WHO

WESTERN PACIFIC REGIONAL OFFICE

Report on Morbidity and Mortality from Flooding in Central Viet Nam 2003

EMERGENCY AND HUMANITARIAN ACTION PROGRAMME

April 2004

Contents

Glossary of terms

WHO	World Health Organisation
IHPH	Institute of Hygiene and Public Health, Ho Chi Minh City
ADD	Acute Diarrhœal Diseases
ARI	Acute Respiratory Infections
DF	Dengue Fever
CHS	Commune Health Station
DHC	District Health Centre

This study was undertaken by Professor Le The Thu, MD, PHD and Dr Dang Van Chinh, MPH, of the Institute of Hygiene and Public Health, Ho Chi Minh City, in collaboration with WHO.

1 Executive summary

Five provinces in central Viet Nam were affected by two periods of flooding during October and November 2003. The Institute of Hygiene and Public Health in Ho Chi Minh City, with support from the World Health Organisation, undertook a study to document and analyse the medium term health impact of these floods.

The principle findings are:

1. The health of the population in the post flood period is significantly worse when the CHS has been damaged or cannot function during the flood period.
2. The incidence of acute diarrhœal diseases and acute respiratory diseases increased significantly in the post-flood period. Children under ten years of age were the most affected.
3. The incidence of skin diseases and conjunctivitis increased after the floods.
4. The incidence of malaria increased slightly in post-flood period. However, the incidence of dengue fever seem to be reduced by flooding.
5. The incidence of infectious diseases was higher in males than females.
6. The incidence of ADD, ARI, skin diseases and conjunctivitis was significantly higher in communes where the Commune Health Station (CHS) was damaged by flooding compared to those where the CHS was undamaged.
7. The number of cases of drowning was low. Males aged 10 to 19 were affected most.
8. Health sector activities were significantly reduced in communes where the CHS was destroyed by flooding or not functioning for any period.
9. Damage or disruption to CHS services was a more significant predictor of increased incidence of infectious diseases than loss of function of DHC.

The principle recommendations are:

1. All CHS in flood prone communes should be relocated to safe areas or protected from the effects of floods and from loss of access to the population during floods. Protecting CHS will significantly reduce post-flood morbidity.
2. CHS that have damaged or destroyed by flood should be immediately supplemented with temporary mobile services. This will significantly reduce post flood morbidity.
3. Communes at risk of flooding need to be identified and mapped for baseline data such as population, prevailing diseases, basic sanitation and health sector resources. This information should be used to prepare local plans for responding to flood emergencies.
4. Primary health care infrastructure, resources and services need to be reinforced in communes known to be at risk from flood and measures must be taken to enhance their ability to deal with increased workloads during the flood season.
5. Issues related to morbidity, mortality and nutritional status of children during and after floods need further research. Current health education and public safety messages regarding flood may not be meeting actual needs or addressing the appropriate target groups.

2 Background

In late 2003, two periods of exceptional floods occurred in all provinces of central Viet Nam. The first flood was from 14th –20th October 2003, affecting mainly Quang Nam, Quang Ngai and Binh Dinh provinces. The second occurred from 11th –14th November, affecting Ninh Thuan and Phu Yen provinces most. Overall, 36.4% of the population of the five provinces were exposed to the floods. However, according to data obtained from the weather bureau, 2004 overall was not a year of exceptional rainfall.

Damage to property and loss of life from these floods was documented in a recent IHPH report[1]. This study on the medium term health impact of flooding completes a overview of the consequences of those floods with respect to health.

The goal of this study was to examine the effects of the floods on the morbidity and mortality trend of the affected communities compared to the unaffected communes, to identify the health needs arsing from being exposed to flood and to propose control and preventive measures for future situations.

The specific objectives of this study are:

- To examine the changes in the incidence of diarrhœal diseases, acute respiratory infections, malaria, dengue fever, skin diseases and conjunctivitis before and after flooding, in flood-affected communities and unaffected communities.
- To examine the morbidity pattern of the affected and the unaffected communes by age and sex.
- To examine the mortality from drowning and snakebite in the affected communities and the unaffected communities before and after flooding.

The operational hypothesis for this study was that the combined effect of poor environmental sanitation, contaminated water and weakened health services during and after floods lead to an in creased potential for transmission of communicable diseases. Flood was considered as the precipitant factor and changes in the incidence of acute diarrhœal diseases, ARI, malaria, dengue fever, skin diseases and conjunctivitis as resultant factors.

3 Study method

The study used data from the monthly records of CHS and DHC in the five flood-affected provinces of Central Vietnam for the period September 2003 to February 2004. In each province, one district and four communes were selected. In all, the study looked at records from a total of five District Health Centres (DHC) and twenty Commune Health Stations (CHS). The localities were chosen according to the level of damage of CHS in the floods. Four types of communes were selected:

(1) communes which were not flooded and the CHS was unaffected;
(2) communes which were flooded but the health station was unaffected (CHS not damaged or inundated);
(3) communes which were flooded and the CHS was damaged but was still able to function; and
(4) communes which were flooded and the CHS was destroyed or could not function.

Data was collected from the routine monthly records of the CHS and DHC by Preventive Medicine officers from the Provincial Health Services. This was a retrospective documentary study collecting data over six months, starting one month before the first flood and ending three months after the last flood. Comparison with data from the same period in previous years was not done.

In this study, the focus was changes in indicators between the two periods of before and after the floods. Adjusted rates of morbidity for communities were used, reflecting various levels of risk since the population structures were quite similar. In estimating the morbidity rates, the population investigated in the latest year was taken as the denominator. No adjustment was made for natural growth or migrations that may have occurred with the study population group.

[1] Report on Health Sector Damage Caused by Flooding in Central Viet Nam 2003, IHPH, December 2003;

The mortality rate reported from DHC is subject to reporting bias, due to the common practice of sending dying patients home or to higher level hospitals. This bias was not accounted for in this study.

The nutritional status of children under five years of age was not examined because of lack of complete and discrete data from communes. The weight of all children under two years old is routinely monitored each month by village health educators but this practice was interrupted during the floods. Under this system, nutritional status is classified as either normal and undernutrition. Therefore, the data collected is neither representative of children living the affected areas nor an accurate assessment of true nutritional status.

Because of well known weaknesses of the source from monthly returns of clinics and hospitals, this paper focuses on identifying changes in trends in morbidity and mortality, rather than on explaining them, which will be the subject of future studies. This is based on the assumption that structural biases and errors in reporting will be consistent over the short time period of the study.

The services provided by private practitioners is a confounding factor that has not been taken into account in the analysis of this data.

3.1 Case Definitions

The following case working definitions were developed and used.:

- A case of diarrhoea: A person who during 24 hours has had three or more liquid stools or one liquid or semi-liquid stool containing pus or mucus or blood.
- A case of acute respiratory infection: A child under five years of age shows any of the following symptoms and signs: Coughing, rapid and or difficult breathing.
- A case of malaria A person whose parasitological study for malaria is positive and who shows clinical signs compatible with the disease.
- A case of dengue fever: A person who has fever was not diagnosed for other causes.

4 Results

4.1 Overview of the morbidity in DHC

Disease	Sep	Oct	Nov	Dec	Jan	Feb	Total
ADD	103	124	104	85	68	94	578
ARI	282	344	370	335	502	365	2198
Skin diseases	196	257	161	210	237	203	1264
Malaria	30	24	7	43	31	13	148
Dengue	16	202	172	60	16	53	519
Conjunctivitis	311	460	244	229	236	267	1747
Total	**938**	**1411**	**1058**	**962**	**1090**	**995**	**6454**

Table 1: number of cases of flood-related of diseases by month in DHC

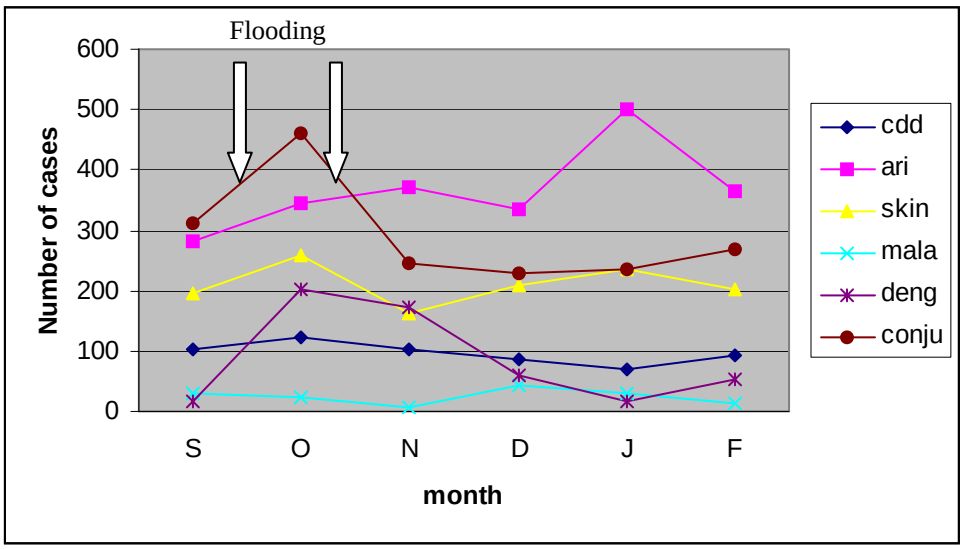

Figure 1. Frequency of cases of flood-related diseases by month in DHC

Table 1 shows the number of cases of selected diseases as reported by DHC from 9/2003-4/2004. Overall, ARI was commonest disease reported; there was a marked increase in the period after flooding. Conjunctivitis was the second common commonest disease reported. However, there was a significant decrease in the number of cases of dengue fever after the floods. The highest number of cases of dengue fever were found during October, when there was much water around for the breeding of mosquitoes. Since a district is made up of many communes, each of which is affected differently by the floods, the trend in incidences as reported by districts is not as sensitive as that reported by the commune. Therefore these trends are only reported here for reference.

4.2 Overview of the morbidity in CHS

4.2.1 Overview of the general morbidity

Disease	Month												Total	
	Sep		Oct		Nov		Dec		Jan		Feb			
	No	%	No	%	No	%	No	%	No	%	No	%	No	%
ADD	421	*12.8*	478	*13.4*	468	*10.1*	435	*11.8*	456	*12.3*	516	*12.4*	**2774**	12.0
ARI	841	*25.6*	823	*23.0*	1436	*30.9*	915	*24.7*	1231	*33.3*	1434	*34.6*	**6680**	29.0
malaria	20	*0.6*	30	*0.8*	7	*0.2*	51	*1.4*	32	*0.9*	19	*0.5*	**159**	0.7
Dengue	15	*0.5*	30	*0.8*	16	*0.3*	0	*0.0*	1	*0.0*	0	*0.0*	62	0.3
Skin diseases	137	*4.2*	164	*4.6*	281	*6.0*	122	*3.3*	84	*2.3*	94	*2.3*	**882**	3.8
Conjunctivitis	233	*7.1*	156	*4.4*	454	*9.8*	224	*6.1*	155	*4.2*	187	*4.5*	**1409**	6.1
Other	1620	*49.3*	1898	*53.0*	1992	*42.8*	1954	*52.8*	1737	*47.0*	1899	*45.8*	**11100**	48.1
Total	3287	*100*	3579	*100*	4654	*100*	3701	*100*	3696	*100*	4149	*100*	**23066**	100

Table 2: numbers and distribution of diseases by month in all communes.

The number of patients ranged from 3,287 cases to 4,654 cases per month in all the twenty communes under the study. The proportion of diseases considered not related to flooding changed from 42.8% to 53% (Table 2 and Figure 2a). In other words, flood-related diseases fluctuated around 48% percent, depending on month. However, the number of the flood-related diseases was increased clearly after the floods (Table 3). This increase appears to be bigger than that of the total number of patients (Figure 2b).

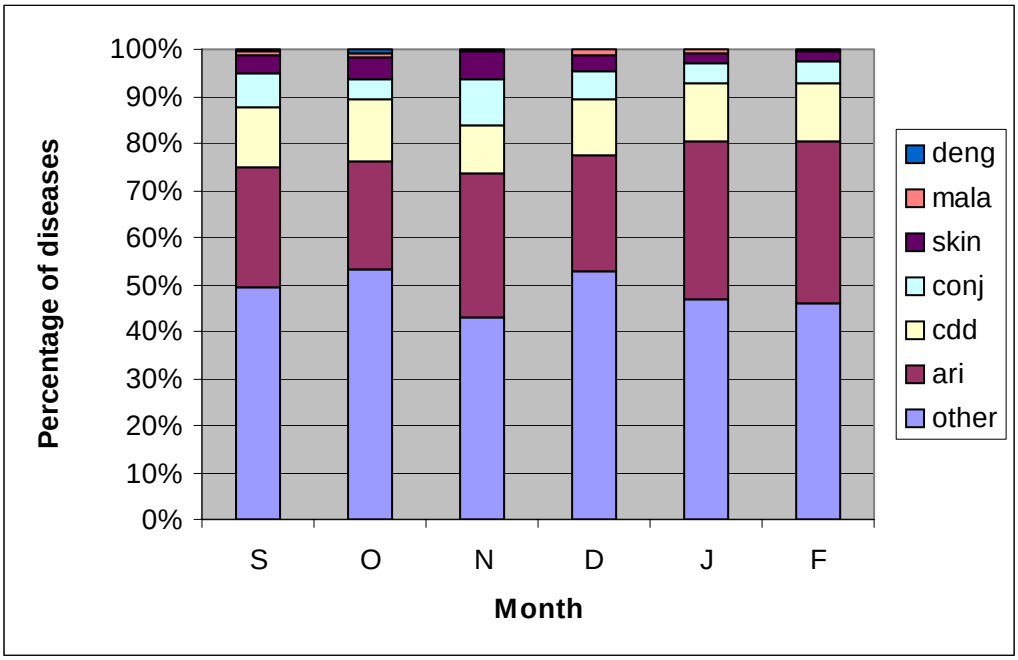

Figure 2a: percentage of diseases by month in all communes

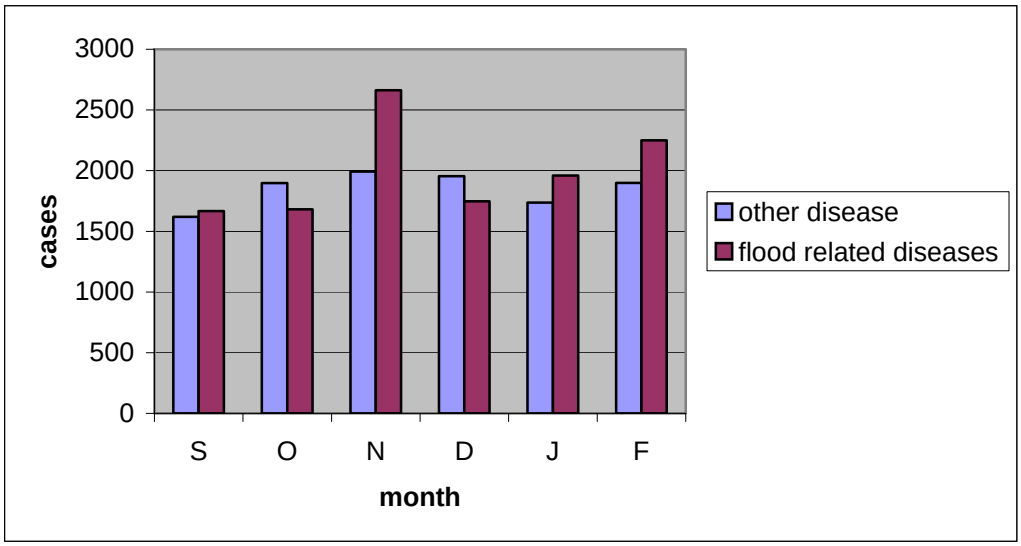

Figure 2b: Changes on cases of flood-related diseases and others by month

4.2.2 Overview of the morbidity related to flooding.

Disease	Month												Total
	Sep		Oct		Nov		Dec		Jan		Feb		
	No	%	No	%	No	%	No	%	No	%	No	%	
ADD	421	25.3	478	28.4	468	17.6	435	24.9	456	23.3	516	22.9	2774
ARI	841	50.4	823	49.0	1436	53.9	915	52.4	1231	62.8	1434	63.7	6680
malaria	20	1.2	30	1.8	7	0.3	51	2.9	32	1.6	19	0.8	159
Dengue	15	0.9	30	1.8	16	0.6	0	0.0	1	0.1	0	0.0	62
Skin diseases	137	8.2	164	9.8	281	10.6	122	7.0	84	4.3	94	4.2	882
Conjunctivitis	233	14.0	156	9.3	454	17.1	224	12.8	155	7.9	187	8.3	1409
Total	1667	100	1681	100	2662	100	1747	100	1959	100	2250	100	11966

Table 3: numbers and percentages of common infectious diseases related to flooding by month

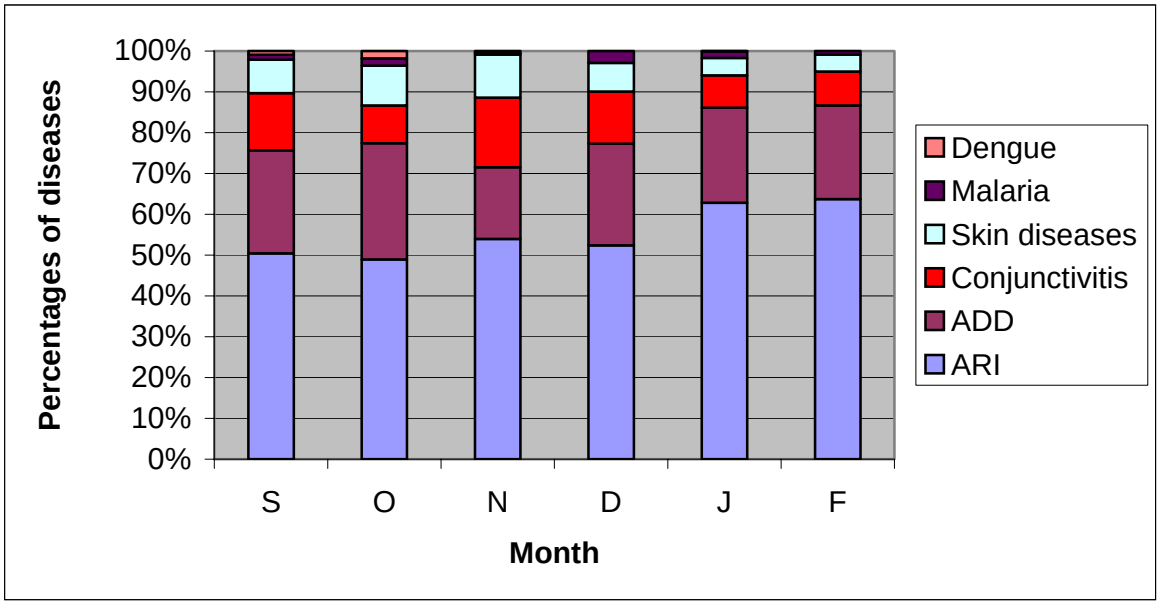

Figure 3: percentages of common infectious diseases related to flooding by month

4.2.3 Incidence of diarrhœal diseases

ADD	Age group												Sex		Total
	0-9		10-19		20-29		30-39		40-59		60+		Male		
Type of CHS	No	%	No	%	No	%	No	%	No	%	No	%	No	%	
Unaffected	146	64.9	25	11.1	7	3.1	15	6.7	16	7.1	16	7.1	118	52.4	225
Inundated	152	42.5	38	10.6	31	8.7	53	14.8	45	12.6	39	10.9	196	54.7	358
Damaged	450	42.6	323	30.6	52	4.9	90	8.5	92	8.7	50	4.7	601	56.9	1057
Not func-tioning	346	30.5	309	27.2	115	10.1	128	11.3	129	11.4	107	9.4	600	52.9	1134
Total	1094	39.4	695	25.1	205	7.4	286	10.3	282	10.2	212	7.6	1515	54.9	2774

Table 4: cases of acute diarrhœal diseases by age group, sex and CHS

Table 4 shows that the total number of cases of diarrhœal diseases in the damaged and non functioning CHS were much higher than those of the unaffected and inundated CHS. The table also shows that the age group from 0 to 9 years old suffered diarrhœa most and there is a tendency for the incidence to decrease rapidly in the next age groups. In addition, it appears that males experienced diarrhœal diseases than females. However, whether male children are more likely than female to be taken to consult health care providers is not known.

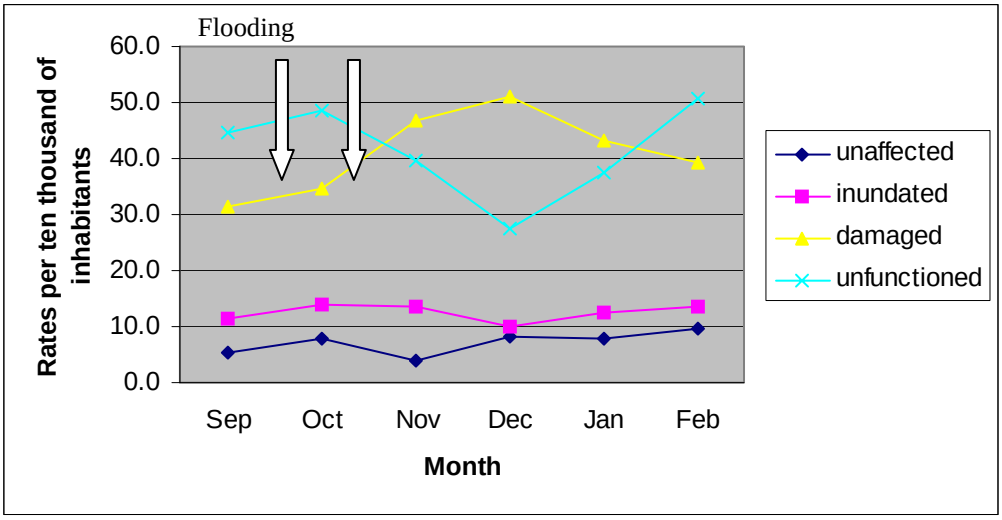

Figure 4: Incidence of ADD (per ten thousand inhabitants) by types of CHS and by month in CHS

Figure 4 indicates that communes with unaffected CHS (not inundated or damaged), the incidence of acute diarrhœal diseases remained at a stable level of during the period before and after flooding. However, those communes where the CHS was damaged show an increase in the incidence of diarrhœal diseases during and after flooding. For example, the incidence of acute diarrhœal diseases in CHS damaged was 31.5 per ten thousand of inhabitants in September, but up to 46.9 in November and up to 51.1 in January and it remained at a high level in February. However, the incidence of diarrhœal disease of the non functioning CHS decreased remarkably during and after flooding, when services could not be delivered, and then increased rapidly one month later, when full function was restored.

Figure 4 also indicates that communes whose CHS was damaged and destroyed had an incidence of diarrhœal diseases three or four times higher than those of communes with unaffected CHS in both the pre- and post- flood periods. This can be explained in two ways; firstly, communes with damaged CHS are more likely to have more general environmental degradation; and secondly, damaged CHS will not be able to provide effective health service to people. The combination of increased workload and degraded health facilities was a serious burden for the health staff.

4.2.4 Incidence of ARI

ARI	Age group												Sex		Total
	0-9		10-19		20-29		30-39		40-59		60+		Male		
Type of CHS	No	%	No	%	No	%	No	%	No	%	No	%	No	%	
Unaffected	426	42.0	126	12.4	78	7.7	107	10.5	110	10.8	168	16.6	607	59.8	1015
Inundated	739	55.6	153	11.5	60	4.5	141	10.6	120	9.0	117	8.8	707	53.2	1330
Damaged	804	34.0	401	17.0	179	7.6	266	11.2	301	12.7	414	17.5	1260	53.3	2365
Not functioning	541	27.5	490	24.9	228	11.6	262	13.3	230	11.7	219	11.1	1063	54.0	1970
Total	2510	37.6	1170	17.5	545	8.2	776	11.6	761	11.4	918	13.7	3637	54.4	6680

Table 5: case and percentage of malaria by age group, sex and CHS, 9/2003-2/2004.

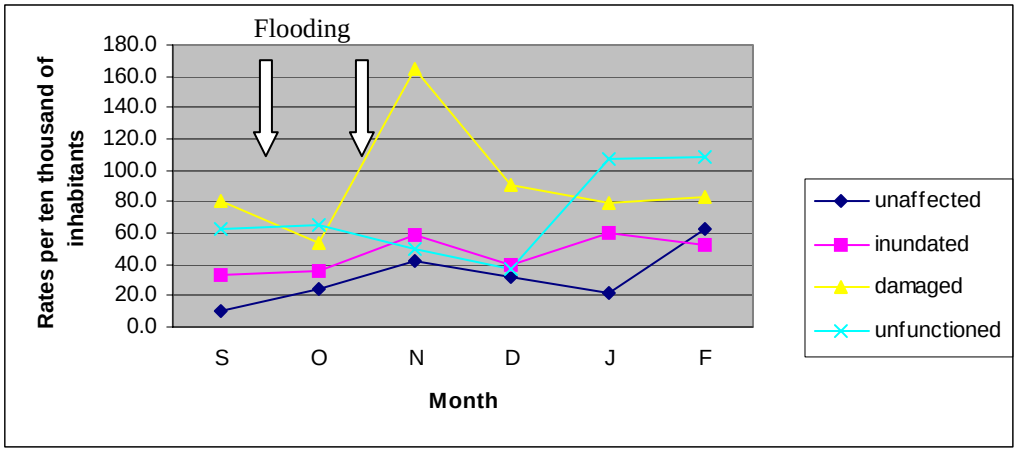

Figure 5: Incidence of ARI (per ten thousands of inhabitants) by types of CHS and by month.

Figure 5 shows the incidence of ARI of types of CHS by month from September 2003 to February 2004 correlated to the damage level of the CHS. The profile of ARI was similar in all the communes, in that the trend began lower in September and October 2003, increasing the peak in November (except for non functioning CHS because perhaps they did not provide full services during that period, where the number of ARI patients appeared to decrease as with the profile of diarrhœa cases) and then remained a higher level in the months after flooding. For example, in the case of damaged CHS, the incidence of ARI in September was 80. 4 per ten thousand of the inhabitants but increased to a peak of 164. 6 in November and the remained at about 79 in later months.

From figure 5 and table 5 it can be seen that the incidence of ARI in the communes with damaged CHS were higher than those with undamaged CHS and that males had ARI diseases than females. This profile is similar to that for diarrhœal diseases (see above).

4.2.5 Incidence of malaria

Malaria	Age group												Sex		Total
	0-9		10-19		20-29		30-39		40-59		60+		Male		
Type of CHS	No	%	No	%	No	%	No	%	No	%	No	%	No	%	
Unaffected	0	0	5	5	17	44.7	12	31.6	4	10.5	0	0.0	35	92.1	38
Inundated	0	0	3	3	3	12.5	8	33.3	9	37.5	1	4.2	20	83.3	24
Damaged	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Not functioning	13	10.2	34	34	34	26.8	38	29.9	7	5.5	1	0.8	91	71.7	127
Total	13	6.9	42	22.2	54	28.6	58	30.7	20	10.6	2	1.1	146	77.2	189

Table 6: case and percentage of malaria by age group, sex and CHS

Table 6 shows that males aged 20 to 39 suffered most from malaria, which may be explained by this group working outdoors to make repairs and rebuild after the flood. Inexplicably, no malaria cases were recorded in communes that had damaged CHS but the highest numbers of cases were found in communes where the CHS had stopped functioning.

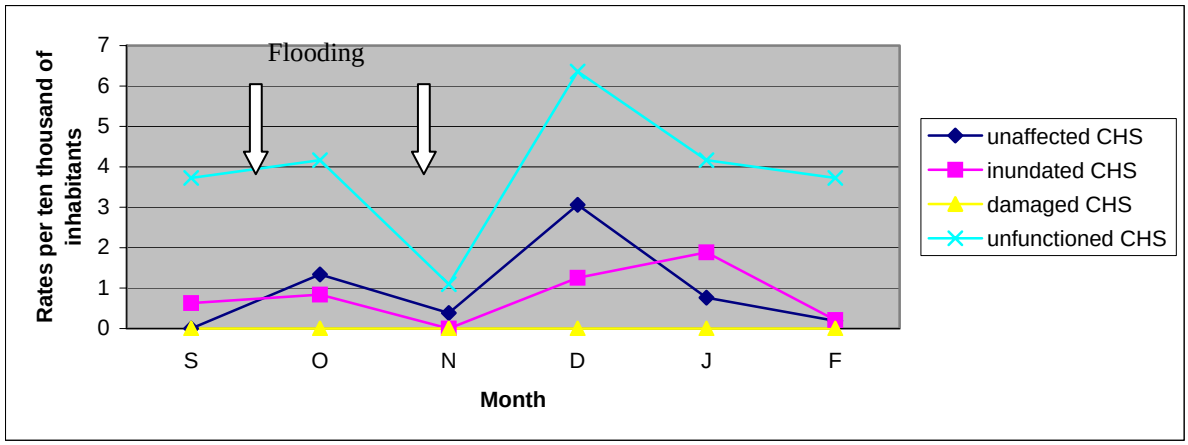

Figure 6: Incidence of malaria (per ten thousands of inhabitants) by types of CHS and by month

Figure 6 shows the incidence of malaria by month, the incidence declined in the time of flooding and then there was a marked increase in after flooding (December), which subsequently declined rapidly in January and February. However, an increase in malaria cases can be expected in the time of post-flooding in endemic areas. This figure is similar to the normal pattern for malaria at this time of year in these areas, due to migrant workers returning home for the Tet holidays**.**

4.2.6 Incidence of dengue fever

Dengue fever	Age group												Sex		Total
	0-9		10-19		20-29		30-39		40-59		60+		Male		
Type of CHS	No	%	No	%	No	%	No	%	No	%	No	%	No	%	
Unaffected	2	4.2	21	43.8	7	14.6	7	14.6	9	18.8	2	4.2	25	52.1	48
Inundated	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Damaged	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Not functioning	4	28.6	8	57.1	0	0.0	2	14.3	0	0.0	0	0.0	8	57.1	14
Total	6	9.7	29	46.8	7	11.3	9	14.5	9	14.5	2	3.2	33	53.2	62

Table 7: case and percentage of dengue fever by age group, sex and CHS

Table 7 shows the age group of from 10 to 19 had the highest dengue fever and the male were more affected than females. However, the number of dengue cases reported was small.

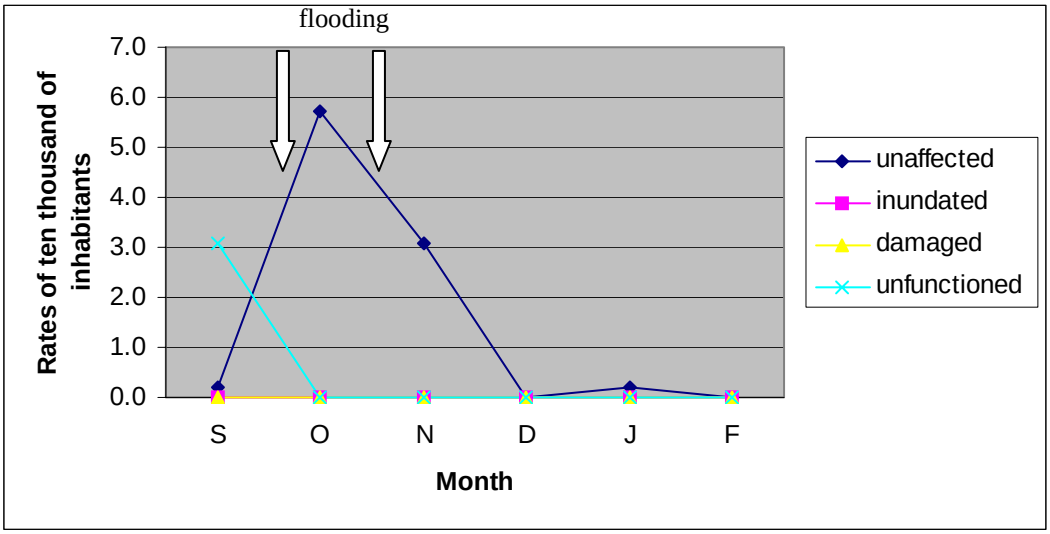

Figure 7: Incidence of dengue fever(per ten thousand of inhabitants) by types of CHS and by month

No cases of dengue fever were recorded in inundated, damaged and non-functioning CHS from October 2003 to Feb 2004. The incidence of dengue fever in the unaffected CHS was low by month. However, it has seen that the incidence increased in the beginning of flooding and reduced rapidly during the later months. This suggests that dengue fever might be alleviated by flooding due to disruption of the breeding cycle. Similarly, the yearly normal pattern for dengue is an increase in the months of September and November and then decrease rapidly in December.

4.2.7 Incidence of skin diseases

Skin diseases	Age group												Sex		Total
	0-9		10-19		20-29		30-39		40-59		60+		Male		
Type of CHS	No	%	No	%	No	%	No	%	No	%	No	%	No	%	
Unaffected	27	36	10	13.3	3	4	15	20	6	8	14	18.7	41	54.7	75
Inundated	54	29.5	48	26.2	12	6.6	25	13.7	26	14.2	18	9.8	100	54.6	183
Damaged	54	10.7	153	30.4	63	12.5	56	11.1	98	19.5	79	15.7	289	57.5	503
Not functioning	31	25.6	25	20.7	19	15.7	23	19.0	16	13.2	7	5.8	66	54.5	121
Total	166	18.8	236	26.8	97	11.0	119	13.5	146	16.6	118	13.4	496	56.2	882

Table 8: case and percentage of skin diseases by age group, sex and CHS

Skin diseases were more common in the group of 0 to 19 years old and males were more affected than females.

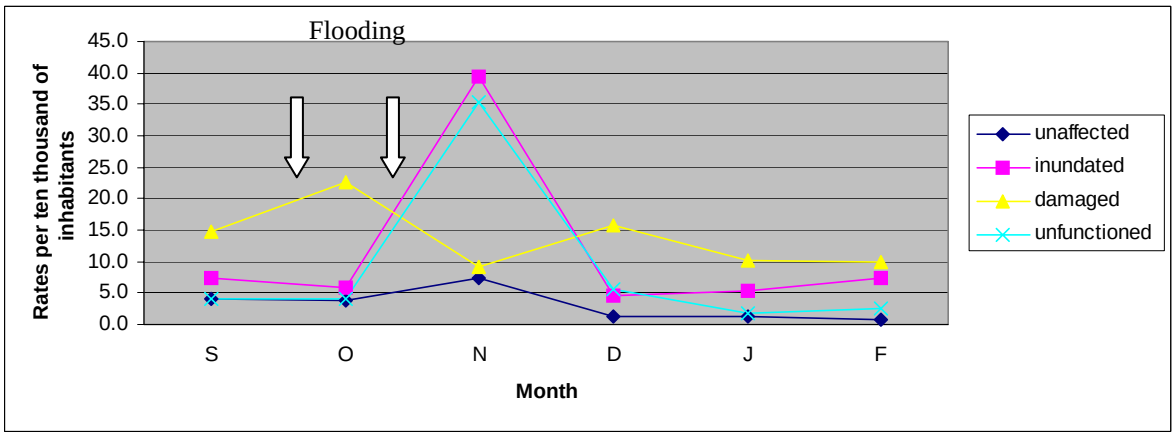

Figure 8: Incidence of skin diseases(per ten thousands of inhabitants) by types of CHS and by month

Skin diseases tended to increase during the immediate post flood period (figure 9) but returned a normal level soon after. This trend was more pronounced in inundated and non functioning CHS.

4.2.8 Incidence of conjunctivitis

Conjunctivitis	Age group												Sex		Total
	0-9		10-19		20-29		30-39		40-59		60+		Male		
Type of CHS	No	%	No	%	No	%	No	%	No	%	No	%	No	%	
Unaffected	1	5.6	1	5.6	2	11.1	4	22.2	2	11.1	8	44.4	8	44.4	18
Inundated	20	19.0	15	14.3	10	9.5	20	19.0	23	21.9	17	16.2	31	29.5	105
Damaged	39	7.5	98	18.9	58	11.2	70	13.5	112	21.6	141	27.2	213	41.1	518
Not functioning	133	17.3	168	21.9	70	9.1	94	12.2	137	17.8	166	21.6	415	54.0	768
Total	193	13.7	282	20.0	140	9.9	188	13.3	274	19.4	332	23.6	667	47.3	1409

Table 9: case and percentage of skin diseases by age group, sex and CHS

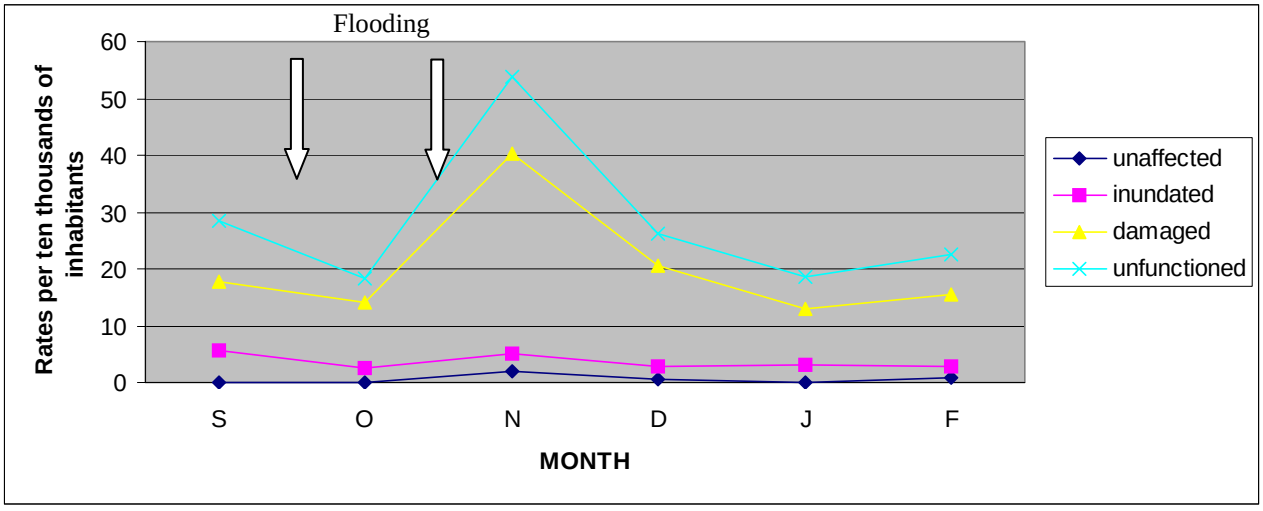

Figure 9: Incidence of conjunctivitis(per ten thousands of inhabitants) by types of CHS and by month

Figure 9 shows that the incidence of conjunctivitis increased during the post-flood period. The highest rates were found in damaged and non functioning CHS, where the incidence peaked at the end of November and reduced quickly in December.

4.3 Obstetric cases

4.3.1 Birth rates by month

Type of CHS	Sep		Oct		Nov		Dec		Jan		Feb		Total
	No	%	No	%	No	%	No	%	No	%	No	%	
Unaffected	53	10.1	36	6.9	56	10.7	28	5.4	43	8.2	41	7.8	257
Inundated	42	8.8	55	11.5	51	10.7	44	9.2	37	7.7	27	5.7	256
Damaged	41	9.6	42	9.8	46	10.7	43	10.0	29	6.8	25	5.8	226
Not functioning	19	4.2	29	6.4	24	5.3	24	5.3	18	3.9	33	7.2	147
Total	155	17.5	162	18.3	177	20.0	139	15.7	127	14.3	126	14.2	886

Table 10: case and percentage of birth by month in CHS

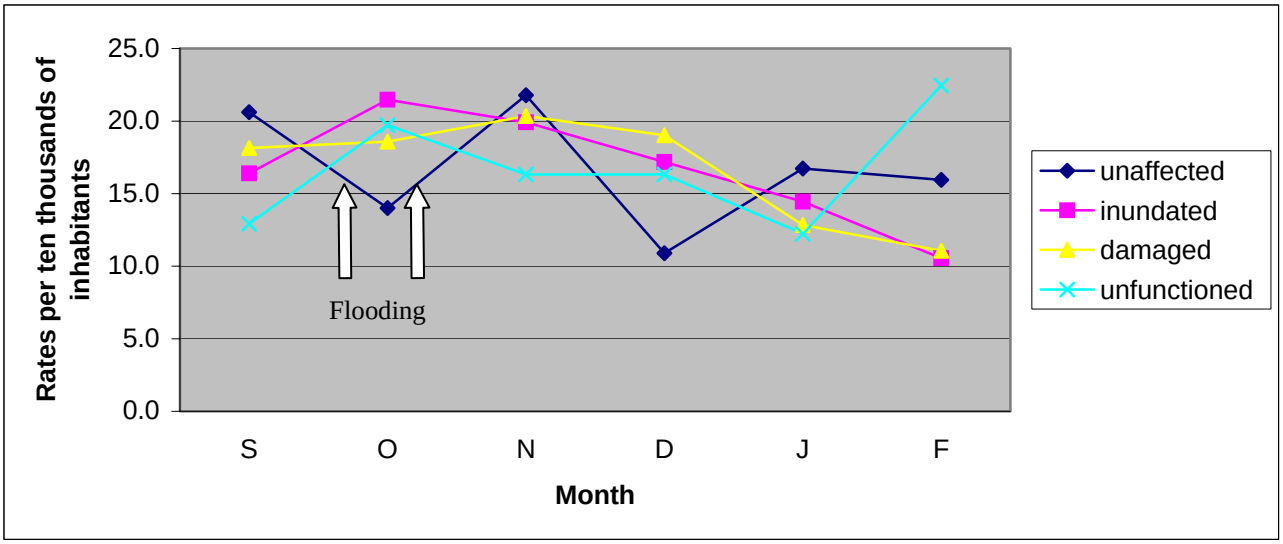

Figure 10: Incidence of new born baby (per ten thousands of inhabitants) by CHS and by month

The flooding had no observable affect on numbers of births (figure 9). Except for unaffected CHS, the incidence of newborn baby went down after the floods, but it is not known if this was due to lack of access to services or a natural tendency. At one DHC, a case of complicated delivery in a commune was referred late at night due to swift water and bad weather; as a result the baby died. Flood presents a high risk for those with a complicated pregnancy since need for referral is often determined late and transportation is limited.

4.4 Overview of mortality

4.4.1 Drowning

Drowning	Sep	Oct	Nov	Dec	Jan	Feb	Total
Unaffected	0	0	0	1	2	0	3
Inundated	0	0	3	0	0	0	3
Damaged	0	0	4	0	0	0	4
Not functioning	3	0	0	0	0	0	3
Total	3	0	7	1	2	0	13

Table 11: number of drowning cases by month in CHS, 9/2003-2/2004

Few cases of drowning were reported in CHS and no significant differences of drowning were found among the unaffected and affected CHS. However, data suggested that the peak of drowning was in November and the age group from 10 to 19 years old drown was affected most. This is quite different from that of the Mekong Delta areas in terms of numbers of drowning deaths and the age groups affected. The reasons for drowning may be to flash floods and mainly related to way they deal with flooding water**.**

4.4.2 Cases of snakebite

Snakebite	Sep	Oct	Nov	Dec	Jan	Feb	Total
Unaffected	0	0	0	0	0	0	0
Inundated	0	0	0	0	0	0	0
Damaged	0	0	0	0	0	0	0
Not functioning	0	0	0	0	0	0	0
total	5	2	4	4	3	4	22

Table 12: number of cases of snakebite of CHS and DHC by month.

No case of snakebite was reported in the CHS but a small number of cases of snakebite were reported in DHC. This situation was not influenced by the floods. All the cases reported here were confirmed snakebites and antivenin was administered. However, information on the expected number of snake bites for these communes at this time for year was not collected. It would seem that snakebite was not a major problem in these floods in Central Viet Nam, despite anecdotal evidence that snake bite is very common during flooding in Viet Nam.

4.4.3 Mortality data

Death	Sep	Oct	Nov	Dec	Jan	Feb	Total
Unaffected	2	2	4	4	0	2	14
Inundated	0	0	2	0	0	3	5
Damaged	4	2	3	1	2	2	14
Not functioning	0	3	3	0	0	1	7
Total	6	7	12	5	2	8	40

Table 13: number of deaths by month in CHS

Table 13 shows that a small number of deaths were recorded in communes before and after flooding. Mortality data collected from DHC is unreliable as a measure of true mortality due to reporting bias. Dying patients are sent home or referred to higher level hospitals and therefore most deaths do not appear in DHC records. However, mortality data reported by communes is more reliable, especially during flooding, since the commune local government pays compensation to flood victims and all deaths are recorded for that purpose.

5 Findings

The two episodes of flash flooding and river flooding which affected five provinces in central Vietnam in mid October and mid November 2003 had significant health consequences for people living in these areas.

The study shows that floods produce significant alterations in morbidity profiles. The disease burden experienced in communes where the CHS is damaged or non-functioning is much greater than those where the CHS is still able to function. However, comparison with data for the same period in previous years was not done, so conclusions about the general applicability of this finding cannot be made.

This report can make the following findings:

- The incidence of acute diarrhœal diseases and acute respiratory infections in the study area was significantly affected by the floods, affecting mainly children under ten years of age. The incidence of disease correlated well with the severity of damage to the CHS but not with the severity of damage of the DHC.
- The incidence of malaria, skin diseases and conjunctivitis was also increased by flooding.
- There was not a significant number of snake bites during the flood period;
- The numbers of deaths from drowning was low and the age of the victims much different from that seen in other areas of Viet Nam.
- In general, males were more affected by infectious diseases than females, except for conjunctivitis.
- Those communes were the CHS was damaged had a higher incidence of ADD and ARI than communes with undamaged CHS.
- There was a decrease in the number of cases of dengue fever after flooding, suggesting the rapid onset flooding affected the breeding and development of the *Aedes* mosquito.
- There was no significant influence on total birth rates by flooding in the study area.

- Despite the floods, some level of primary health care services continued to be delivered, as seen by the number of cases of acute diarrhœal diseases and ARI reported by the CHS during the actual flood period.
- During the floods, more people attended the CHS in affected areas than in unaffected areas. An increased number of consultations combined with of damage to CHS facilities indicated that the workloads of commune health staff were increased to meet the needs of people. However, the needs were sometimes not met, which is reflected by a false decrease in case numbers at the height of the flooding.
- In damaged CHS, higher workloads were generated by additional emergency activities such as epidemic surveillance, environmental sanitation and sterilising water wells as well as an increased number of patients. This high workload period lasted for up to two months after flooding. In addition, resources such as funds and health staff were constrained because, despite being in flood prone areas, CHS are not required make contingency plans for dealing with floods and the post flood period.

6 Recommendations

In response to the findings, the authors can make the following recommendations:

1. All CHS in flood prone communes should be relocated to safe areas or protected from the effects of floods and from loss of access to the population during floods. This will significantly reduce morbidity in the post flood period.
2. Primary health care infrastructure, resources and services need to be reinforced in communes known to be at risk from flood and measures must be taken to enhance their protection during the flood season. This includes making locally specific contingency plans to protect the CHS and to continue to deliver services under flood conditions. The MOH should issue instructions on this matter, including issuing guidelines for CHS on how to make plans and developing the relevant training packages and courses to facilitate the planning process.
3. Communes at risk of flooding need to be identified and mapped for baseline data such as population, prevailing diseases, basic sanitation and health sector resources. This information should be used to prepare local plans for responding to flood emergencies. The distribution of emergency resources should be based on at the level of severity and on morbidity patterns caused by floods so that all activities, available resources, and aid supplies may be used with the best.
4. CHS that have damaged or destroyed by flood should be replaced with temporary services and then repaired and restored to function as soon as possible. This will have a significant effect in reducing post flood morbidity. The MOH needs to make this a policy issue and to develop guidelines for organising, equipping and deploying temporary services to flood affected areas.
5. It is important that health information systems include mortality data, such as through a death registration system. This should be established from commune to district level. Such a system will allow all causes of mortality, including from flood, to be analysed and addressed.
6. Issues related to morbidity, mortality and nutritional status of children during and after floods need further research. Current health education and public safety messages regarding flood may not be addressing the actual needs.
7. The contribution made by the private sector in providing care during emergencies such as floods needs further study.

7 Annex

7.1 List of communes, districts and populations under study

No	Province	District	Commune	Population
1	Quang Nam	Duy Xuyen		127,836
			1.Tam Hoa	8,677
			2. Tam Xuan 1	12,169
			3. Duy Trinh	7,745
			4. Duy Vinh	9,838
2.	Quang Ngai	Tu Nghia		178,599
			1. Nghia An	16,474
			2. Nghia Thuan	6,665
			3.Nghia Phuong	8,933
			4. Nghia My	6,331
3	Binh Dinh	Phu Cat		187,080
			1. Ngo May	10,731
			2. Cat Nhon	10,528
			3. Cat Thang	8,760
			4. Cat Chanh	6,808
4	Phu yen	Phu Hoa		101,061
			1.Hoa Dinh Dong	13,147
			2. Son Giang	4,016
			3. Binh Ngoc	5,118
			4. Hoa Quang	10,750
5	Ninh Thuan	Ninh Phuoc		170,384
			1. Nhi Hoa	3,250
			2. Phuoc Nam	14,369
			3. An Hai	12,337
			4. Phuoc Hai	1,188

7.2 Population of the study area

	Total population by type of communes
1: CHS unaffected	52,279
2: CHS inundated	47,747
3. CHS damaged	42,893
4. CHS destroyed or not functioning	45,613