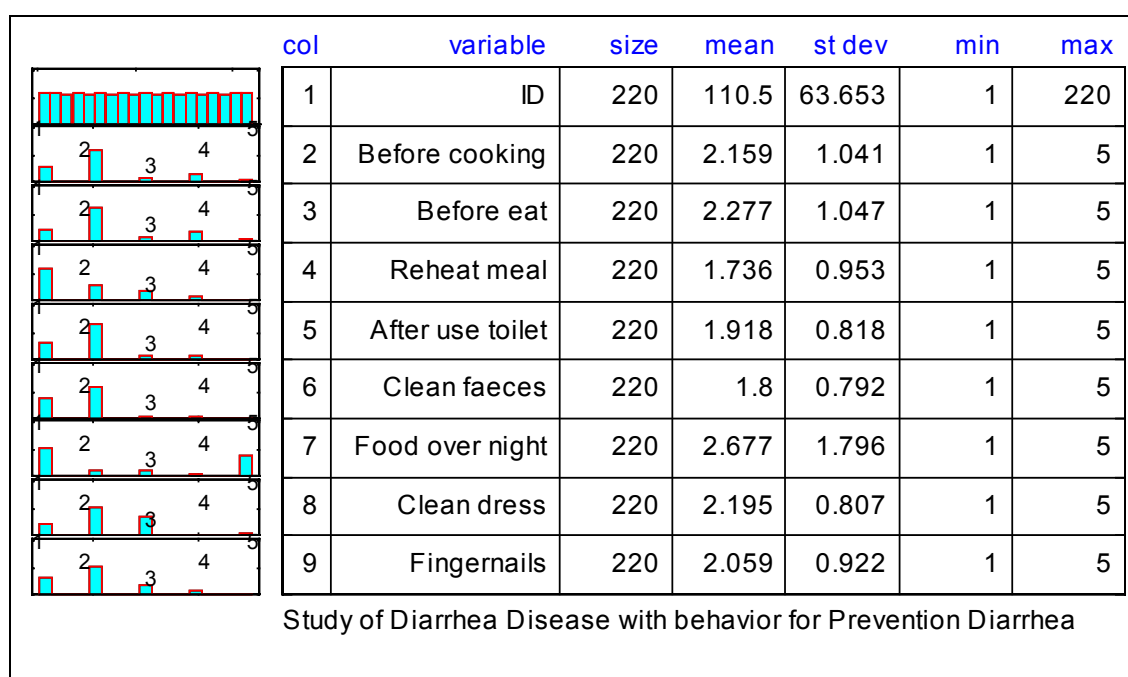


Figure 3.6: Histograms and numerical summaries of behaviour factors

The variables in the *Breast milk* are coded as follows:

Sick	1 = Sick, 2 = Not sick
Breast hygiene	1 = Washing every time, 2 = Washing sometime, 3 = Never washing

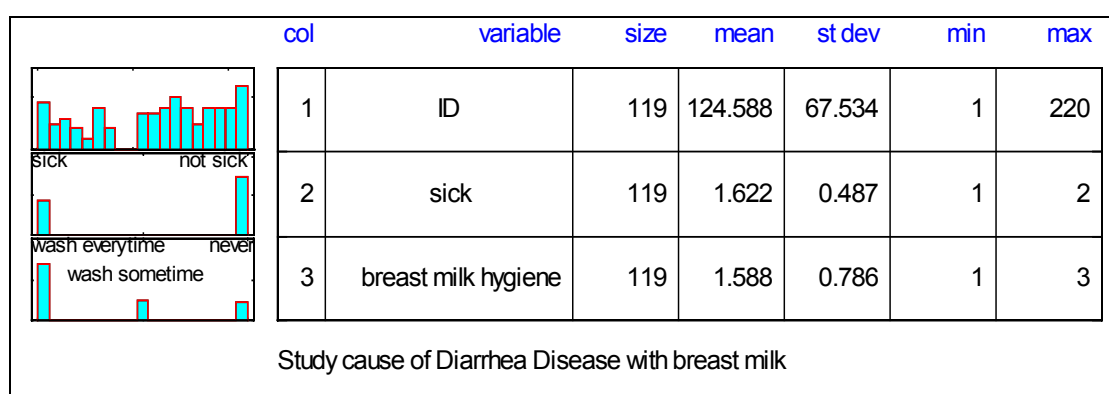


Figure 3.7: Histograms and numerical summaries of breast milk factors

Figure 3.8 shows histograms and numerical summaries of can milk variables for prevention of diarrhea disease. The variables are sick with diarrhea disease, and carers using canned milk for the children. It presents the size, mean, standard deviation, minimum, and maximum of each variables together with frequency plots for this sample of 45 carers. The responses were multiple choice.

The variables in the can milk are coded as follows:

Sick	1 = Sick, 2 = Not sick
Can milk hygiene	1 = Washing every time, 2 = Washing some time, 3 = Never washing

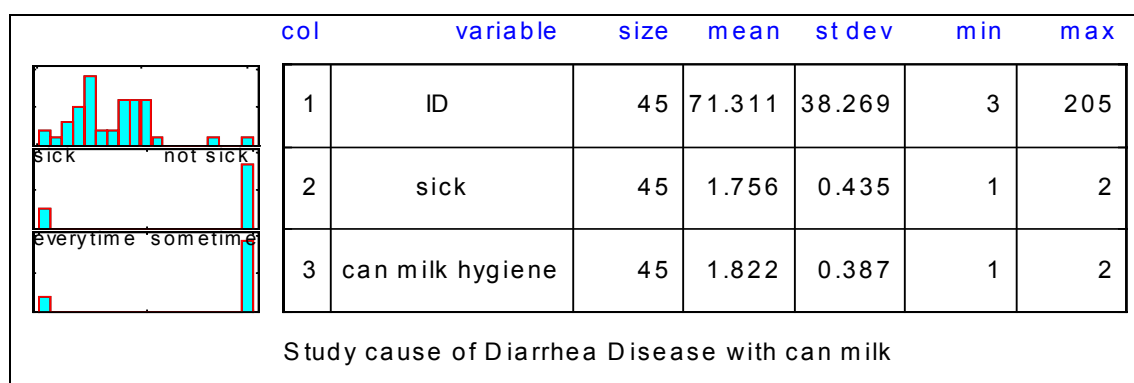


Figure 3.8: Histograms and numerical summaries of can milk factors

Similarly, the histograms and numerical summaries of fresh milk variables for prevention of diarrhea disease are shown in Figure 3.9 including the two variables of these tables : sick with diarrhea disease, and carers using fresh milk for the children.

The responses were multiple choice for this sample of 40 carers.

The variables in the *Fresh milk* are coded as follows:

Sick	1 = Sick, 2 = Not sick
Fresh milk hygiene	1 = Washing every time, 2 = Washing sometimes, 3 = Never washing

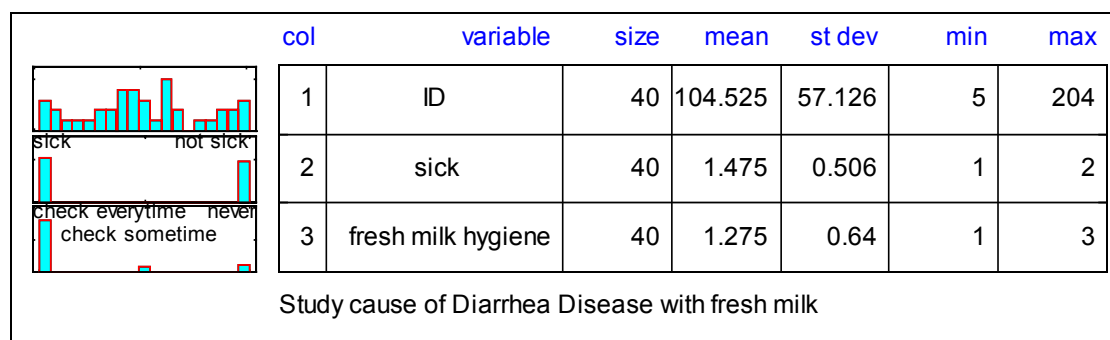


Figure 3.9: Histograms and numerical summaries of fresh milk factors

### 3.5 Association between the Outcome and Each Determinant

In this section the associations between diarrhea disease and each determinant including Socio-demographic factors, Environmental factors, Knowledge factors and Behaviour factors are investigated.

Table 3.3 shows the association of continuous variables in socio-demographic factors and diarrhea disease. It can be seen that only one of socio-demographic variables, age, shows an association.

Variable	t-test	Degrees of freedom	P-value
Age (log to base 2)	2.019	218	0.044
Income (log to base 10)	0.990	218	0.323

Table 3.3: The association between socio-demographic factors and sick with diarrhea

The associations between age group of child carers and sick with diarrhea disease are examined by using box plots as depicted in Figure 3.10. It was found that the older child carers with mean age of 34 years had children sick with diarrhea disease and the younger child carers with mean age of 31 years had no children sick with diarrhea disease. The two-sample t-test gives a t-statistic of 2.019 with p-value 0.045.

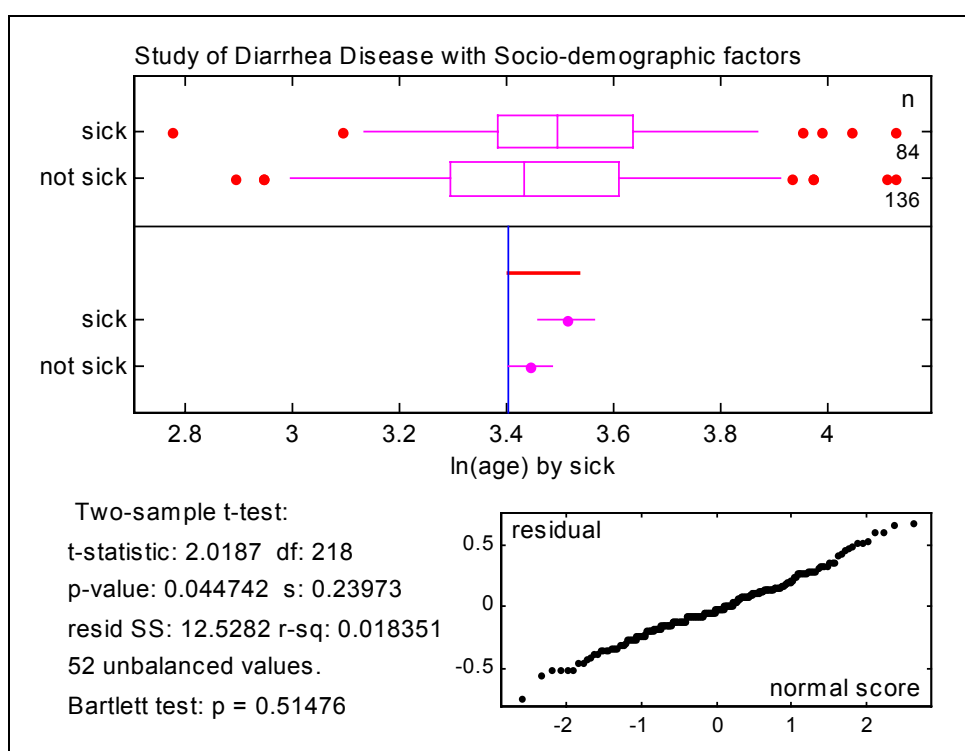


Figure 3.10: Box plots comparing age of child carers and diarrhea sickness

Table 3.4 shows the chi-squared statistic, degrees of freedom, p-value and odds ratio of each category in socio-demographic factors with diarrhea disease. It is found that none of the seven socio-demographic variables shows any association with diarrhea disease, sex being the one closest to achieving statistical significance.

Category	Chi-square	Degree of freedom	P-value	Odds ratio
Carer	0.429	1	0.513	7.286
Sex	2.913	1	0.088	5.187
Marital status	1.749	2	0.186	0.261
Religion	1.232	1	0.267	0.734
Occupation	3.224	5	0.358	1.032
Education	1.051	5	0.305	0.726
Number of children	0.696	2	0.404	0.769

Table 3.4: The association between socio-demographic factors and diarrhea sickness

The association between sex and sick with diarrhea disease is presented in Figure 3.11. There is no association between sex of child carers and diarrhea disease, the test for no association has a p-value of 0.088.

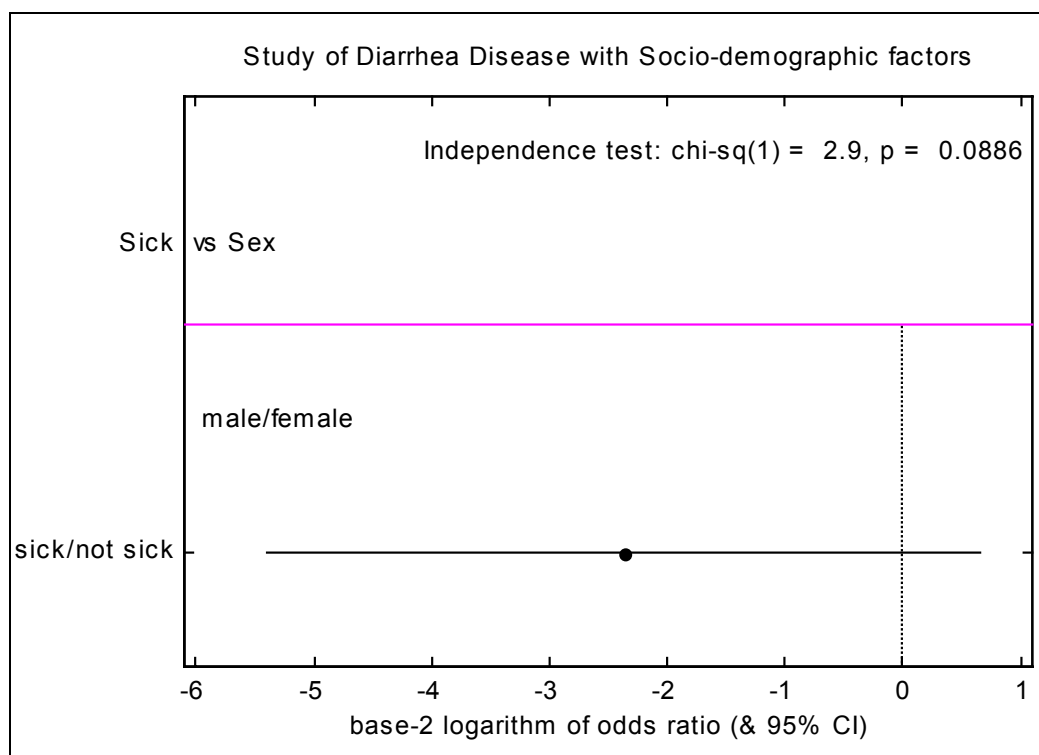


Figure 3.11: Association between sex and diarrhea sickness

Table 3.5 shows the chi-squared statistic, degrees of freedom, p-value and odds ratio for the association between the environmental variable factors and diarrhea disease. Two out of nine categories of environmental factors, including water quality and domestic animals showed associations with diarrhea disease.

Category	Chi-square	Degree of freedom	P-value	Odds ratio
Source of water	1.424	3	0.700	1.067
Water quality	9.140	2	0.010	2.456
Place tending child	2.283	1	0.131	0.634
Pets	19.95	1	0.000	4.4577
Filthy water	0.367	1	0.545	0.818
Keep rubbish	3.535	1	0.060	0.570
Eliminate rubbish	0.119	1	0.730	0.615
Defecation place	2.748	1	0.098	0.574
Eliminate excrement	1.320	2	0.518	1.012

Table 3.5: The associations between environmental factors and diarrhea sickness

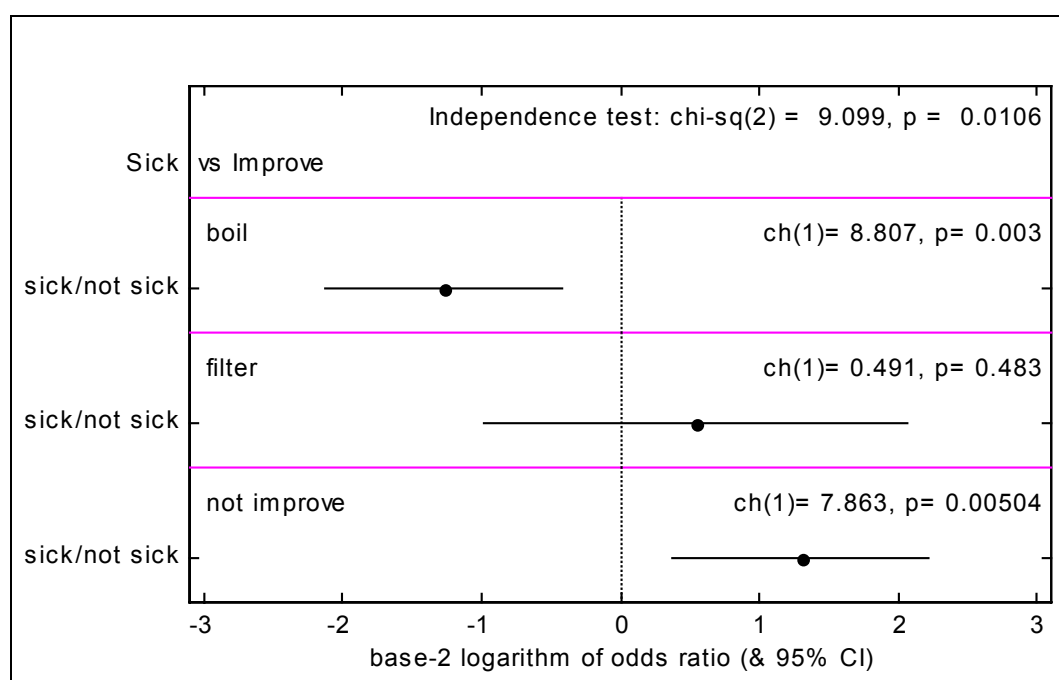
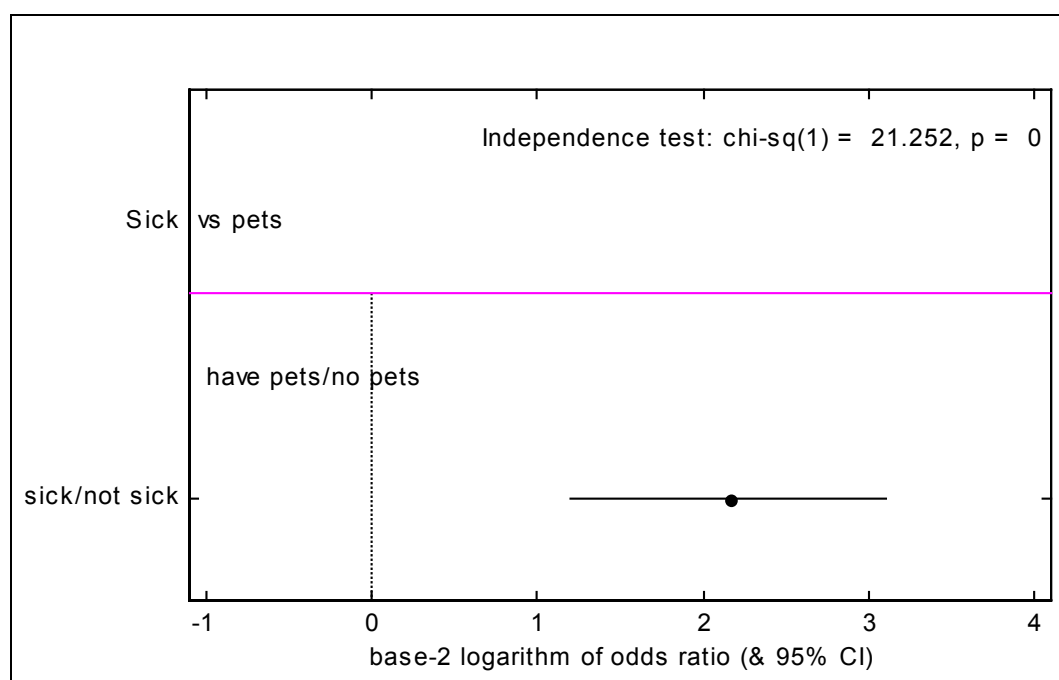


Figure 3.12: Association between water quality and diarrhea sickness



The association between water quality and diarrhea sickness is presented in Figure 3.12. The children and child carers improved water quality by boiling were found to have least incidence rate of diarrhea disease, whereas those of child carers not improving water quality had the highest incidence rate of diarrhea disease. For child carers improving water quality by filtering and other method showed no significant associations with Diarrhea disease.

Figure 3.13 shows the association between domestic animal and diarrhea sickness. The child carers who had domestic animals exhibited the incidence rate with diarrhea disease in children 4.19 times greater than those who had no domestic animal.



*Figure 3.13: Association between domestic animal and diarrhea sickness*

The association between garbage disposal and sick with diarrhea disease is almost statistically significant as shown in Figure 3.14. The child carers who took the garbage disposal away from the children exhibited 0.57 times less incidence rate with diarrhea disease in children than those who did not dispose of garbage. The odds ratio gives the p-value is 0.06.

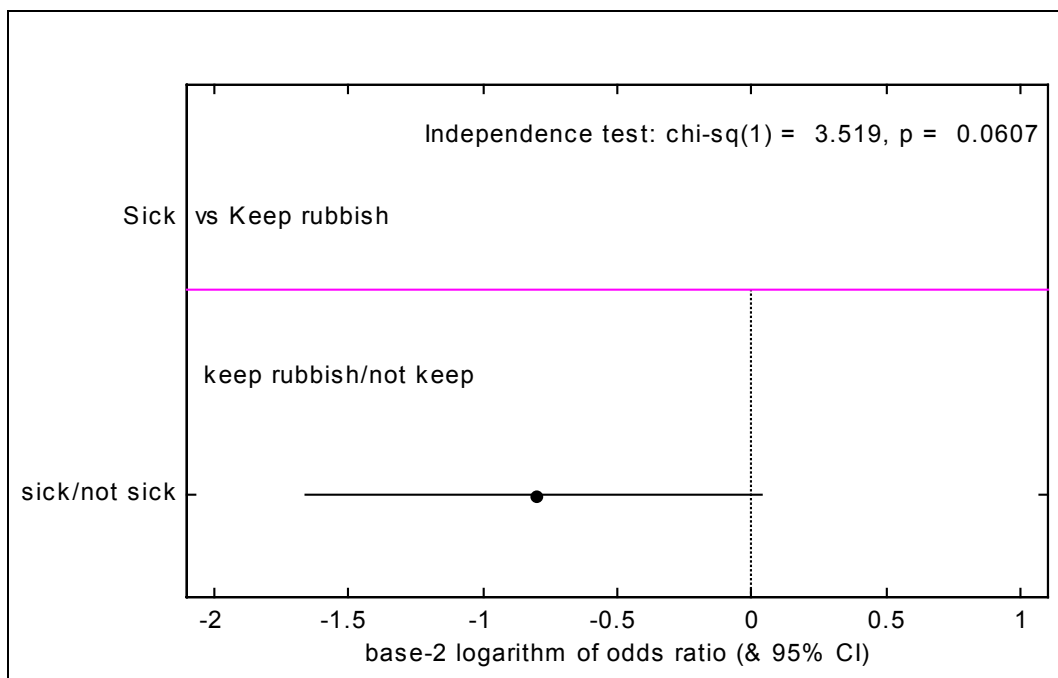


Figure 3.14: Association between garbage disposal and diarrhea sickness

Similarly, there was an almost statistically significant association between defecation place and sick with diarrhea disease (Figure 3.15). The estimated incidence rate with diarrhea disease for children who defecate inside the toilet was 0.57 times lower than that for others ( $p$ -value = 0.097).

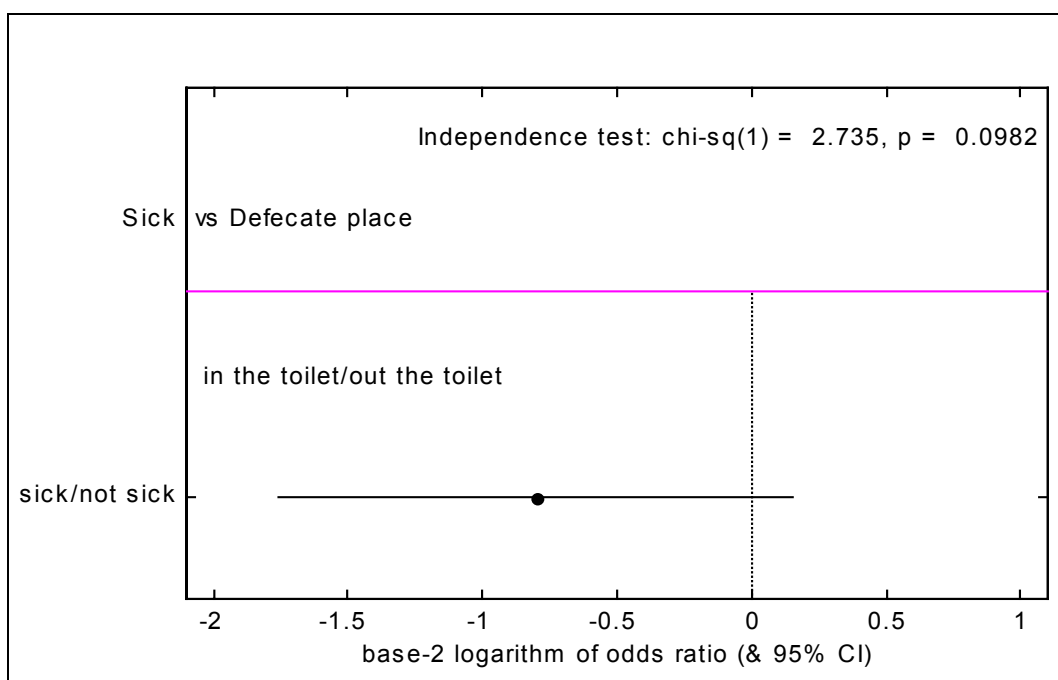


Figure 3.15: Association between defecation place and diarrhea sickness

Table 3.6 shows the chi-squared statistic, degrees of freedom, p-value and odds ratio for knowledge factors about diarrhea disease. Out of the twenty variables, only one variable among the knowledge factors (keeping ORS) was found to be significantly associated with diarrhea disease. Given the number of comparisons, this result may not be statistically significant.

Category	Chi-square	Degree of freedom	P-value	Odds ratio
Cause	1.295	1	0.255	1.596
Carrier	1.898	1	0.168	1.743
Symptom	2.972	1	0.085	1.637
Transfer	2.850	1	0.092	1.622
Prevent	1.180	1	0.277	1.353
Heat meal	1.642	1	0.200	1.582
Vaccine	0.899	1	0.343	1.670
Washing hand	2.287	1	0.13	1.565
Cause death	1.643	1	0.200	0.700
Infectious	0.806	1	0.369	1.346
Effect	0.797	1	0.372	0.780
Eating	0.265	1	0.607	0.867
Drinking	0.630	1	0.427	1.265
ORS	2.531	1	0.112	1.564
Keep ORS	7.646	1	0.005	2.455
<b>Danger signs</b>				
Heavy diarrhea	0.021	1	0.884	0.950
Heavy vomiting	0.358	1	0.550	0.184
Cannot eat	1.585	1	0.208	1.530
Blood in feces	0.062	1	0.803	1.079
Heavy weakness	0.008	1	0.927	1.026

*Table 3.6: The association between knowledge factors and diarrhea sickness*

Figure 3.16 shows the association between knowledge of symptoms of diarrhea disease and sickness with diarrhea disease. The child carers who could not answer correctly about diarrhea symptoms were estimated to have an incidence rate 1.64 times greater than others. The p-value is 0.085.

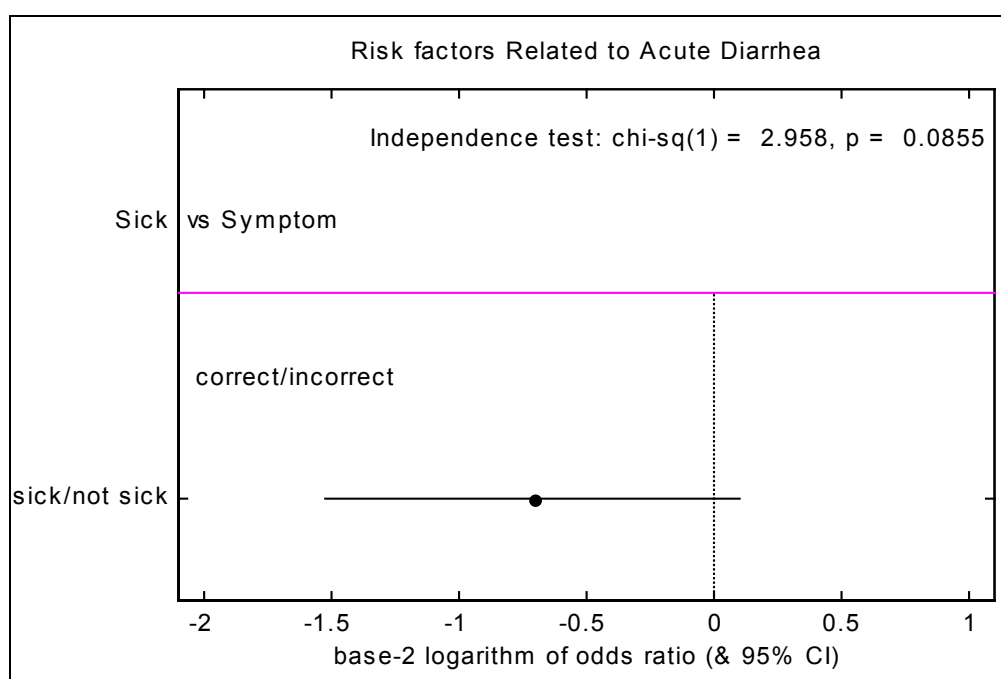


Figure 3.16: Association between symptom of diarrhea and diarrhea sickness.

The association between knowledge of transfer of diarrhea patients and diarrhea sickness was found to be similar to that between symptoms of diarrhea and diarrhea sickness as presented in Figure 3.17. It shows the difference in knowledge among child carers. The child carers answering incorrectly about transfer of diarrhea patients exhibited a slightly higher incidence rate than others (1.62 times). The p-value is 0.091.

Figure 3.18 shows association between knowledge of keeping ORS (oral dehydration solution) and diarrhea sickness. The child carers who did not give correct answers about the ORS solution for diarrhea patients showed 2.45 times higher incidence rate. The p-value is 0.005.

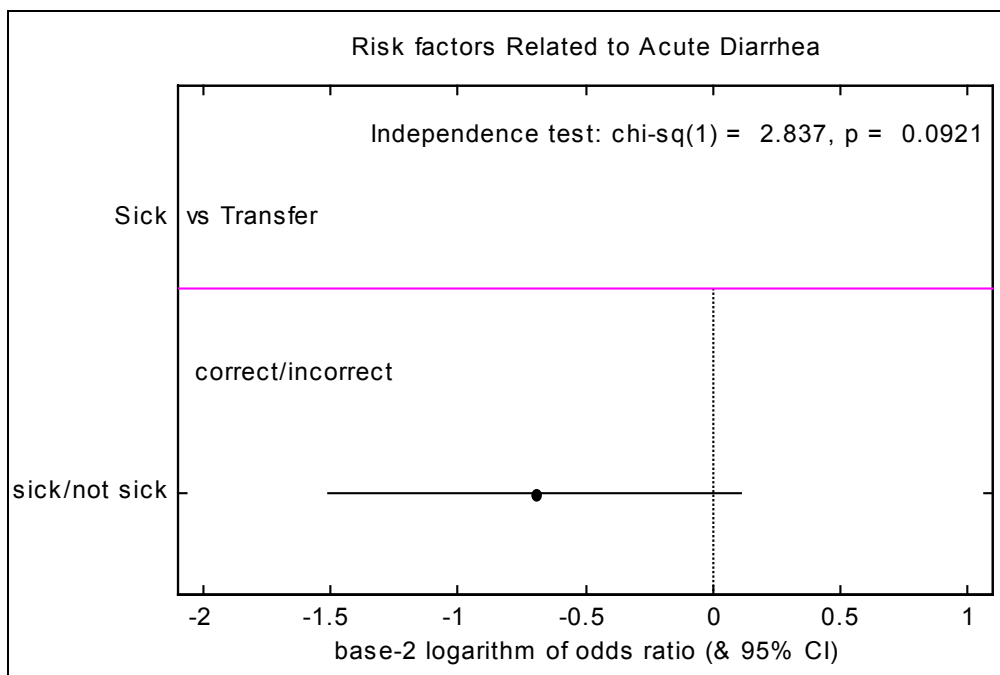


Figure 3.17: Association between knowledge of transfers of diarrhea patients

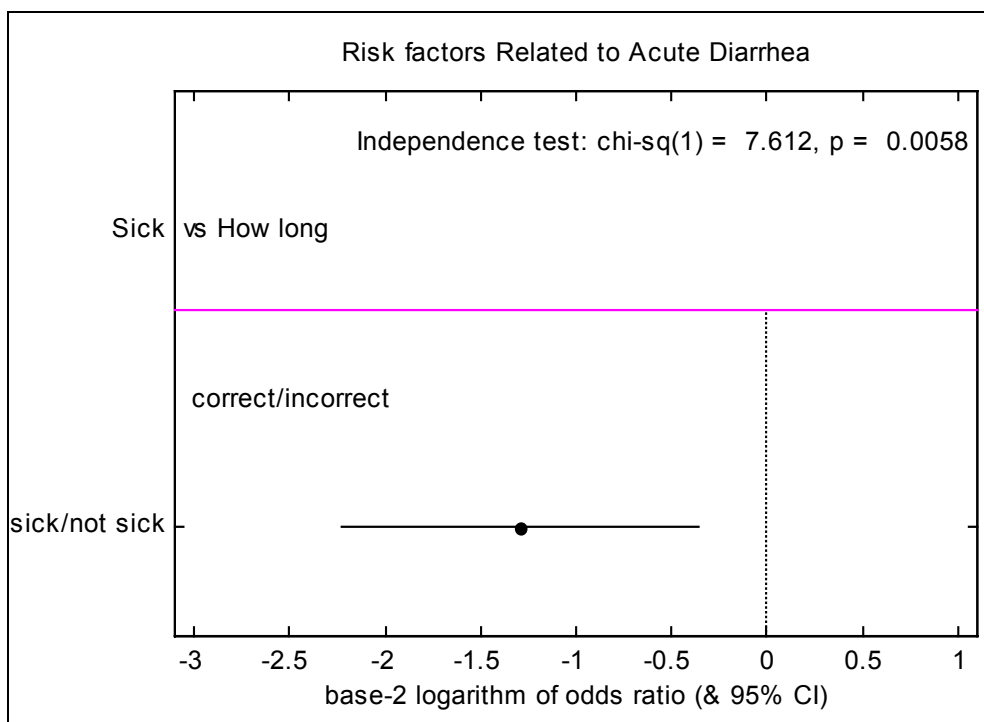


Figure 3.18: Association between knowledge of keeping ORS solution and diarrhea Sickness

The chi-squared statistics, degrees of freedom, p-value and odds ratios of behaviour factors about diarrhea disease are listed in Table 3.7. Four out of the eleven categories of behaviour factors exhibited significant associations with diarrhea, including washing hands after use of toilet, keeping food over night, cleaning dress and cutting fingernails.

Category	Chi-square	Degree of freedom	P-value	Odd ratio
Washing hand before cooking	0.611	1	0.434	1.308
Washing hand before child eat	0.103	1	0.744	1.109
Washing hand after use toilet	4.755	1	0.029	0.967
Reheat meal	0.015	1	0.903	0.405
Clean feces	0.876	1	0.349	0.651
Over night	6.915	1	0.008	2.121
Clean dress	8.860	1	0.002	0.284
Fingernails	20.34	2	0.000	0.252
Breast milk	3.511	2	0.173	1.538
Can milk	0.898	1	0.343	2.175
Fresh milk	0.507	2	0.776	1.538

*Table 3.7: The association between behavior factors and diarrhea sickness*

Figure 3.19 shows the association between behaviour of washing hands after toilet use and sickness with diarrhea. The child carers who did not wash their hands every time after using the toilet showed a higher incidence rate (p-value, 0.029).

Similarly, the child carers who reheated meals not every time before feeding children had an incidence rate 2.12 times greater than others (p-value 0.008, Figure 3.20).

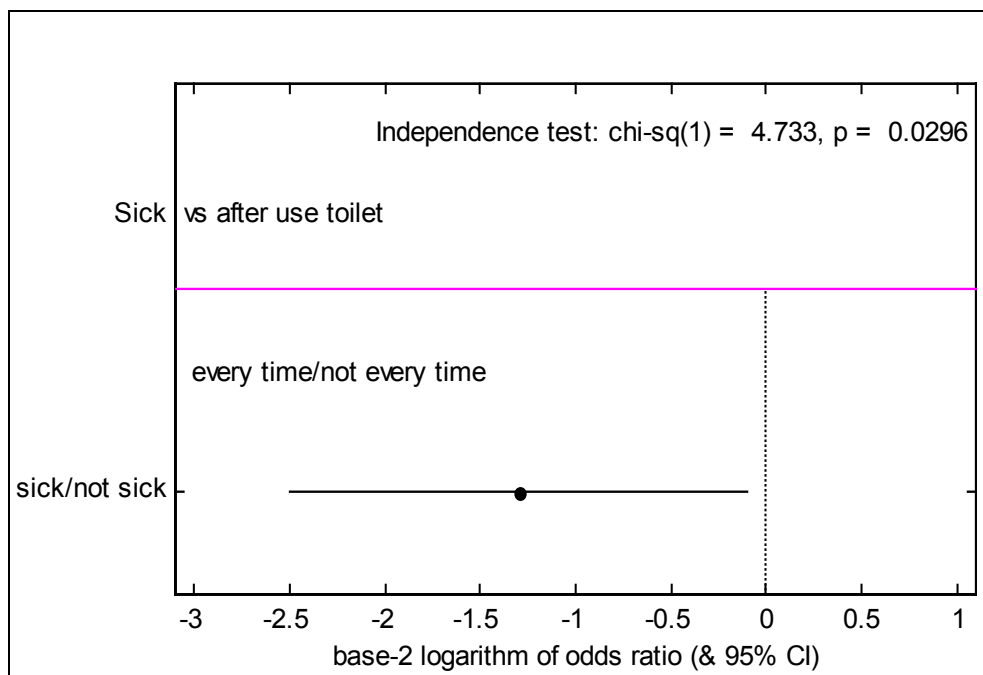


Figure 3.19: Association between washing hand after use toilet and diarrhea sickness

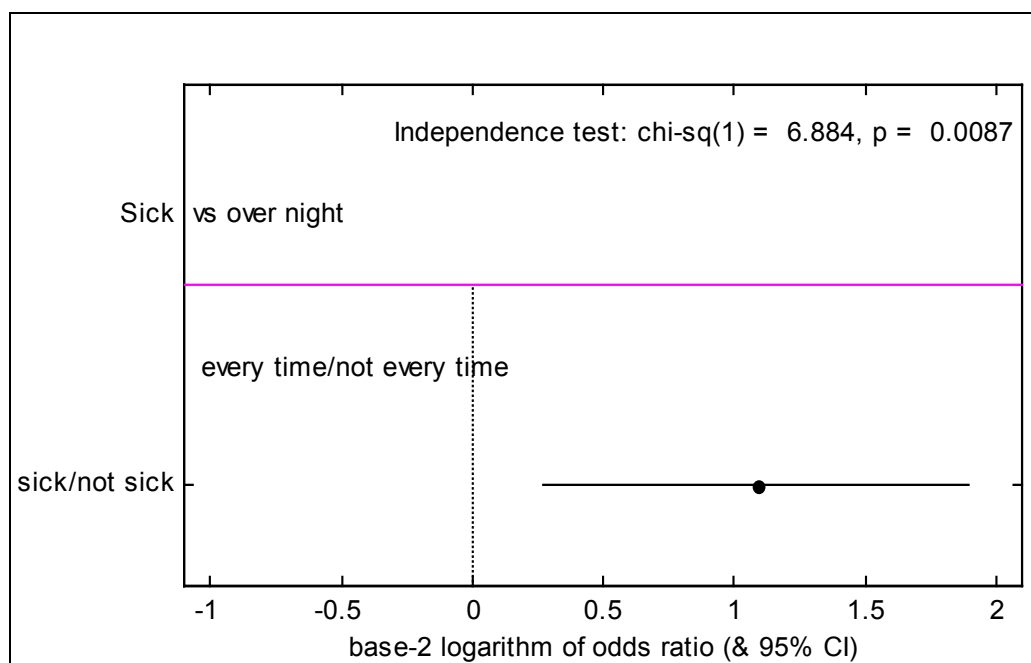


Figure 3.20: Association between keeps food over night and diarrhea sickness

The association between cleaning dress of patient and sick with diarrhea is depicted in Figure 3.21. The child carers cleaning a patient's dress with water or soap without boiling the dresses showed a higher incidence rate than others (p-value 0.002).

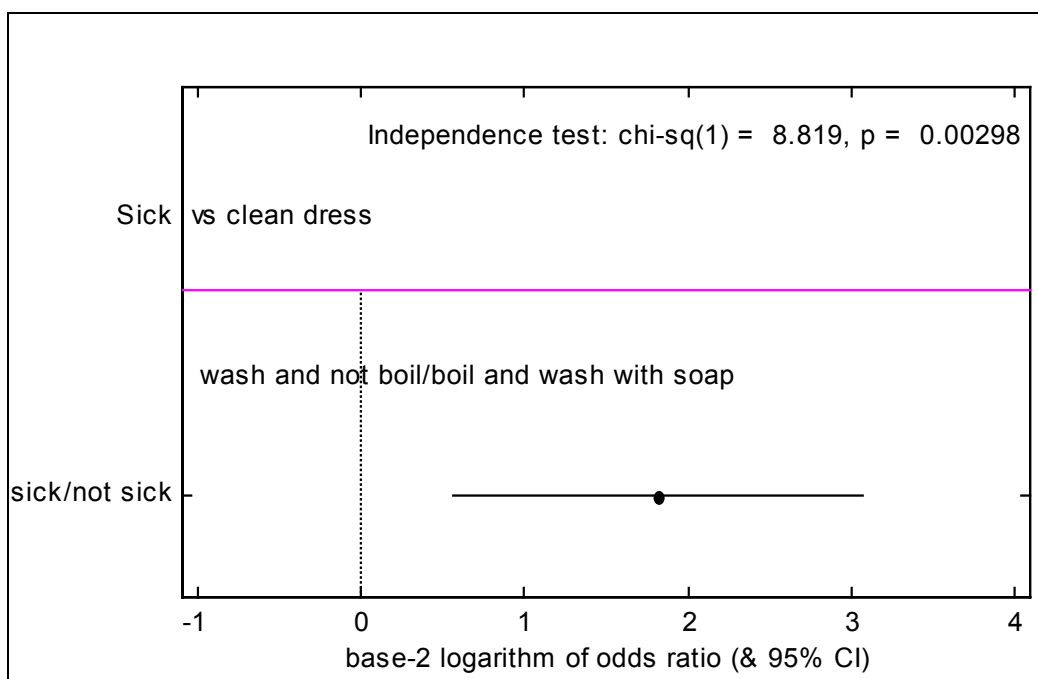


Figure 3.21: Association between clean dresses' patient and diarrhea sickness

For cutting fingernails, the child carers who cut children's fingernails twice a week showed the least incidence rate with diarrhea while those who cut children's fingernails once a week showed the highest incident rate. However, there was no significant association between the child carers who cut children's fingernails less than once a week (Figure 3.22). This pattern is difficult to explain.



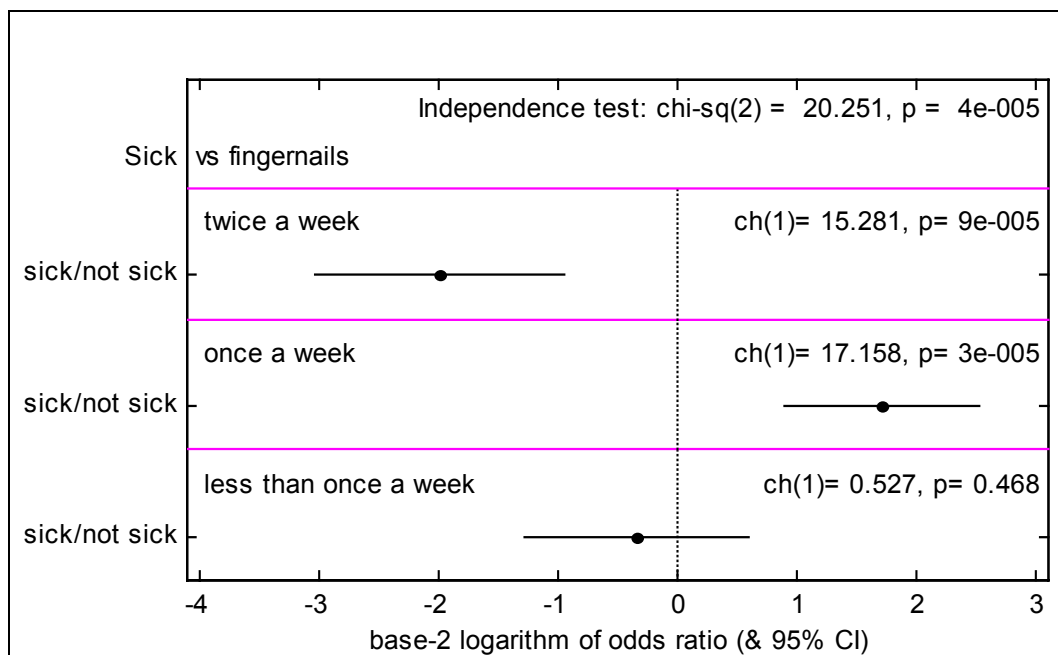


Figure 3.22: Association between cutting fingernails and diarrhea sickness