Status of Human Health

at

The Eloor Industrial Belt, Kerala, India:

A Cross-sectional Epidemiological Study

Supported by Occupational Health and Safety Centre- Mumbai

GREENPEACE

September, 2003

Status of Human Health

at the

Eloor Industrial Belt, Kerala- India [1]

Greenpeace India

Assisted by the Occupational Health and Safety Centre-Mumbai.

September. 2003

First Level Report

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[1] This report may be found on the web site of Greenpeace India: http://www.greenpeaceindia.org/

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I. MAIN RESEARCH FINDINGS:

Contrary to the expectations based on the initial literature survey about possible increases in particular types of diseases due to air and water pollution; this health assessment has discovered that there is an overwhelming increase in most types of systemic diseases across Eloor (target village) when compared to Pindimana (reference village). Broadly one can say that the cocktail of poisons in the air and water of Eloor affects all body-systems adversely. Potentially the immune system seems to be affected too.[2] Increased prevalence and incidence of diseases and symptoms at Eloor have been observed from the database of health information of the community and workers at Eloor and Pindimana generated by the Field Investigation based on an exploratory format questionnaire.[3]

A Stratified Random Sample of the Eloor[4] (target) population when compared with those at Pindimana[5] (reference) shows a significant increased disease incidence in many body systems. The key systems that are affected are the Neoplasm[6] (2.5 times odds[7]), Blood & blood forming organs[8] (2.1 times odds), Endocrine, nutritional and metabolic system[9] (1.17 times relative risk), Mental and behavioural[10] (3.03 times odds), The Nervous system[11] (1.59 times odds), The eye & adnexa[12] (1.21 times odds), The Ear & mastoid process[13] (1.49 times odds), The Circulatory system[14] (1.59 times odds), The Respiratory system[15] (1.29 times odds), The Digestive system[16] (1.69 times odds), Skin & subcutaneous tissue[17] (1.69 times odds), the Musculo-skeletal system & connective tissue[18](1.17 times odds), the Genitourinary system[19] 1.09 times odds), Congenital malformations, deformations & chromosomal[20] (2.63 times odds), Injury, poisoning & certain other consequences of external causes[21] (2.65 times odds), External causes of morbidity & mortality[22] (1.36 times odds). All systemic classification was based on the International Classification of Diseases-10 (ICD-10).[23]

Clinically confirmed[24] Cancer Incidence is greater in Eloor at a statistically significant rate. When 13 cases of incidence were reported in the Eloor set, only one was reported in the sampling set at Pindimana. The combined odds ratio across Eloor and Pindimana is (2.85:1). This is alarming to say the least. One of the body systems worst hit seemed to be the nervous system when combined with the mental and behavioral effects (odds- 1.59:1 & 3.03:1). Congenital malformations, deformations and chromosomal aberrations follow (odds- 2.63:1). Accidental injury and poisonings are leading

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[2] Despite the fact that Pindimana, the reference village, was going through an epidemic of Leptospirosis and Dengue Fever, the rate of occurrence of infectious diseases under Category-1 of the ICD(International Classification of Diseases) in Eloor Section A and Eloor Section B, two target areas within Eloor(which was not facing an epidemic) was slightly more than the rate at the reference! This clearly shows that there is an ongoing live epidemic in Eloor which is not being perceived as one that requires attention as it is on all the time.

[3] Please see Appendix 1 for details.

[4] Sampling Ratio was 1:4

[5] Sampling Ratio was 1:7

[6] Chapter-2 of the International Classification of Diseases, the ICD, Version-10, http://www.wellcool.demon.co.uk/ltmhi/PBarkerICD10.htm

[7] *Odds and risk:* The ''odds'' or ''risk'' of an event is the ratio of the probability that the event occurs to the probability that the event does not occur. In other words, the odds of an event that has a probability *p* of occurring is given by *p*/(1 2 *p*), and ranges from zero to infinity. For example, an event with probability of 0.8 of occurring has an odds of 0.8/(1 2 0.8) 5 4 (or 4 to 1 ''on/for'' in bookmaker's jargon). Odds and probability/chance differ because of the denominator, which becomes important for more frequent events. An interesting property of odds is that the odds for the complement of an event (i.e., not the event) is the reciprocal of the odds for the event. For example, an event with probability of 0.2 5 1 2 0.8 of occurring has an odds of 0.2/(1 2 0.2) 5 ¼ (or 4 to 1 ''against'' in bookmaker's jargon). From the paper: "Use Of The ''Odds Ratio'' For Diagnosing Forecast Skill" David B. Stephenson, Laboratoire De Statistiques Et Probabilite´S, Universite´ Paul Sabatier, Toulouse, France: http://www.met.rdg.ac.uk/cag/publications/wf2000.pdf

[8] *ibid* Chapter-3

[9] *ibid* Chapter-4

[10] *ibid* Chapter-5

[11] *ibid* Chapter-6

[12] *ibid* Chapter-7

[13] *ibid* Chapter-8

[14] *ibid* Chapter-9

[15] *ibid* Chapter-10

[16] *ibid* Chapter-11

[17] *ibid* Chapter-12

[18] *ibid* Chapter-13

[19] *ibid* Chapter-14

[20] *ibid* Chapter-17

[21] *ibid* Chapter-19

[22] *ibid* Chapter-20

[23] All confidence intervals for relative risk/odds calculations would be elaborated in the second level report.

[24] Clinical Confirmations were obtained by follow-up house visits with a team of doctors from the Occupational Health and Safety Centre-Mumbai using Spirometry for Respiratory Illness (Chapter-10, ICD-10) and examinations of medical records (Chapter-10, ICD-10) for ascertaining Cancer Incidence.

causes of mortality (Odds- 2.65:1). Diseases affecting the Neoplasms (2.5:1) and Blood and blood forming organs (2.1:1) are significantly great Eloor.

Medical Verifications were performed using the lung function tests (Spirometry) on a random sample of the reference and target populations. These confirmed high rates of actual incidence.[25] The increases Lung-function of people at Eloor when compared to Pindimana revealed statistically significant

DISEASE CONDITION	RELATIVE RATE OF OCCURANCE	RESULT
THYROID	215.36%	
DEPRESSION	***484.01%***	***DEATH***
Mental Disease	67.07%	
MEMORY LOSS	113.39%	
EPILEPSY	151.31%	
MIGRAINE	***233.44%***	***DEATH***
Paralysis and Paralytic Stroke	105.58%	
Vision Loss	142.43%	
Hearing Loss	90.49%	
Heart Disease	171.37%	DEATH
BRONCHITIS	***335.51%***	***DEATH***
ASTHMA	***223.18%***	***DEATH***
STOMACH ULCERS	***2553.72%***	
ALLERGIC DERMATITIS	***202.46%***	
Lumps on Body and Skin Disease	202.46%	DEATH
ARTHRITIS	***473.81%***	
RHEUMATISM	***428.95%***	
FIBROID	***260.84%***	***DEATH***
Hysterectomy	51.85%	
Infertility	211.59%	
BIRTH DEFECTS	***379.40%***	***DEATH***
CANCER	***285.00%***	

Figure 1: Table showing DEATH and DISEASE potentially due to pollution. The Relative Occurance of 215.36% for Thyroid diseases means that Thyroid diseases are found at an increased rate of 2.15 times in Eloor when compared to the reference village.

In the above analysis notice the high rates of death at Eloor due to Cancer, Birth Defects, Bronchitis, Asthma and Depression. Notice the high prevalence of Allergic Dermatitis, Arthritis, Rheumatism, Infertility, Migraine, Epilepsy, Thyroid, Fibroids and Lumps on the body.

[25] For Eloor the figure was 10- severely affected under FEV1 or FVC or both below 60% of the predicted values, the expected values in healthy persons. 7 are moderately affected and 9 showed that their values for lung function are just below the 80% of predicted values. Totally 26 out of 45 tested for lung function are affected *ie* 57.8% confirmed respiratory illness rates. Lung function test could be administered to 43 persons. Three persons were obviously affected and could not perform the test. Eight had reported respiratory problems but did not want to go through the lung function test. Four persons were in good health with no problems so tests were not administered. Totally 28 persons interviewed (and tested or only checked) have respiratory system affected.

II. EXECUTIVE SUMMARY

An Introduction to Eloor:

Eloor is a river island on the river Periyar around 17 kms from its mouth at the Arabian Sea near the city of Cochin, the commercial capital of Kerala. It occupies an area of 11.21 square kilometres. Eloor supports the largest industrial belt in Kerala with over 247 chemical industries. The industries make a range of chemicals- petrochemical products, pesticides, rare-earth elements, rubber processing chemicals, fertilizers, zinc/chrome products and leather products. Most of these industries are over 50 years old and employ the most polluting of technologies. The industries take in large amounts of fresh-water from the River Periyar and in-turn discharge concentrated effluent with nominal treatment. This leads to the large-scale devastation of aquatic life in the river and the farmlands in the region. There are more than 30 effluent pipes spewing toxins into the river directly from the industry.[26] Air emissions range from acid mist to sulphur dioxide, Hydrogen Sulphide, Ammonia and Chlorine gas.[27] Air pollution within industrial environment was noted. We do not have specific data but workers do complain about the foul atmosphere.[28]

There are close to 40,000 people living and working on the island, 29,064 of whom are part of the village community not employed by the industries. The rest are employees and stay in the company quarters. The Woman to Man ratio is 1000:1054.[29] Some of the residents work for industries in Eloor and do not stay in quarters; some are working in industries outside Eloor. What we need to note is the direct and indirect dependence on industries of a lot of people in Eloor.

Blatant Violations of existing norms prevalent in Eloor:

Information regarding pollutants, chronic and acute effects of pollutants is not given to local the residents, the local authority-the village Panchayat, workers and the doctors in Eloor as envisaged by the Factories Act and the rules under the EP Act.

The plan for 'Disaster Control' inclusive of information on products, storage of hazardous substances, effects and antidotes and proper health services is not made public, as it should be. The health services available to the people seemed inadequate. The medical fraternity of the ESI hospital, of the local area is not oriented for diagnosing and treating health problems due to environmental pollution.[30]

The Final Research Question: "*"What are the Health Problems faced by the resident community of Eloor Industrial Estate, due to increased pollution of the air and water by chemical industries?"*

The Background to the Community Health Assessment:

Despite the fact that the pollution of the River Periyar and the land has been established in sampling missions by the Kerala State Pollution Control Board, research Universities and Greenpeace, there has been little action by regulatory authorities.[31] It seemed to us at the beginning of the research like there needs to be stronger arguments and actions from the community that backs up the new research. We decided to back our existing research on contamination due to the local pesticide industry, Hindustan Insecticides Ltd and Merchem Ltd[32] with further studies focussing on the River Periyar the

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[26] From a joint assessment done by the Periyar Malineekarana Virudha Samithi, KSSP and the Kerala State Pollution Control Board. The pollution control board is still defaulting on a white paper it was to prepare to stop these pipes.

[27] There are many unidentified chemicals that are in the plumes of the industries of the area. The Pollution Control Board has not comprehensively monitored these.

[28] Interview of workers by Vijay Kanhere- OHSC Mumbai.

[29] 14,144 women and 14,920 men. Most people are employed in the services industry--serving the government or private industry. Many run local businesses. Traditional occupations including fishing and farming have been entirely wiped out by polluting industry. There is a section of people that are migrant and are involved in illegal sand-mining from the bed of the river. A small population on the island is unemployed..

[30] Observations made by the team of legal and medical professionals from OHSC-Mumbai in June,2003.

[31] The local pollution control board has been entirely ineffective in 'controlling pollution' if not preventing it. Therefore the local community agitations have more often focused on the pollution control board to initiate immediate action against polluting bodies Refer the Kerala Pollution Control Board Website for developments: http://www.kspcb.nic.in

[32] After the Greenpeace Sampling mission of 1999 when it was established that a large amount of polluting chemicals have been released by certain specific industries (Hindustan Insecticides ltd, Merchem Ltd), the local community took direct action against the polluting agencies by damming the polluting stream-Kuzhikkandam Thodu. The companies have ever since been forced to

final sink of all the run-off from the factories. A resident of Eloor was appointed by Greenpeace as the Riverkeeper for the Periyar to monitor water quality of the river on a weekly basis and alert local government, regulatory authorities and the pollution control boards of the need to take immediate action to stop pollution.[33]

Over the last two years the communities affected by toxics and radiation pollution, the organisations that support them and the academic/activist health fraternity convened in two meetings which discussed the need for performing common-sense health surveys in toxics/radiation hotspots across the country. These original vision for these studies was that they would create a prima facea link between pollution and health problems and take the struggle of communities ahead to the remediation and compensation plank. These meetings were cordial and strategic at the same time and were dubbed CHESS-1 and CHESS-2.[34] The collective energy drawn from both meetings gave rise to new alliances like CAPE,[35] and fuelled new health investigations like the one you are reading right now. Greenpeace is performing another six health studies elsewhere in the country, which seeks to strengthen the objectives of CAPE. Lay Epidemiology is the scientific arena, which all these studies seek to create and address.[36]

The fact that the Community Health Problems of Eloor were quite apparent and that a similar reality was observed across the country along the 24 hotspots identified by Greenpeace India[37] prompted us to go for a health assessment that shall establish *prima facea* the problem.[38] Greenpeace initiated an alliance with Occupational Health and Safety Cell- Mumbai, which has prior experience in the matter of Epidemiological Research. The broad framework was of OHSC taking the lead with Medical Verifications of the primary data collected using a questionnaire research was arrived at jointly, with Greenpeace taking the primary role in the field based research and the survey. The Ethical Guidelines developed by the National Committee for Ethics in Social Science Research in Health (NCESSRH)[39] were strictly adhered to throughout the study.

The Health Assessment Method:

The Greenpeace team stared active field based work in on the health assessment in April, 2003 and continued the field investigations till JULY 2003. The OHSC team joined the field-study in two phases for Medical Verifications of Respiratory Illness in Eloor and Pindimana respectively.

The first step was to obtain Community Consent to do the assessment and ensure participation and cooperation from the local *Panchayat* and local community leaders.[40] Next came a comprehensive literature survey of all available material on health status of the community.[41] All available maps

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enter into a dialogue with the panchayat and local people to come up with a plan to clean up the mess along the stream. They have failed to come up with a safe protocol for doing so. Their current plan involves dredging the sludge and dumping it in a nearby wetland permanently destroying the water table. There is currently a court injunction on any such action.

[33] He has also addressed the people of Cochin city with the dangers of using the polluted river water for drinking purposes.

[34] CHESS stands for Community Health Environmental Survey Skillshare. It is an open collective of organisations and individuals together building a health platform to fight Toxics and Radiation pollution in the country.

[35] CAPE stands for Community Action for Pesticide Elimination. The Secretariat of CAPE is at Thanal Conservation and Action Network (http://www.thanal.org/). The Coordinator is Kavitha Kuruganti (kkurugan@dialb.greenpeace.org)

[36] Refer the "Manual of Lay Epidemiology" produced by The Community Health Cell at Bangalore(http://www.sochara.org/) Details in Appendix- 7.

[37] On the "1000 Bhopals Jatha" which was a bus-tour across these hotspots listening to distressing stories of people caught between the wheels of company fortune and taking direct action against criminal companies.

[38] The local people have been complaining of large-scale health problems on the island. These include respiratory disorders, cancers, congenital problems like mentally/ physically challenged children, chronic depression and reproductive problems.

[39] Ethical Guidelines for Social Science Research in Health: By National Committee for Ethics in Social Science Research in Health (NCESSRH).

www.cehat.org/publications/ethical1.html

Also see , Notes on Qualitative Research and Ethics of Research On Disaster and Complex Political Emergencies by Fatima Alvarez-Castillo, Professor,University of the Philippines Manila, Email: fatima.castillo@up.edu.ph

[40] Several one-to-one meetings with the local panchayat (its president and secretary) and local community leaders (Purushan Eloor of PMVS and Prasad/ Adv.Rajesh of JAV) ensured that the objectives were met.

[41] The following were the sources for the secondary literature survey-

1) The Integrated Child Development Programme- A Compilation of the whereabouts of people with disease in the village.
2) The Eloor Village Panchayat- The Death Register
3) The Regional Cancer Detection Centre- The statistical averages of incidence of cancer in patients that approach the center.
4) The Union Christian College, Aluva—An Environmental Impact Assessment of the Alwaye Industrial Belt, dept of Economics, August 1993.

were digitised to produce one comprehensive map that would capture all the data from secondary sources on it. (See the Map in Appendix-5)

After plotting of people with ill health and cases of death (morbidity and mortality) due to diseases with environmental factors on this detailed map, we made the decisions on identification of the Target and Reference Groups. We also looked at the available state averages could have been used to supplement the data from the reference group. A shortlist of five reference villages were examined Maaradi, Aavoli, Puthenvelikkara, Koovappady and Pindimana of which the last one was chosen for reasons of similarity in "Determinants" and "Processes" of the "Indicators that Count" framework.[42] Pindimana is roughly 40 kms distant from Eloor as the crow flies and is upstream of the same River Periyar in the part least populated by Industries. The only exposure people have to chemicals there is pesticide drift. Therefore we designated it as a reference and not a control. We arranged for a visit of the partners in research, the OHSC-Mumbai to Eloor and Pindimana to observe the reality of the island and its reference and help us with developing the medical aspects of the study.

In setting the criteria to develop the study questionnaire, we concluded that it is in the best interest of the study to increase the study power to assess the maximum possible number of people by eliminating as many questions as possible from the study questionnaire. We assume that the studies that would be done in follow-up possibly by the institutions of the Govt of India and the WHO would ensure a comprehensive, cause-effect look at all the health problems.

The Proposed Research Question in the first round of discussions was: "What is the prevalence of Chronic Respiratory Illness and Cancer in the affected community around Eloor Industrial Estate?" This evolved into the more broad and exploratory research question later as we interacted with the advisory board: *"What are the Health Problems faced by the resident community of Eloor Industrial Estate, due to increased pollution of the air and water by chemical industries?"* The meetings with the advisory board also discussed and thrashed out issues like scientific biases, sampling sizes/ratios, training module for interviewers, ethics and statistical analysis.

The Training of the interviewers[43], a community sampling exercise[44] and Pilot Surveys[45] to identify practical difficulties in the working of the Field Investigation were performed. This effectively launched the team of 10 interviewers for 45 days of data collection at the end of which we have information about 9122 individuals across Eloor and Pindimana.

Throughout the investigation involving respondents all basic ethical norms were strictly followed. Voluntary Prior Informed Written Consent was obtained from each participant after giving a brief introduction to the study and organisational nature of Greenpeace.

The Analysis: We restricted our analysis to simple percentage analysis and lead it to the calculation of Odds-Ratios under the International Classification of Diseases (ICD-10).(Refer Appendix 6 for detailed graphs which shows prevalence of the diseases and disease-sets) Simple Office software was coupled with Manual Computation techniques to reach the figures on prevalence percentages, incidence, statistical significance and overall patterns. Most of these were projected into graphs for easy reading

The Findings: The one basic finding is that we observed without exception, all body systems are adversely affected in Eloor as opposed to Pindimana. This shows that the cocktail of poisons in the air and water of Eloor as opposed to Pindimana is exerting synergistic effects on the health and well-being of the local population and these effects seem to be unpredictable especially across particular age groups.

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5) The Village& the Taluk Office: Census Data and Demographic information.

[42] Refer Table 2 of this report which lists in detail the "Indicators that Count" framework of developed by Hancock et al. (1998 and 1999)

[43] Inhouse, for 3 days with the help of local doctors and the Community Health Cell in remote contact.

[44] With all the important people in the local community, the Panchayat Officials, the Community Leaders and youth.

[45] One day events that ended in another day of one-to-one review and amendments in the questions.

The mortality due to Pollution-related illnesses like Cancer, Birth Defects, Asthma and Bronchitis is very high. There is a statistically significant increase in confirmed cases of Respiratory Illness[46].

Discussion:

The fact that there an unpredictable and stressful overload of diseases on the population of Eloor, potentially due to exposure to the cocktail of chemicals released by the industries, goes a long way to prove that Industrial Belts like the one in Eloor must be phased out and no new Industrial Belt of this nature must be planned. Industries must follow all ecological an ethical norms and implement clean production and closed-loop systems in their production cycle.

Remedial ACTION:

Remedial action must include all possible efforts to block the toxicity exposure routes of the local population:

1. Zero discharge on the river periyar! We cannot tolerate any more dumping of effluents into the periyar, the lifeline of the whole of cochin.

2. Implement immediate and concrete steps towards clean production at eloor now.

3. Compensate and medically rehabilitate all people affected by the criminal levels of pollution.

4. Clean-up all contaminated sites immediately

5. Absolute and complete enforcement of the environmental norms and laws must happen.

6. The companies and the government must make public all information regarding pollution, health risks, emergency preparedness and related dangers to local communities. Companies must ensure that all workers have access to their medical records.

7. Immediate punitive action need to be initiated by the government on the companies that are poisoning the communities and workers in the industrial estate and around.

8. The companies must apologise to the affected people of eloor and cochin and accept complete responsibility and liability for their past actions.

These events must be taken up by the polluting companies and the Government.

IV ACKNOWLEDGEMENTS

The authors wish to acknowledge the support of the Community Health Cell, Bangalore for all the research support and advise. More specifically, we want to thank Dr. Thelma Narayan, Dr. Rajan Patil for their guidance and help. We also want to recognize the valuable assistance of our Project Advisory Committee in forming the study design and reviewing its progress. Finally, we want to thank the representatives of all of the universities and organizations who contributed study material and information to this project.

[46] According to the Lung-Function Analysis performed by Vijay Kanhere of the OHSC-Mumbai across Eloor and Pindimana.

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1. RESEARCH PROBLEM/CONTEXT

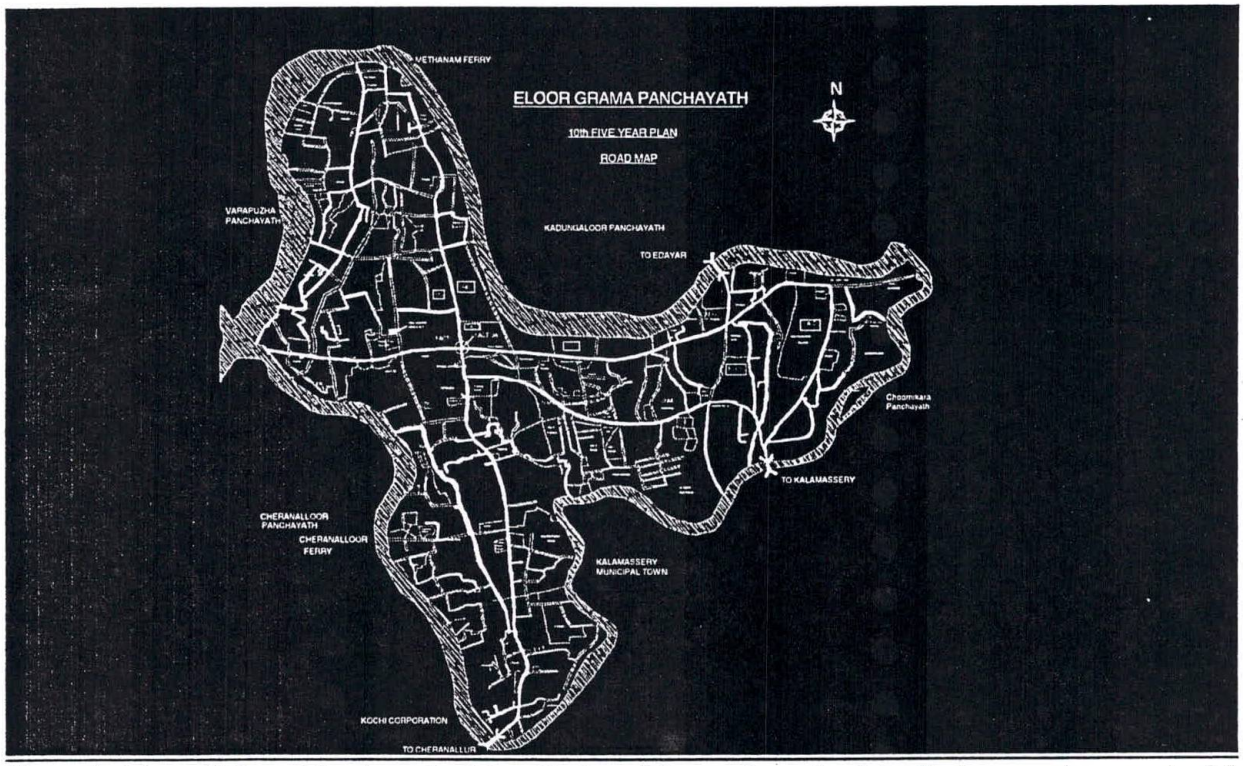

Figure.2: Map of Eloor Island on the River Periyar. The top branch of the Periyar receives most of the dumped effluent from Industry.

1.1 Eloor: A Brief Description-

1.1.1 Geography:

Eloor is a river island on the river Periyar around 17 kms from its mouth at the Arabian Sea near the city of Cochin. It occupies an area of 11.21 square kilometers. (See Fig-1) There is one high point on the island within the industrial estate near FACT and the TCC from where all the drainage originates.

1.1.2 The Community::

There are close to 40,000 people living and working on the island, 29,064 of whom are part of the village community, mostly not employed by the industries. The rest are employees and stay in the company quarters. The Woman to Man ratio is 1000:1054. (14,144 women, 14,920 men).

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September, 2003

Some of the residents work for industries in Eloor and do not stay in quarters; some are working in industries outside Eloor. What we need to note is the direct and indirect dependence on industries of a lot of people in Eloor.

1.1.3 The Socio-Political Background:

Most people are employed in the services industry--serving the government or private industry. Many run local businesses. Traditional occupations including fishing and farming have been entirely wiped out by polluting industry. There is a section of people that are migrant and are involved in illegal sand-mining from the bed of the river. A small population on the island is unemployed too.

The Village of Eloor is governed by the local Pachayat- Eloor Grama Panchayat. The hierarchy of local self-governance in the ascending order of power is as follows: Eloor Panchayat—Alangad Block Panchayat—North Paravur Taluk Office-Ernakulam Zila Parishad. It comes under the Aluva Assembly constituency and the Ernakulam Lok Sabha Constituency.

1.1.4 Pollution Problems:

Eloor supports the largest industrial belt in Kerala with over 247 chemical industries some of which are across the bank of the river at Edayar. The industries make a range of chemicals- petrochemical products, pesticides, rare-earth elements, rubber processing chemicals, fertilizers, zinc/chrome products and leather products[47]. Most of these industries are over 50 years old and employ the most polluting of technologies.

The siting of the factories is such that they trap the island community, as the connecting bridges to the mainland, are off the industrial part of the island, away from community households. In the event of a chemical accident like the one that happened in Bhopal, they have no choice but to swim across the river for cover, which could lead to massive injury and loss of life.

The industries take 17 million cusecs of fresh-water from the River Periyar and in turn discharge roughly 1.5 million cusecs of concentrated effluent with very little treatment.[48] This leads to the large-scale devastation of aquatic life in the river and the aquaculture farms in the region. There are 30+ pipes spewing effluent into the river directly from the industry.

Air emissions range from acid mist to Sulfur dioxide, Particulate matter, Carbon Black, Ammonia and Chlorine gas[49]. There are many unidentified chemicals that are in the plumes of the industries of the area. The Pollution Control Board has not been monitoring these in a comprehensive manner.

1.1.5 The Campaign Context:

The local pollution control board has been entirely ineffective in 'controlling pollution' if not preventing it. Therefore the local community agitations have more often focused on the pollution control board to initiate immediate action against polluting bodies.

After the Greenpeace Sampling mission of December-1999 when it was established that a large amount of polluting chemicals[50] have been released by a certain specific company (Hindustan Insecticides Ltd), the local community of Eloor took direct action against the polluting agencies by blocking the polluting stream-Kuzhikkandam Thodu in 2001.

The companies have ever since been forced to enter into a dialogue with the panchayat and local people to come up with a plan to clean up the toxic mess along the stream. They have failed to come up with a safe protocol for doing so. Their current plan involves dredging the sludge and dumping it in a nearby wetland permanently destroying the water table. Recently the local community near the Kuzhikkandam Creek has organised as a new group to file another case against the proposed toxic-dumping plans of the local panchayat.

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[47] See Appendix 9 for details of pollutants released, used and produced by the key industries in Eloor and Edayar.

[48] Projection by the Periyar Malineekarana Virudha Samithi PMVS and KSSP.

[49] See Appendix 9 for details.

[50] Look for the file Hindustan.pdf on the website: http://www.greenpeace.org to get the complete report. Quite a few heavy metals and over a hundred organochlorines. Refer Table3, page 10 of the report for a detailed look at the organic chemicals and Table 4, page 13 for a look at the heavy metals.

Meanwhile VJ Jose, a resident of Eloor was appointed by Greenpeace as the Riverkeeper for the Periyar as the '1000 Bhopals Bus Jatha' was passing by Eloor. His primary role has been monitoring water quality of the river and alerting local government, regulatory authorities and the pollution control boards of the need to take immediate action to stop pollution. He has also addressed the people of Cochin city with the dangers of using the potentially polluted river water for drinking purposes.

Greenpeace has also made a compilation of all information on the chemicals in raw materials, products, effluents and emissions, which also enlist, detailed information on potential health problems to workers and community. This is in continuance with the Community Right to Know Campaign in the area. [51]

1.1.6 The Health Problems[52]:
The local people had been complaining of large-scale health problems on the island. These included respiratory disorders, cancers, congenital problems like mentally/ physically challenged children, chronic depression and reproductive problems. It was noted that the time to do a meaningful assessment of the same had arrived.

The Proposed Research Question for the study was **" What are the Health Problems faced by the resident community of Eloor Industrial Estate, due to increased pollution of the air and water by chemical industries?"**

2. METHODS AND LIMITATIONS

The answer was researched involving five strategies:
2.1 A Review of literature from around the world and Eloor (March-April 2003);
2.2 A questionnaire based survey of people in Eloor and Pindimana (May-July 2003);
2.3 Follow up Medical Verifications for Respiratory Illness and Cancer.(May-July,2003)
2.4 Ethnographic interviews of two subsets of people at Eloor (August, 2003);
2.5 Focus-group discussions (August 2003).

In all strategies involving respondents all basic ethical norms were strictly followed. Voluntary prior informed written consent was obtained from each participant. The people were informed of the results of the medical examination as soon as it was over. All patients were given medical-advise by the doctors to the best of the ability and grasp of the patients' current condition. Some were also given legal advise on using the Public Liabilities Insurance Act to claim some compensation from the Industries via the State. The Interviewers had regular working hours and was paid on a monthly basis for their services. They had limited performance incentives so the projections of completion of the survey were met. The projections were arrived

Here is a detailed account of each of the five strategies:

2.1) A Review of Contamination/Health/Indicators Information Gathered From Secondary Sources at Eloor and elsewhere:

2.1.1 Literature from Eloor:

The following were the sources for the literature survey-

a) The Integrated Child Development Programme- A Compilation of the whereabouts of people with disease in the village.
b) The Eloor Village Panchayat- The Death Register
c) The Regional Cancer Detection Centre- The statistical averages of incidence of cancer in patients that approach the center.
d) The Union Christian College, Aluva—An Environmental Impact Assessment of the Alwaye Industrial Belt, Dept of Economics, August 1993.
e) The Village & the Taluk Office: Census Data and Demographic information.

[51] This compilation is available on request. Because of its bulk(3000+ pages) it has not been printed out into a hard edition. It could be viewed using a computer.
[52] Identified mostly through observational studies done by the local community and the local self Government

Number of Mentally& Physically Ill in the Overall Population (ICDS Data): 159	
Death Register- Death Rate: 4.425 per 1000	
Cancer Death Rate	0.361272
Ashtma Death Rate	0.481696
Rhuematism DR	0.275255
Heart Attack DR	0.946188
Paralysis DR	0.395679
Renal Failure DR	0.240848
Others	1.376273
Death Rate 98-99	4.077209

Figure 3: Mortality figures compiled for the period from 1998 to 1999 at Eloor Industrial Belt.

Mortality rates, Socio-economic indicators and other factors that influence the Health of Communities were considered while taking design decisions for the health survey. The design decisions- including those of which village to choose as a reference to Eloor (target) and what sampling technique to follow was taken at the advisory board meetings. The Advisory met three times during the survey and recommended meaningful amendments in structure and approach which was implemented almost in its entirety in the field by the Greenpeace and OHSC team. Mapping of Mortality patterns on the detailed map of Eloor was performed. This graphically portrayed the patterns across the industrial belt in terms of local geography, wind patterns, water flow and other ecological processes greatly enhancing our capacity to analyse the data.

THE TARGET VILLAGE- ELOOR	A PROPOSED REFERENCE- PINDIMANA
Population: 29,064	Population: 15, 729
Total Area: 11.21 sq kms	Total Area: 22.87 sq kms
Male/Female Ratio: 1054:1000	Male/Female Ratio: 1003:1000
Occupations: Service sector, Business, Chemical Factory Based, Ex-Agriculture, Ex-fishing-Fishing (few fish), Dairy, Tailoring, Animal Husbandry-Chicken, Pig, Vegetables, Banana (no large scale farming)	Occupations: Agriculture-Vegetables, Banana, Areca nut, Rubber, Pineapple, Tapioca, Traditional Fishing, Tailoring, Food Processing, Animal husbandry- Dairy, Chicken, Pig, Matchstick production
Riverine Status: River Island- locked on all sides	Riverine Status: Locked by the river on one side
Number of Industries: 18 large chemical industries 247 in the vicinity	Number of Industries: 1 Hollow brick industry

Figure 4: An early comparative study between the target and the reference village, Pindimana.

2.1.2 Literature from Global Sources:

Our understanding of health and the influencing indicators of community health is based on an existing conceptual framework of characteristics of the health of communities, the "Indicators That Count" framework developed by Hancock et al. (1998 and 1999) (see Figure 1). [53]

[53] The framework presents a logical progression from inputs to processes of change to outputs. The inputs are determinants of health (environmental viability, liveable built environments, community conviviality, social equity and economic adequacy). Next, education and governance are related
to processes-of-change which underpin community health. Finally, population health outcomes include measures of both positive health (e.g., quality of-life) and negative health (e.g., disability/morbidity/mortality, functional health measures). For the purposes of our research, we refer to Sustainability, Viability, Livability, etc. as "categories" while the sub-levels within these categories are referred to as "elements" (e.g., energy use, water consumption, etc.).

HEALTH STATUS

Positive Health and Quality of Life: Well-being/self-reported health; Life satisfaction; Happiness
Mastery/Self-esteem/Coherence
Health-promoting Behaviours
Negative Health: Stress/anxiety; Other morbidity/disability measures; Health utility index
Mortality: Overall mortality rate; Infant mortality rate; Suicide rate; Life expectancy

Figure 5: Health Status in the "Indicators That Count" framework developed by Hancock et al. (1998 and 1999)

As you see from the table above the evaluation of community health must take into account a complex mix of indicators. Our study strategically chose to explore overall patterns in morbidity and mortality through an exploratory approach. This was seen as the most inclusive choice available to us given our limitations.

The study also looked at determinants of community health other than Contaminated Air/Water/Food. These determinants were checked across the target (Eloor) and proposed reference villages to reach the closest match. This helped us narrow ourselves on Pindimana as the reference village.

DETERMINANTS
Sustainability
Water consumption; Renewable resource consumption; Waste production and reduction; Local production of resources; Land use (allocation of use); Ecosystem health; Ecological footprint
Viability
Air quality; Water quality; Toxics production and use; Soil contamination; Food chain contamination
Livability
Housing quality; Density and land use in the built-environment; Community safety and security; Transportation/automobile dominance; Walkability; Green/open space; Smoke-free space; Noise pollution
Conviviality
Family safety and security; Sense of neighbourhood/place; Social support networks; Charitable donations; Commitment to public services; Demographics
Equity
Economic disparity; Housing affordability; Discrimination and exclusion; Access to power and control
Prosperity
Diverse economy; Local control of businesses; Employment/unemployment; Quality of employment; Traditional economic activity indicators
PROCESSES
Education
Early childhood development; Education attainment/school quality; Adult literacy; Lifelong learning
Governance
Voluntarism/associational life; Citizen action/civic ness; Human and civil rights; Voter turnout; Perception of political leaders and government services; Healthy public policy

Figure 6: Indicator Categories and Elements of the "Indicators That Count" Framework(text in black signifies criteria that have been observed in the current survey)

When reviewing global research one looked at the existing typologies of research in community health. Of the five types of relevant research listed by Frankish et al [54] (1- Conceptual[55], 2- Needs Assessment[56], 3- Tools Development[57], 4- Implementation[58] and 5- Intervention Outcome Research[59]); in the area of

[54] Institute of Health Promotion Research, University of British Columbia, September 2002- www.ihpr.ubc.ca/pdfs/frankish-cphifinal_v4.pdf

[55] Conceptual research is needed to better articulate the key characteristics of interest as they relate to community health. We need to better understand how Indians (both lay people and decision leaders) conceptualize health and quality of life at a supra-individual (i.e.,neighbourhood or community level). We also need research on the values underlying these perceptions and their implications for program and policy development.

[56] Needs assessment research should involve five aspects: identification of users and uses of community-levelindicators; better description of target populations and service environments; more complete description of problems and potential solutions); assessment of the relative importance and nature of specific needs; and communication of these needs to decision makers and relevant audiences.

[57] Tool development is needed to develop, validate and test new ways of measuring community-level indicators. At present, sufficient tools do not exist or they are poorly validated and not rigorously or widely used.

[58] Implementation research is needed to examine the factors influencing the successful execution of indicator projects. Many project are developed with the intent of fostering change in a given jurisdiction. If they "fail", it is often difficult to ascertain if they were provided sufficient resources (e.g., time, people, money) so as to be successful.

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Community Health that warrant further attention, future research, and immediate corrective measures ours would fall under the final category.

Intervention outcome research would in all probability lead to action from the concerned parties in the direction of affirming the rights of the communities affected.

2: A Questionnaire based Survey was conducted across the target and reference villages:

The Questionnaire was exploratory in nature and observed the prevalence and incidence of various types of diseases that are normally caused due to toxic pollution. The details of a sample questionnaire are attached herewith. (See Appendix 1)

The format and the content of the questionnaire was finalised after several rounds of discussions with the advisory board in Bangalore. Over the course of many meetings with the Advisory board, the Questionnaire got abridged from four pages to one page; the sampling unit changed from individual to the household and a key informant was to be chosen by the interviewer using a standard criteria- that the key informant is the person in the household who is in charge of the family's health.

The key informant was to report the health status of all the living members of the family and the last two deceased members. The interviewer would take the family health information down in a table using a set of codes given to him, which were later classified during analysis under the International Classification of Diseases.

The questionnaire was administered to the populations sampled out randomly from three strata(A,B,C) which were distinctly separated geographically by the factories-belt of Eloor(target) and one in Pindimana (reference). The Sampling ratio for Eloor was 1:4 and that of Pindimana was 1:7. Roughly all the strata (A,B,C) and Pindimana(D) had similar population sizes[60]. All in all we generated information about 9122 alive people, both villages put together. The information about deceased has also been collated.

The method of sampling followed was Stratified Random Sampling. The Sampling exercise was done in a moderately sized community meeting where all the important and interested people in Eloor picked lots till we arrived at the number of houses required for the health survey.

3) Follow up Medical Verifications for Respiratory Illness and Cancer.(May-July,2003)

These were planned and conducted by the Occupational Health and Safety Centre- Mumbai. The follow-up medical verification was done using house-calls and primarily relied on Spirometry for verification of Respiratory Illness cases and examination of medical records for cancer verification. Conducted by doctors of the Occupational Health and Safety Centre, under the leadership of Dr. Murlidhar V and Vijay Kanhere, this was a 6-day event in June when they diagnosed the degree of disability in communities. This information was used to objectively verify and qualify some of the observations of the questionnaire survey.

4) Ethnographic interviews of two subsets of people at Eloor (August, 2003):

Collecting Ethnographic Information from Various Individuals classified according to age and occupation using open questionnaires (Refer Appendix-7 for abridged version of each interview) These interviews were done by VJ Jose, the Periyar Riverkeeper asking a series of common-sense open questions to a group of people who were present in Eloor before the factories were set up and another group of parents of affected children in the neighborhood.

5) Focus group discussions (August 2003):

The focus groups were held as the community sampling exercise was being conducted before the field survey and later as the final debrief was being conducted within the community after the survey. Both sessions confirmed our earlier understanding from individual interviews. They also confirmed the common sense understanding of the findings of the preliminary literature survey.

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[59] Intervention outcome research is needed. Many indicator projects are developed with the goal of launching some form of "intervention" and linking indicators of "community health" to important outcomes such as changes in health behaviours, health status and use of health or social services. At present, we lack sufficient knowledge to say which interventions are effective and to elucidate the causal pathways between community-level factors and the outcomes of interest.

[60] A=Target 617 houses/ completed 516: B=Target 562/complete 462: C=792/632

3. THE LIMITATIONS:

The health problems of contract and permanent workers due to degradation of environment within polluting units were not specifically considered, as access to them was limited. We could only approach workers at the residences in Eloor. So the drifting population got excluded.

Especially at certain worker households, the interviewers made an observation that visibly obvious illnesses were not being reported. So it is possible that generally illnesses have been underreported and figures arrived at from the database would be conservative at the least.

The resources and time at our disposal was limited. Therefore we could not go ahead with a comprehensive census and had to limit ourselves to a Stratified Random Sample as recommended by the advisory group.

4 DISCUSSION:

4.1 Implications For Remedial Health Action To Protect Communities And Workers In Indian Industrial Estates:

The Routes of Exposure of the people to the chemical-cocktail are Water, Air and Food. The Water route is shared by the people of Eloor with the whole of Cochin. The Air however is shared with select distant fiserfolks' villages. The food route is shared by all communities downstream which grow vegetables using the polluted effluent water. The common-sense strategy to stop the health problems would be to cap the tap from the top: plug these exposure routes.

The immediate interventions that this project would suggest regulators and criminal parties take up:

1. **Zero Discharge on the River Periyar!**
2. **Implement immediate and concrete steps towards Clean Production at Eloor now.**
3. **Compensate and Medically Rehabilitate for life, all people affected by the criminal levels of pollution.**
4. **Clean-up all contaminated sites (Kuzhikkandam Creek, the large wetlands in A,B,C) immediately.**
5. **Absolute and complete enforcement of the environmental norms and laws must happen.**
6. **The companies and the government must Make Public All Information regarding pollution, health risks, emergency preparedness and related dangers to local communities. Companies must ensure that all workers have access to their medical records.**
7. **Immediate punitive action needs to be initiated by the government on the companies that are poisoning the communities and workers in the industrial estate and around.**
8. **The companies must apologise to the affected people of Eloor and Cochin and accept complete responsibility and liability for their past actions.**

4.2 Implications For Policy And Practice:

It is clear that the nature of illness spreads across practically all body systems in an almost unpredictable manner. This is clearly due to the fact that it is a cocktail of chemicals (a few score heavy metals a few hundred organic chemicals) and that are in the air and water of Eloor. There is very little medical research globally that accounts or synergistic effects of synthetic chemicals in human beings. The evidence that one finds at Eloor clearly shows that the synergistic effects of these chemicals are more devastating than expected.[61]

These findings have implications on industrial planning policy globally. The paradigm of designing industrial estates recklessly with no regard for the effects on public health needs to change. The chemical cocktail that are released into the air and water needs to be stopped. When there are a complex group of chemicals in your air and water it becomes almost impossible to predict and remedy the human diseases that may be caused by them, not to mention the near impossibility of treatment and clean-up of the contaminated air and water.

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[61] See www.ourstolenfuture.org/NewScience/synergy/synergy.htm
Also http://www.health.state.mn.us/divs/eh/groundwater/hrlmix.html for some new action on groundwater contamination and synergistic effects.
Also http://www.nmenv.state.nm.us/aqb/projects/Corrales/ DOH_Synergistic_Effects.pdf

Industrial Estates must be allowed to exist only in the rare exception, when they are planned like ecological neighborhoods where all the chemicals used within the estates are self contained using closed loop systems and zero-discharge is effectively implemented by online regulation.[62] The new planning paradigm must accommodate clean production technology as its integral part. [63]

4.3 Dissemination/Knowledge Transfer

We have adopted a participatory approach in all our research activities.[64] The Dissemination plan is also based on an understanding of the needs and concerns of our audience, the community, workers, scientists, media-persons, policymakers, politicians and the medical community.

The report will be produced in three levels. The first level report would sum up all the broad findings and give an overview of the community health picture of the Industrial Belt for regulators to take immediate action under the Precautionary Principle. It would be shared with the community, the regulators and the media. This would set the ball rolling on a community consultative actions agenda.

The second level report would be a detailed account with in-depth analysis with all the technical detail required for publication. Greenpeace would publish it for the global audience. The third level report would be in the form of a brief article, which would be sent to a reputed international journal of medicine/environmental health for publication.

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[62] See http://www.indigodev.com/ADBHBCh2Foundations.doc
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See www.cleanproduction.org for details of clean production techniques and success stories from around the world.

[63] See Cornell Work and Environment Initiative http://www.cfe.cornell.edu/wei/ Includes eco-industrial roundtable newsletters and proceedings, case profiles, and papers on eco-industrial parks and networks.

[64] We define participatory research as "systematic inquiry, with collaboration of those affected by the issue being studied, for purposes of educatio and taking action or effecting social change." As such, our work was designed to make our research questions more relevant to our community people, our methods more acceptable, and our results more useful to decision makers.

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Appendix 1: COPY OF THE QUESTIONAIRRE SURVEY

2003 HEALTH SURVEYS' - FIELD INVESTIGATION QUESTIONNAIRE

GREENPEACE

1. _____ Identification Number (Area Code+ Interviewer code+ Ward Number+ House Number)
2. _____ DATE
3. _____ TIME
4. _____ Number of Family Members
5. _____ Address+ Phone Number (H/PP): _____

NAME OF FAMILY MEMBER	AGE	SEX	Ky Inf mt Y / N	OCCUPATION	EDUCATION # of yrs	Over all Health	DOCTOR-DIAGNOSED HEALTH PROBLEM 1	2	3	4	Perceived Health Problem 1	2	3	Habits? Smoking/ Drinking/ Chewing-tobacco- CT n/y / Snuff- SN n/y / Tobacco-paste- TP n/y S n/y	D n/p	CT n/y- SN n/y- TP n/y
M1)																
M2)																
M3)																
M4)																
M5)																
M6)																
M7)																
M8)																

Deceased Member:	*age*	*sex*	*Year of Death*	*Occupation*	*Education*	*Over-all Health*	*Cause of death?*	*Any chronic disease?*	*Any addictive habits?*
D1)									
D2)									

GREENPEACE

Appendix 2: FOLLOWUP MEDICAL INVESTIGATION OF CARCINOMA QUESTIONNAIRE:

1._____Identification Number (Area Code+ Interviewer code+ Ward Number+ House Number+ followup number-(two digits)
2._____date:
3._____AGE
4. Male/Female____ SEX
5. Type of cancer_____
6. Organ affected_____
7.TNM Stage
8.In which year was it detected?_____
9.How was it detected?
10.local doctor
11.Senior doctor in a major hospital
12.Pathology confirmation
13.Was surgery performed?
14.Was chemotherapy administered?
15.Was radiotherapy administered?
16.Is there pain at present?
17.Is there bleeding from the site?

Appendix 3: FOLLOWUP INVESTIGATION OF RESPIRATORY DISABILITY USING PULMENORY FUNCTION TESTING-- QUESTIONNAIRE:

1. _____Identification Number (Area Code+ Interviewer code+ Ward Number+ House Number+ FOLLOWUP NUMBER-(TWO DIGITS)
2._____DATE:
3._____AGE
4. Male/Female____ SEX
5.Y/N _____Do you smoke? Y/N Did you smoke earlier?
6. _____S (n)/(y): Smoking n=number of cigarettes/bidis per day/ y= number of years of smoking
7.Y/N Do you get up due to cough?
8.Y/N is the problem for more than two months?
9.Y/N is the problem for more than two years?
10.Is there a particular season when the problem is faced?
11.Y/N is the cough with expectoration?
12.Y/N are you suffering due to asthma?
13.Y/N are you diagnosed to be asthamatic?
14.Y/N is there a family history of asthma?
15.Y/N.have you associated this problem with any cause?
16. what is the cause you have identified? _____
17.What is the medication you take for asthma? _____
18. what is the frequency of medication?

BREATHLESSNESS:

Do you become breathless while:

19.climbing stairs
20.walking at usual speed
21.walking for even 100 steps/ performing activities of daily living
22.even at rest
23. GRADE OF BREATHLESSNESS:_____

READINGS OF LUNG FUNCTION TEST

Sr. No.	FEV1	FVC	PEFR	MEFR	Selected
1.					
2.					
3.					

4.					

AFTER BRONCHODILATOR:

Sr. No.	FEV1	FVC	PEFR	MEFR	Selected
1.					
2.					
3.					
4.					

24. FEV1 _____% of predicted ; 25. FVC _____% of predicted;
26. COMMENTS

APPENDIX 4: PULMONARY FUNCTION TESTS AT ELOOR AND ITS CONFIRMATION RATES

Q1	2	3	4	5	6	7	8	9	10	11
Sr No	Code	F	M	PFT done?	FEV1 <60%	FEV1 <80%	FVC <60%	FVC <80%	Breath-lessness grade	Lung function affected
1		Y	N	N	-	-	-	-	3	Nk
2		Y	N	N	-	-	-	-	1	Nk
3		Y	N	Y	N	N	N	N	0	N
4		Y	N	Y	n	N	N	y	0	Y
5		Y	N	Y	N	Y	N	Y	1	Y
6		Y	N	Y	n	Y	N	y	1	Y
7		Y	N	Y	Y	-	Y	-	1	Y
8		Y	N	Y	n	Y	N	y	0	Y
9		Y	N	Y	N	N	N	Y	1	Y
10		Y	N	N	-	-	-	-	nk	Nk
11		Y	N	Y	Y	-	Y	-	0	Y
12		y	n	y	n	n	N	n	1	N
13		Y	N	N	-	-	-	-	-	Nk
14		y	n	y	n	n	N	n	0	N
15		Y	N	Y	N	N	N	N	3	Y
16		y	n	y	n	n	N	N	2	N
17		Y	N	Y	N	N	N	N	1	N
18		y	n	y	n	N	n	y	2	Y
19		Y	N	Y	N	Y	N	Y	2	Y
20		y	n	y	n	N	n	n	1	N
21		Y	N	Y	N	N	N	Y	1	Y
22		y	n	n	-	-	-	-	0	N
23		Y	N	N	N	N	N	N	0	N
24		y	n	y	n	N	n	y	0	Y
25		Y	N	Y	Y	-	N	Y	1	Y
26		y	n	y	n	N	n	n	1	N
27		Y	N	N	-	-	-	-	Nk	Nk
28		y	n	n	-	-	-	-	0	N
29		Y	N	Y	N	N	N	N	0	N
30		y	n	y	n	Y	n	y	4	Y
31		N	Y	Y	N	N	N	N	1	N
32		n	y	y	n	N	n	n	2	N

33		N	Y	Y	N	N	N	Y	1	Y
34		n	y	y	n	Y	y	-	nk	Y
35		N	Y	Y	N	Y	N	Y	0	Y
36		n	y	y	n	N	N	n	0	N
37		N	Y	Y	Y	-	Y	-	2	Y
38		n	y	y	y	-	Y	-	1	Y
39		N	Y	Y	N	Y	N	Y	1	Y
40		n	y	y	n	N	N	n	0	N
41		N	Y	Y	N	N	N	N	0	N
1	2	3	4	5	6	7	8	9	10	11
42		n	y	y	y	-	N	y	1	Y
43		N	Y	N	-	-	-	-	-	N
44		n	y	y	n	N	n	n	-	N
45		N	Y	Y	N	Y	N	Y	1	Y
46		N	Y	Y	Y	-	Y	-	2	Y
47		N	Y	Y	N	N	N	n	0	N
48		N	Y	Y	Y	-	Y	-	1	Y
49		N	Y	Y	N	Y	N	Y	1	Y
50		N	Y	Y	Y	-	Y	-	2	Y
51		N	Y	N	-	-	-	-	0	N
52		N	Y	N	-	-	-	-	0	N
53		N	Y	Y	N	N	N	N	1	N
54		Y	N	Y	N	N	N	n	0	N
55		N	Y	N	-	-	-	-	2	Y
56		N	Y	Y	N	N	N	N	0	N
57		Y	N	Y	Y	-	Y	-	2	Y
58		Y	N	N	-	-	-	-	0	N
Total Of yeses		33 Females	25 Males	45	10	10	9	17		28
Total of nos		--	-	13						25
Total of nks		-	-	-	-	-	-	-	03	05

Nk=not known

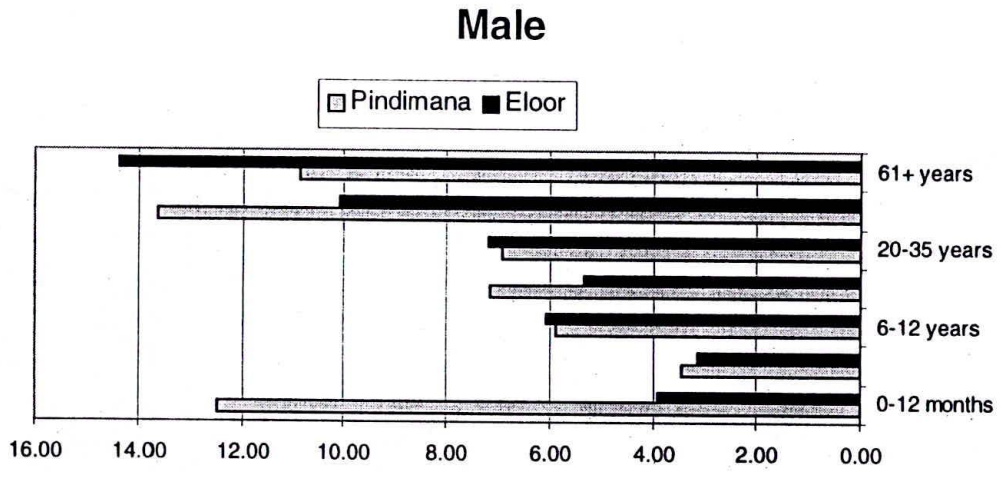
10 tested are severely affected with FEV1 or FVC or both below 60% of the predicted values (the expected values in healthy persons). 7 are moderately affected and 9 showed that their values for lung function are just below the 80% of predicted values.

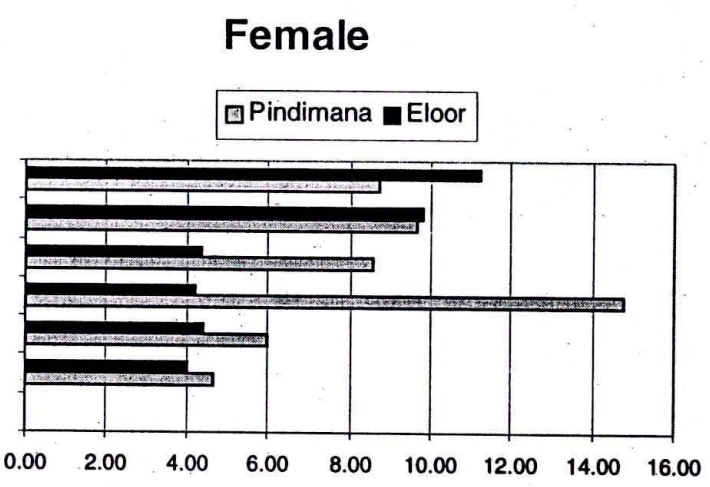
Totally 26 out of 45 tested for lung function are affected. Lung function test could be administered to 43 persons. Three persons were obviously affected and could not perform the test. Eight had reported respiratory problems but did not want to go through the lung function test. Four persons were in good health with no problems so tests were not administered.

Totally 28 persons interviewed (and tested or only checked) have respiratory system affected.

APPENDIX 6: LIST OF FINDINGS TRANSCRIBED INTO CHARTS

CHART-1: Certain infectious and parasitic diseases- Chapter 1 ICD-10 (International Classification of Diseases)

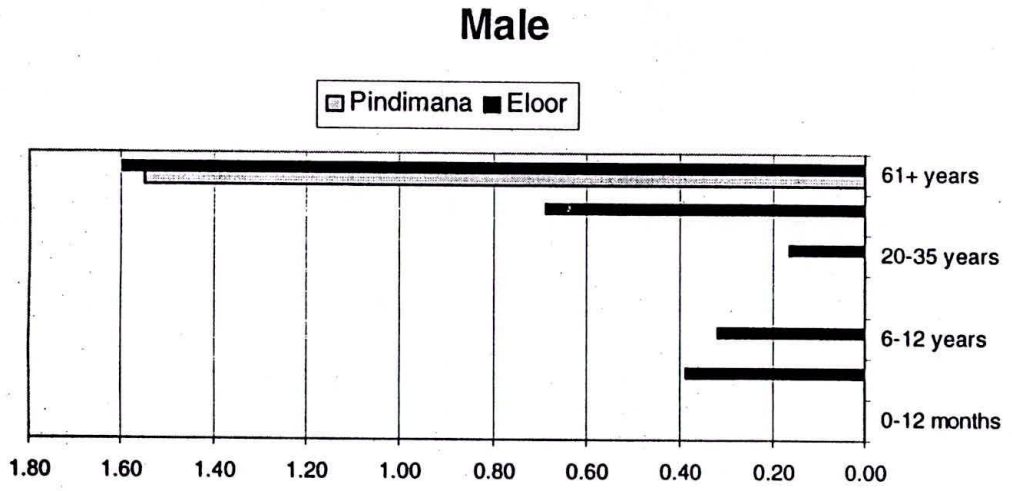


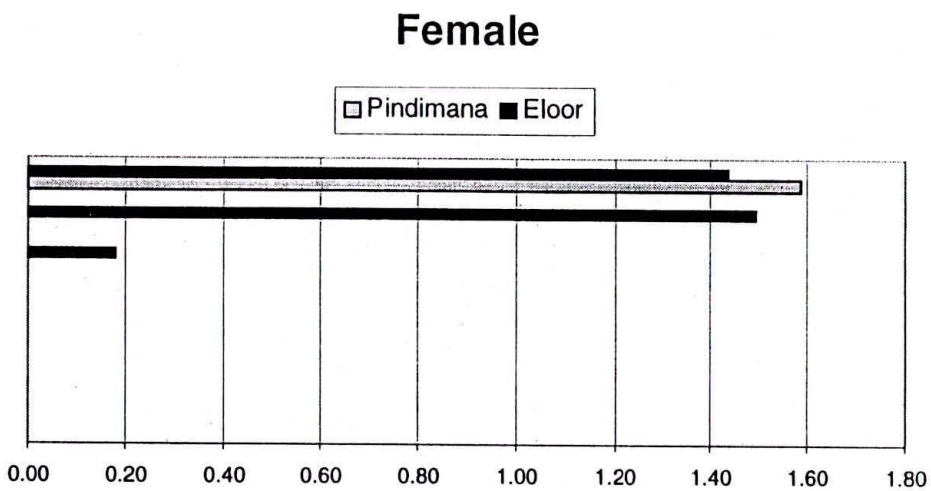


Age Group	A		B	B	C	C	A+B+C	A+B+C	(A+B+C)	(A+B+C)	Affected	Affected	Affected Population D		Total Population D		Affected Male	Affected Female
	male	female	male	female	male	female	male	female	Total Population – Male	Total Population Female	(A+B+C) Population (%) male	(A+B+C) Population (%) female	male	female	male	female	(D) Population (%)	(D) Population (%)
0-12 months	3	0	0	0	0	0	3	0	77	71	3.90	0.00	1	0	8	14	12.50	0.00
1-5 years	3	5	4	4	1	0	8	9	256	225	3.13	4.00	2	2	58	43	3.45	4.65
5-12 years	6	8	10	6	3	0	19	14	314	318	6.05	4.40	5	4	85	67	5.88	5.97
12-19 years	8	5	9	6	2	4	19	15	356	355	5.34	4.23	5	13	70	88	7.14	14.77
19-35 years	34	16	38	16	15	16	87	48	1212	1104	7.18	4.35	15	20	217	233	6.91	8.58
35-60 years	46	44	42	57	30	17	118	118	1168	1206	10.10	9.78	34	24	249	248	13.65	9.68
60+ years	18	15	28	27	8	5	54	47	376	418	14.36	11.24	14	11	129	126	10.85	8.73

GREENPEACE

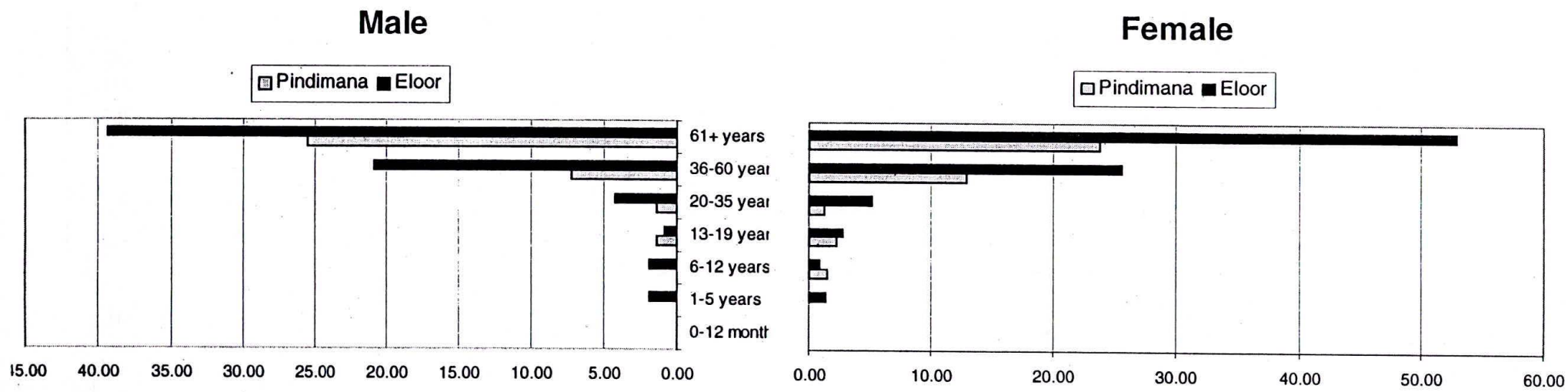
CHART-2: Neoplasms- Chapter 2 ICD-10 (International Classification of Diseases)





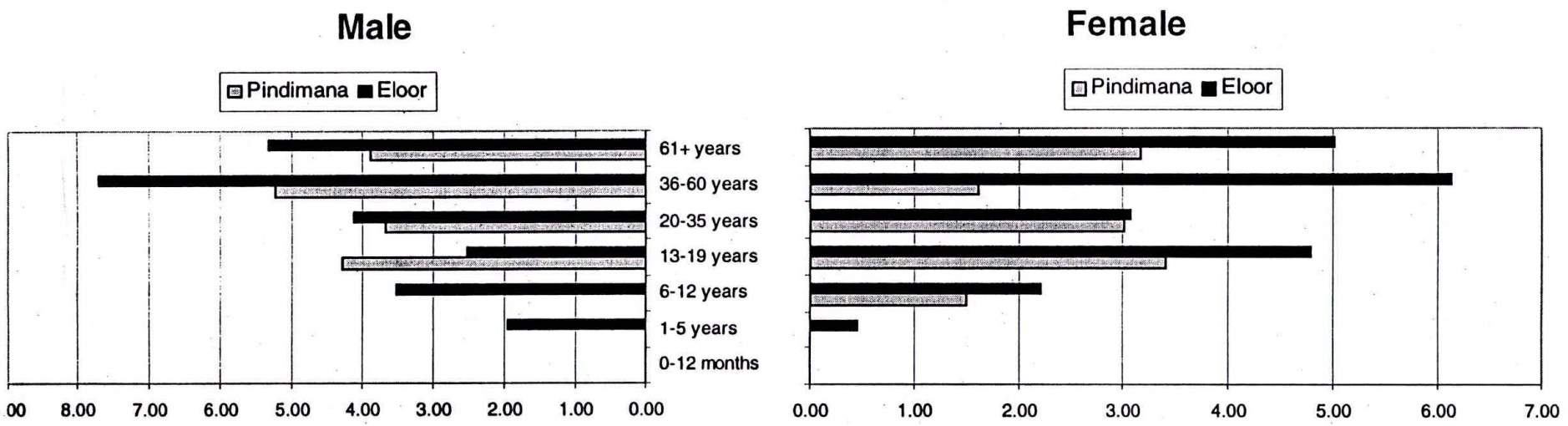
Age Group	A		B		C		A+B+C		(A+B+C)	(A+B+C)	Affected	Affected	Affected Population D		Total Population D		Affected Male	Affected Female
	male	female	Male	female	male	female	male	female	Total Population - Male	Total Population Female	(A+B+C) Population (%) male	(A+B+C) Population (%) female	male	female	male	female	(D) Population (%)	(D) Population (%)
0-12 months	0	0	0	0	0	0	0	0	77	71	0.00	0.00	0	0	8	14	0.00	0.00
1-5 years	0	0	1	0	0	0	1	0	256	225	0.39	0.00	0	0	58	43	0.00	0.00
6-12 years	0	0	1	0	0	0	1	0	314	318	0.32	0.00	0	0	85	67	0.00	0.00
13-19 years	0	0	0	0	0	0	0	0	356	355	0.00	0.00	0	0	70	88	0.00	0.00
20-35 years	1	0	1	2	0	0	2	2	1212	1104	0.17	0.18	0	0	217	233	0.00	0.00
36-60 years	1	4	5	10	2	4	8	18	1168	1206	0.68	1.49	0	0	249	248	0.00	0.00
61+ years	2	1	4	4	0	1	6	6	376	418	1.60	1.44	2	2	129	126	1.55	1.59

CHART-3: Diseases of blood & blood forming organs & certain disorders- Chapter 3 ICD- 10 (International Classification of Diseases)



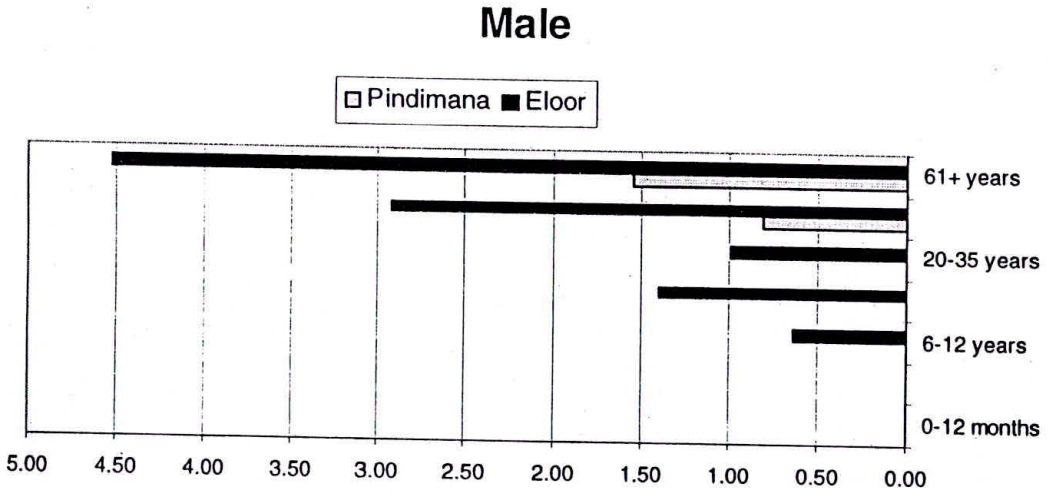
Age Group	A		B		C		A+B+C		(A+B+C)	(A+B+C)	Affected	Affected	Affected Population D		Total Population D		Affected Male	Affected Female
	male	female	male	female	male	female	male	female	Total Population - Male	Total Population Female	(A+B+C) Population (%) male	(A+B+C) Population (%) female	male	female	male	female	(D) Population (%)	(D) Population (%)
0-12 months	0	0	0	0	0	0	0	0	77	71	0.00	0.00	0	0	8	14	0.00	0.00
1-5 years	1	2	4	1	0	0	5	3	256	225	1.95	1.33	0	0	58	43	0.00	0.00
6-12 years	3	1	2	1	1	1	6	3	314	318	1.91	0.94	0	1	85	67	0.00	1.49
13-19 years	2	6	0	4	1	0	3	10	356	355	0.84	2.82	1	2	70	88	1.43	2.27
20-35 years	17	18	21	24	14	15	52	57	1212	1104	4.29	5.16	3	3	217	233	1.38	1.29
36-60 years	72	91	61	98	111	118	244	307	1168	1206	20.89	25.46	18	32	249	248	7.23	12.90
61+ years	35	62	63	82	50	77	148	221	376	418	39.36	52.87	33	30	129	126	25.58	23.81

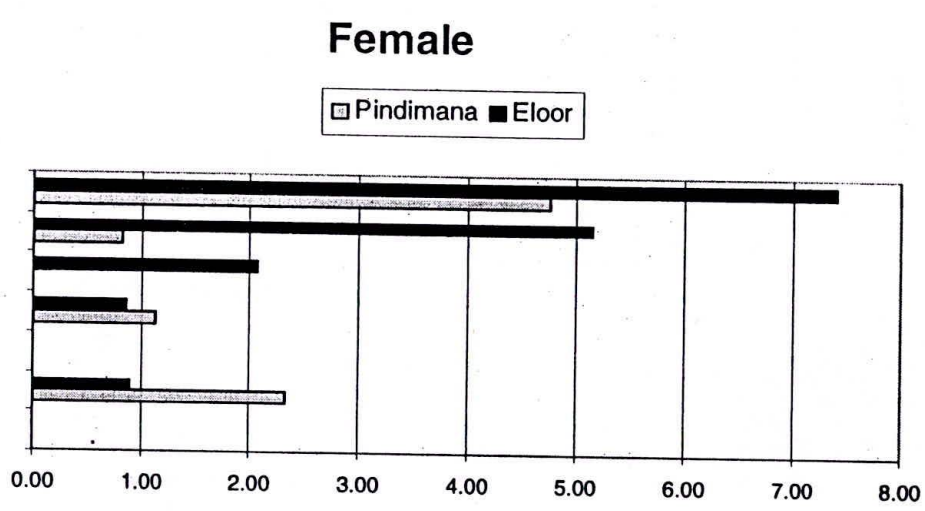
CHART-4: Endocrine, nutritional and metabolic diseases- Chapter 4 ICD- 10 (International Classification of Diseases)



Age Group	A		B		C		A+B+C		(A+B+C)	(A+B+C)	Affected	Affected	Affected Population D		Total Population D		Affected Male	Affected Female
	male	female	male	female	male	female	male	female	Total Population - Male	Total Population Female	(A+B+C) Population (%) male	(A+B+C) Population (%) female	male	female	male	female	(D) Population (%)	(D) Population (%)
0-12 months	0	0	0	0	0	0	0	0	77	71	0.00	0.00	0	0	8	14	0.00	0.00
1-5 years	3	0	0	0	2	1	5	1	256	225	1.95	0.44	0	0	58	43	0.00	0.00
6-12 years	5	1	1	3	5	3	11	7	314	318	3.50	2.20	0	1	85	67	0.00	1.49
13-19 years	4	11	2	1	3	5	9	17	356	355	2.53	4.79	3	3	70	88	4.29	3.41
20-35 years	23	14	16	9	11	11	50	34	1212	1104	4.13	3.08	8	7	217	233	3.69	3.00
36-60 years	32	28	27	18	31	28	90	74	1168	1206	7.71	6.14	13	4	249	248	5.22	1.61

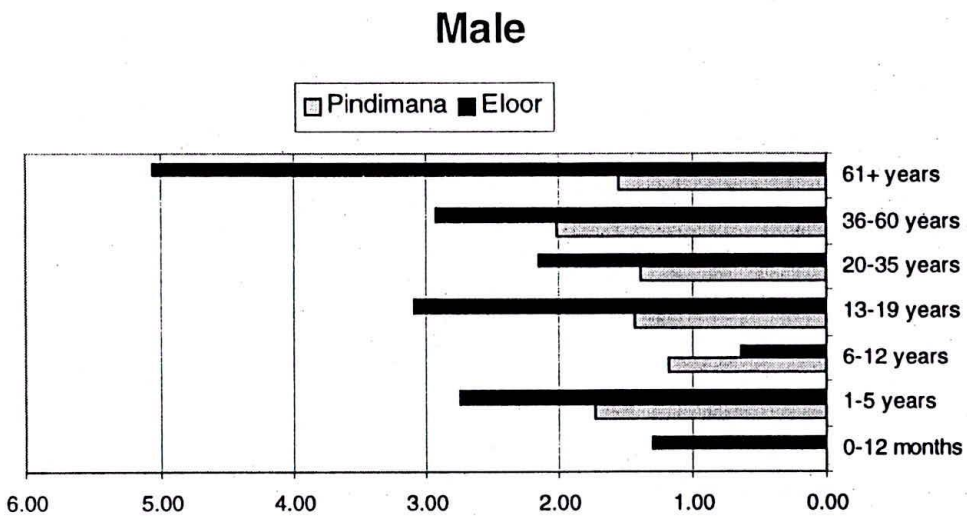
CHART-5: Mental and behavioural disorders- Chapter 5 ICD-10 (International Classification of Diseases)

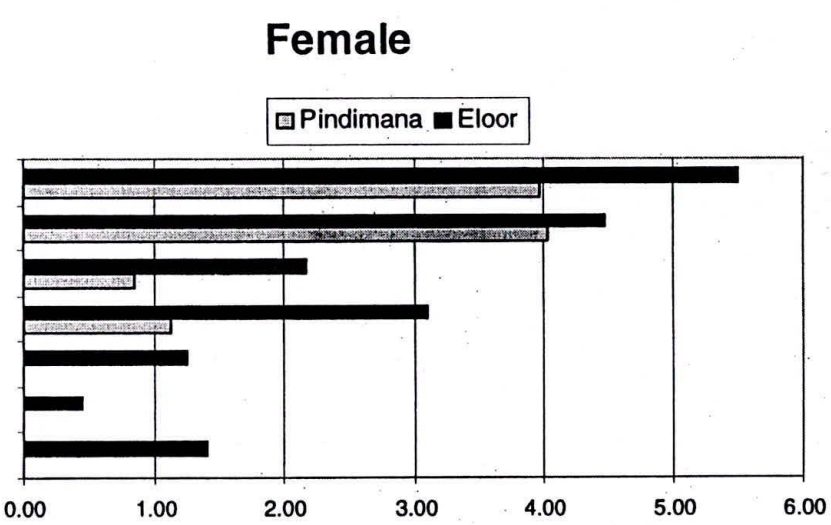




Age Group	A		B		C		A+B+C		(A+B+C)	(A+B+C)	Affected	Affected	Affected Population D		Total Population D		Affected Male	Affected Female
	male	female	male	female	male	female	male	female	Total Population - Male	Total Population Female	(A+B+C) Population (%) male	(A+B+C) Population (%) female	male	female	male	female	(D) Population (%)	(D) Population (%)
0-12 months	0	0	0	0	0	0	0	0	77	71	0.00	0.00	0	0	8	14	0.00	0.00
1-5 years	0	2	0	0	0	0	0	2	256	225	0.00	0.89	0	1	58	43	0.00	2.33
6-12 years	1	0	1	0	0	0	2	0	314	318	0.64	0.00	0	0	85	67	0.00	0.00
13-19 years	4	3	0	0	1	0	5	3	356	355	1.40	0.85	0	1	70	88	0.00	1.14
20-35 years	7	16	1	6	4	1	12	23	1212	1104	0.99	2.08	0	0	217	233	0.00	0.00
36-60 years	26	48	4	10	4	4	34	62	1168	1206	2.91	5.14	2	2	249	248	0.80	0.81
61+ years	12	22	5	6	0	3	17	31	376	418	4.52	7.42	2	6	129	126	1.55	4.76

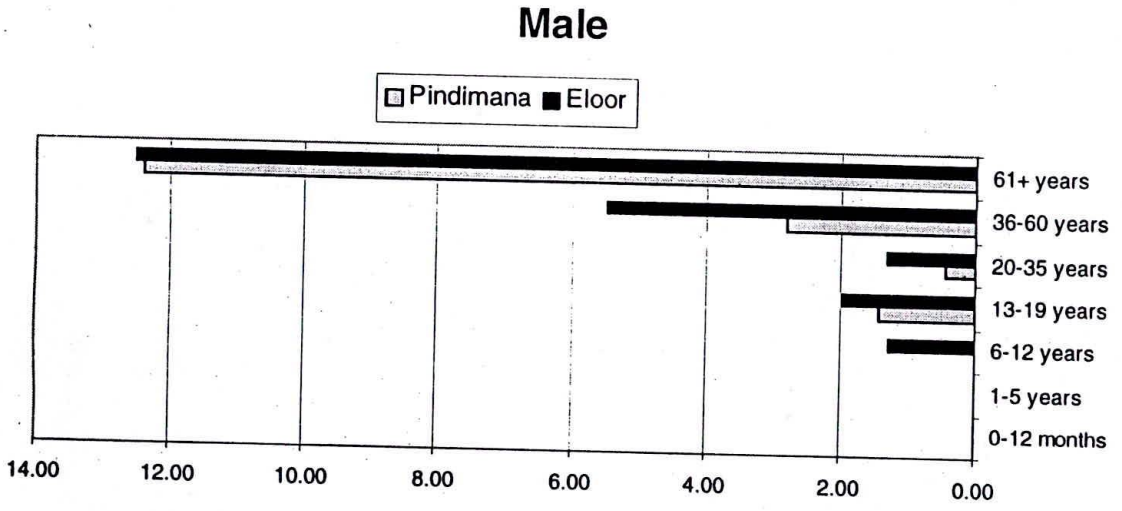
CHART-6: Diseases of the nervous system- Chapter 6 ICD-10 (International Classification of Diseases)

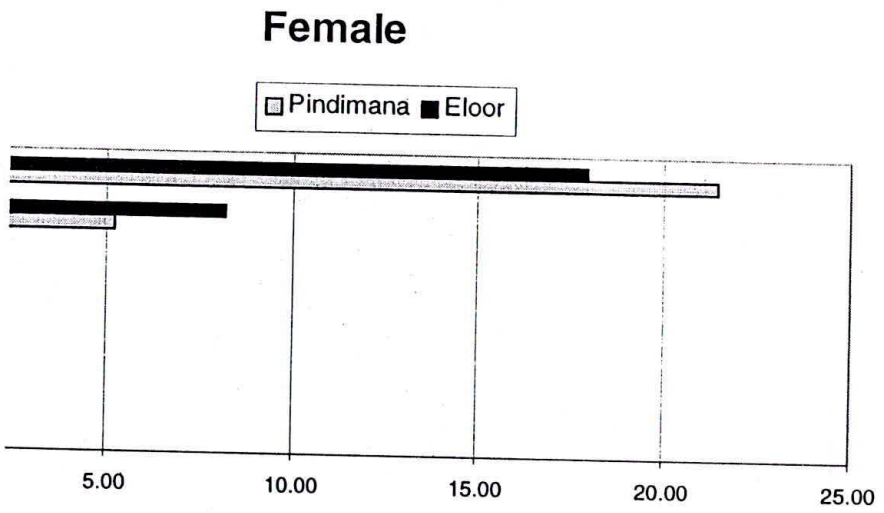




Age Group	A		B		C		A+B+C		(A+B+C)	(A+B+C)	Affected	Affected	Affected Population D		Total Population D		Affected Male	Affected Female
	male	female	male	female	male	female	male	female	Total Population - Male	Total Population Female	(A+B+C) Population (%) male	(A+B+C) Population (%) female	male	female	male	female	(D) Population (%)	(D) Population (%)
0-12 months	0	0	1	0	0	1	1	1	77	71	1.30	1.41	0	0	8	14	0.00	0.00
1-5 years	4	0	2	0	1	1	7	1	256	225	2.73	0.44	1	0	58	43	1.72	0.00
6-12 years	0	2	0	2	2	0	2	4	314	318	0.64	1.26	1	0	85	67	1.18	0.00
13-19 years	4	6	4	4	3	1	11	11	356	355	3.09	3.10	1	1	70	88	1.43	1.14
20-35 years	9	7	11	11	6	6	26	24	1212	1104	2.15	2.17	3	2	217	233	1.38	0.86
36-60 years	10	19	11	16	13	19	34	54	1168	1206	2.91	4.48	5	10	249	248	2.01	4.03
61+ years	3	11	13	9	3	3	19	23	376	418	5.05	5.50	2	5	129	126	1.55	3.97

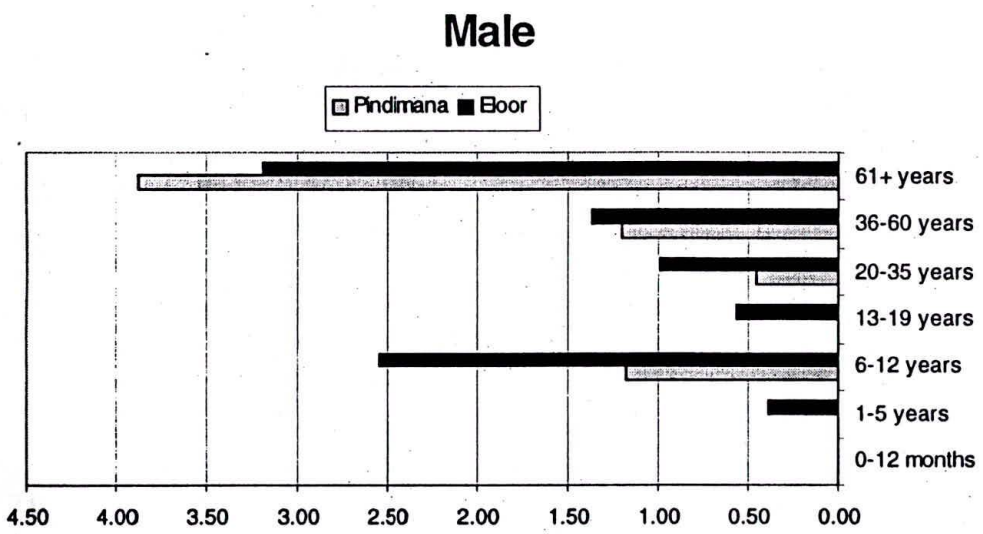
CHART-7: Diseases of the eye & adnexa- Chapter 7 ICD-10 (International Classification of Diseases)

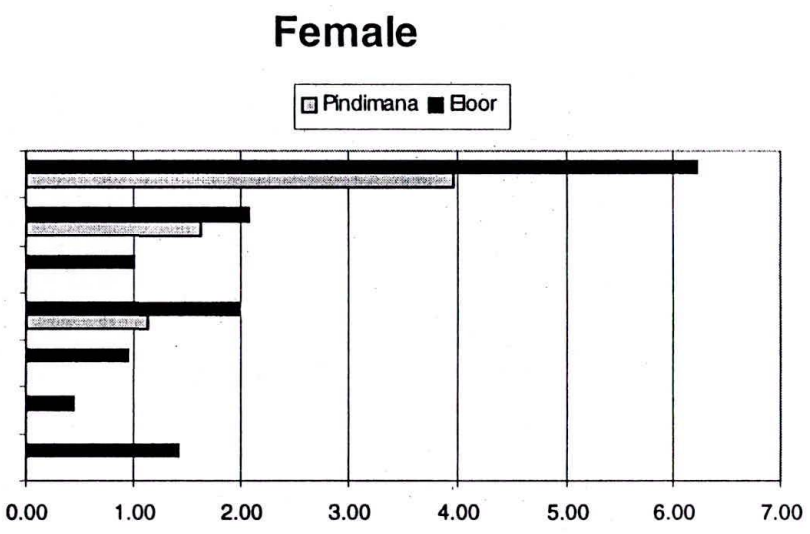




Age Group	A		B		C		A+B+C		(A+B+C)	(A+B+C)	Affected	Affected	Affected Population D		Total Population D		Affected Male	Affected Female
	male	female	male	female	male	female	male	female	Total Population - Male	Total Population Female	(A+B+C) Population (%) male	(A+B+C) Population (%) female	male	female	male	female	(D) Population (%)	(D) Population (%)
0-12 months	0	0	0	0	0	0	0	0	77	71	0.00	0.00	0	0	8	14	0.00	0.00
1-5 years	0	0	0	0	0	0	0	0	256	225	0.00	0.00	0	0	58	43	0.00	0.00
6-12 years	2	3	1	0	1	1	4	4	314	318	1.27	1.26	0	1	85	67	0.00	1.49
13-19 years	4	5	0	1	3	0	7	6	356	355	1.97	1.69	1	1	70	88	1.43	1.14
20-35 years	6	7	4	6	6	2	16	15	1212	1104	1.32	1.36	1	2	217	233	0.46	0.86
36-60 years	16	23	20	31	28	45	64	99	1168	1206	5.48	8.21	7	13	249	248	2.81	5.24
61+ years	11	21	17	24	19	30	47	75	376	418	12.50	17.94	16	27	129	126	12.40	21.43

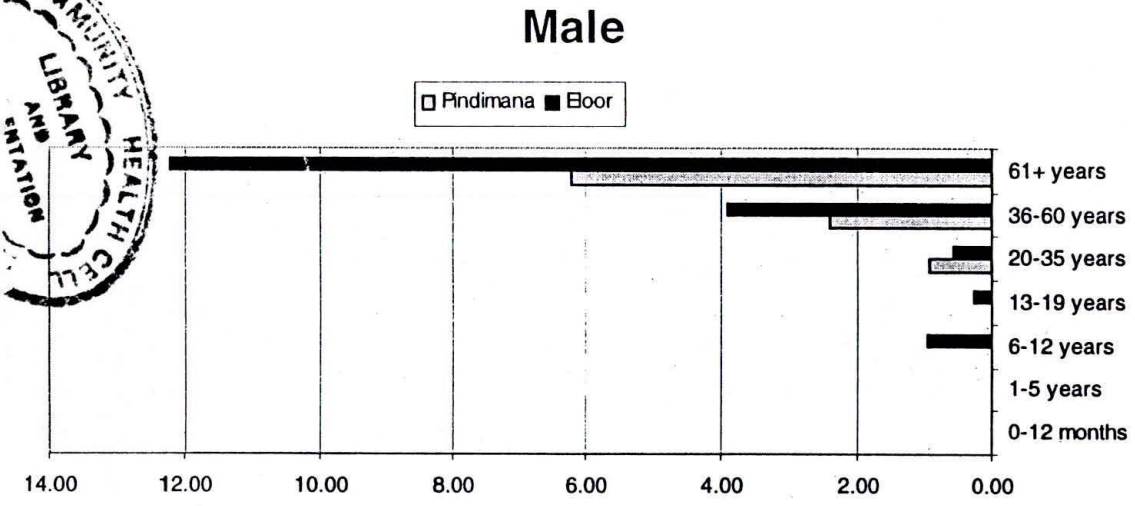
CHART-8: Diseases of the ear & mastoid process- Chapter 8 ICD-10 (International Classification of Diseases)

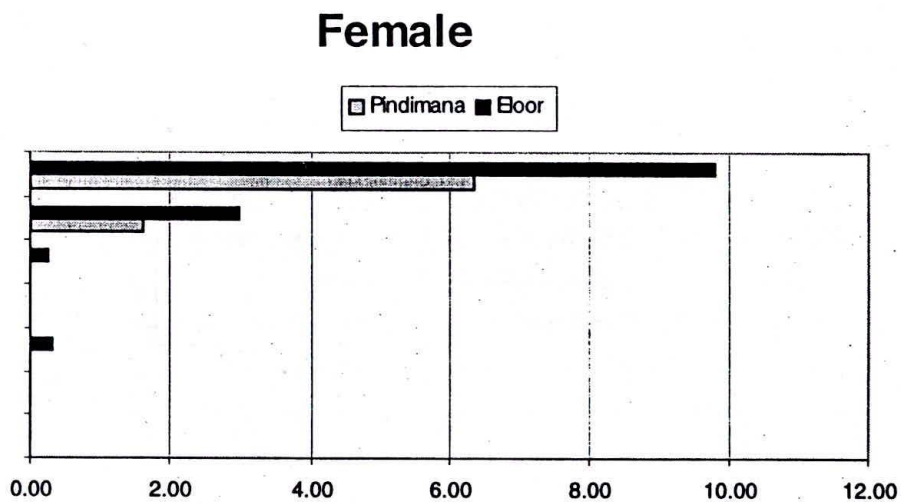




Age Group	A		B		C		A+B+C		(A+B+C)	(A+B+C)	Affected	Affected	Affected Population D		Total Population D		Affected Male	Affected Female
	male	female	male	female	male	female	male	female	Total Population - Male	Total Population Female	(A+B+C) Population (%) male	(A+B+C) Population (%) female	male	female	male	female	(D) Population (%)	(D) Population (%)
0-12 months	0	1	0	0	0	0	0	1	77	71	0.00	1.41	0	0	8	14	0.00	0.00
1-5 years	0	0	1	0	0	1	1	1	256	225	0.39	0.44	0	0	58	43	0.00	0.00
6-12 years	2	1	3	0	3	2	8	3	314	318	2.55	0.94	1	0	85	67	1.18	0.00
13-19 years	1	4	0	2	1	1	2	7	356	355	0.56	1.97	0	1	70	88	0.00	1.14
20-35 years	2	3	9	5	1	3	12	11	1212	1104	0.99	1.00	1	0	217	233	0.46	0.00
36-60 years	6	9	7	6	3	10	16	25	1168	1206	1.37	2.07	3	4	249	248	1.20	1.61
61+ years	3	6	7	11	2	9	12	26	376	418	3.19	6.22	5	5	129	126	3.88	3.97

CHART-9: Diseases of the circulatory system- Chapter 9 ICD- 10 (International Classification of Diseases)





Age Group	A		B		C		A+B+C		(A+B+C)	(A+B+C)	Affected	Affected	Affected Population D		Total Population D		Affected Male	Affected Female
	male	female	male	female	male	female	male	female	Total Population - Male	Total Population Female	(A+B+C) Population (%) male	(A+B+C) Population (%) female	male	female	male	female	(D) Population (%)	(D) Population (%)
0-12 months	0	0	0	0	0	0	0	0	77	71	0.00	0.00	0	0	8	14	0.00	0.00
1-5 years	0	0	0	0	0	0	0	0	256	225	0.00	0.00	0	0	58	43	0.00	0.00
6-12 years	1	0	2	1	0	0	3	1	314	318	0.96	0.31	0	0	85	67	0.00	0.00
13-19 years	0	0	1	0	0	0	1	0	356	355	0.28	0.00	0	0	70	88	0.00	0.00
20-35 years	3	0	4	1	0	2	7	3	1212	1104	0.58	0.27	2	0	217	233	0.92	0.00
36-60 years	17	11	17	13	12	12	46	36	1168	1206	3.94	2.99	6	4	249	248	2.41	1.61
61+ years	15	12	22	19	9	10	46	41	376	418	12.23	9.81	8	8	129	126	6.20	6.35

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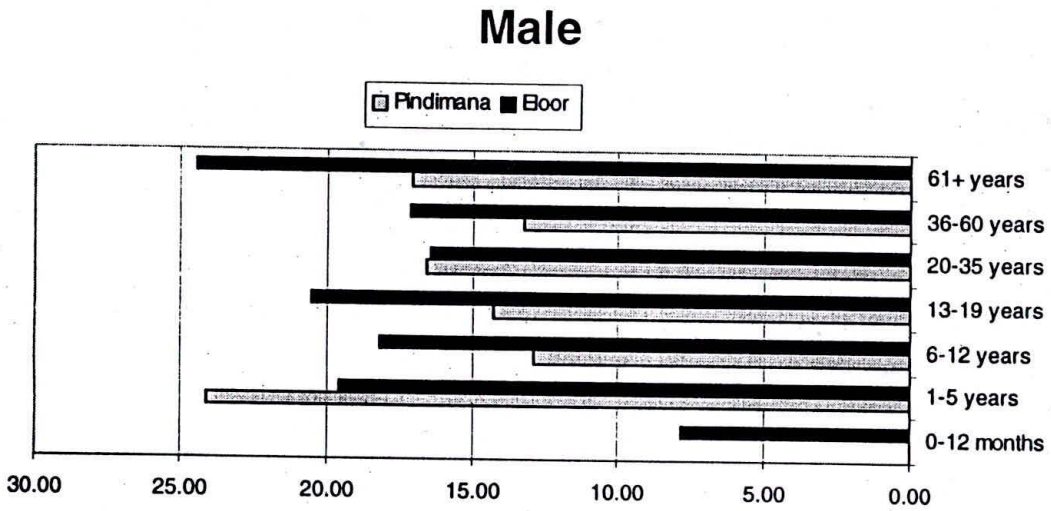
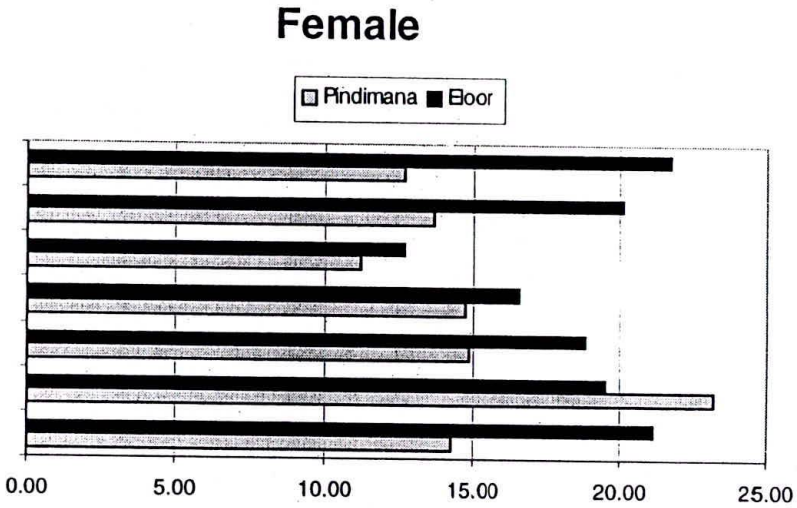
Greentech

CHART-10: Diseases of the respiratory system- Chapter 10 ICD-10 (International Classification of Diseases)

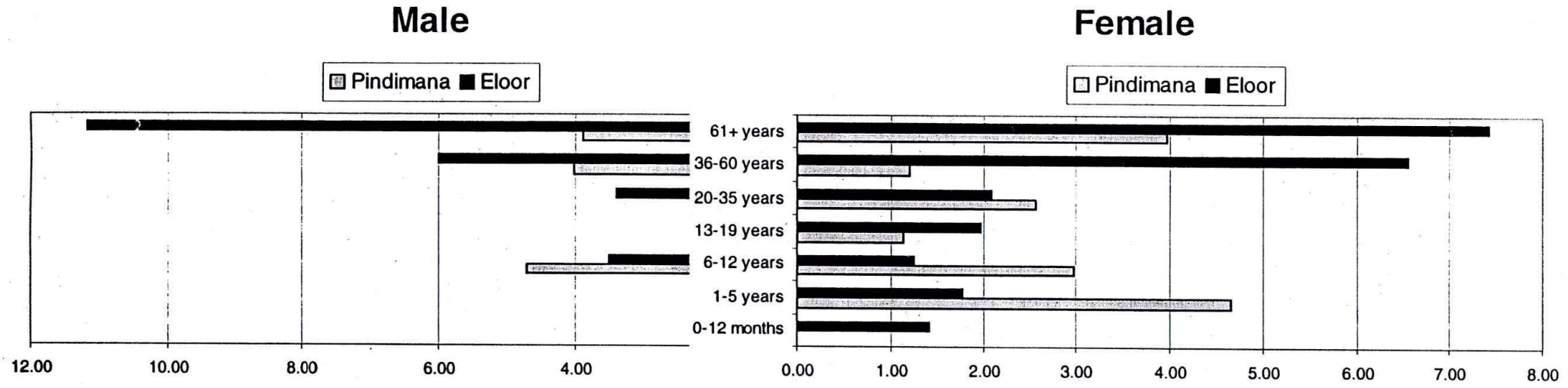




Age Group	A		B		C		A+B+C		(A+B+C)	(A+B+C)	Affected	Affected	Affected Population D		Total Population D		Affected Male	Affected Female
	male	female	male	female	male	female	male	female	Total Population - Male	Total Population Female	(A+B+C) Population (%) male	(A+B+C) Population (%) female	male	female	male	female	(D) Population (%)	(D) Population (%)
0-12 months	0	2	3	5	3	8	6	15	77	71	7.79	21.13	0	2	8	14	0.00	14.29
1-5 years	8	5	25	16	17	23	50	44	256	225	19.53	19.56	14	10	58	43	24.14	23.26
6-12 years	17	16	16	14	24	30	57	60	314	318	18.15	18.87	11	10	85	67	12.94	14.93
13-19 years	22	12	11	18	40	29	73	59	356	355	20.51	16.62	10	13	70	88	14.29	14.77
20-35 years	48	33	69	46	82	61	199	140	1212	1104	16.42	12.68	36	26	217	233	16.59	11.16
36-60 years	44	83	78	75	78	85	200	243	1168	1206	17.12	20.15	33	34	249	248	13.25	13.71
61+ years	26	29	38	27	28	35	92	91	376	418	24.47	21.77	22	16	129	126	17.05	12.70

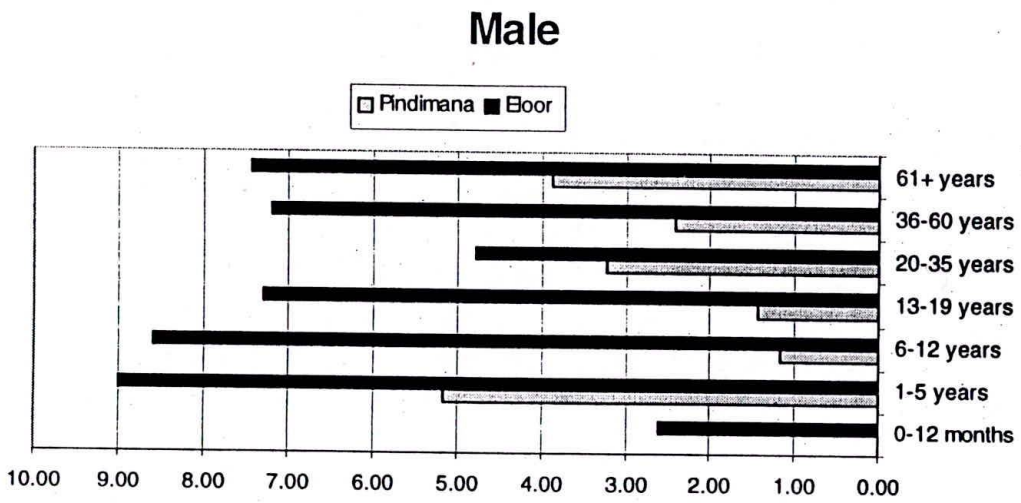
GREETINGS

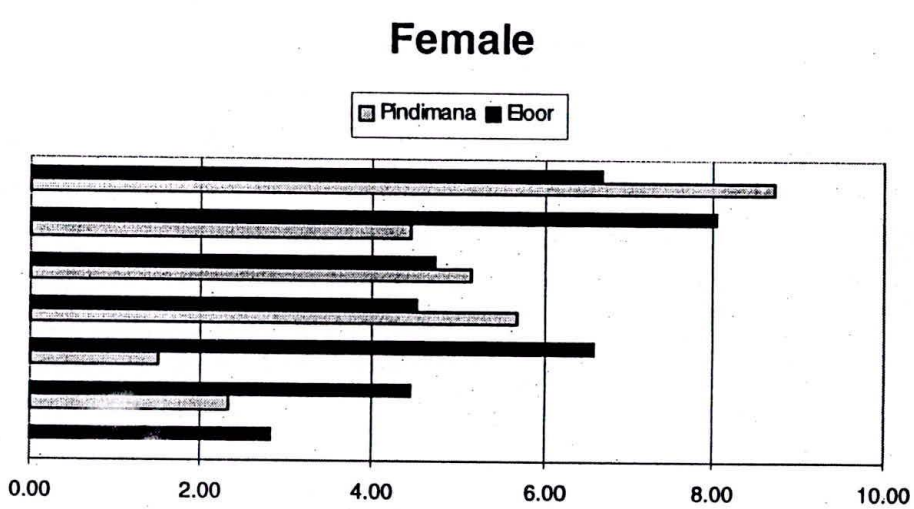
CHART-11: Diseases of the digestive system- Chapter 11 ICD- 10(International Classification of Diseases)



Age Group	A		B		C		A+B+C		(A+B+C)	(A+B+C)	Affected	Affected	Affected Population D		Total Population D		Affected Male	Affected Female
	male	female	male	female	male	female	male	female	Total Population - Male	Total Population Female	(A+B+C) Population (%) male	(A+B+C) Population (%) female	male	female	male	female	(D) Population (%)	(D) Population (%)
0-12 months	0	0	0	0	0	1	0	1	77	71	0.00	1.41	0	0	8	14	0.00	0.00
1-5 years	1	3	1	1	3	0	5	4	256	225	1.95	1.78	1	2	58	43	1.72	4.65
6-12 years	8	2	3	0	0	2	11	4	314	318	3.50	1.26	4	2	85	67	4.71	2.99
13-19 years	2	2	1	2	0	3	3	7	356	355	0.84	1.97	1	1	70	88	1.43	1.14
20-35 years	8	1	22	6	11	16	41	23	1212	1104	3.38	2.08	5	6	217	233	2.30	2.58
36-60 years	16	13	28	34	26	32	70	79	1168	1206	5.99	6.55	10	3	249	248	4.02	1.21

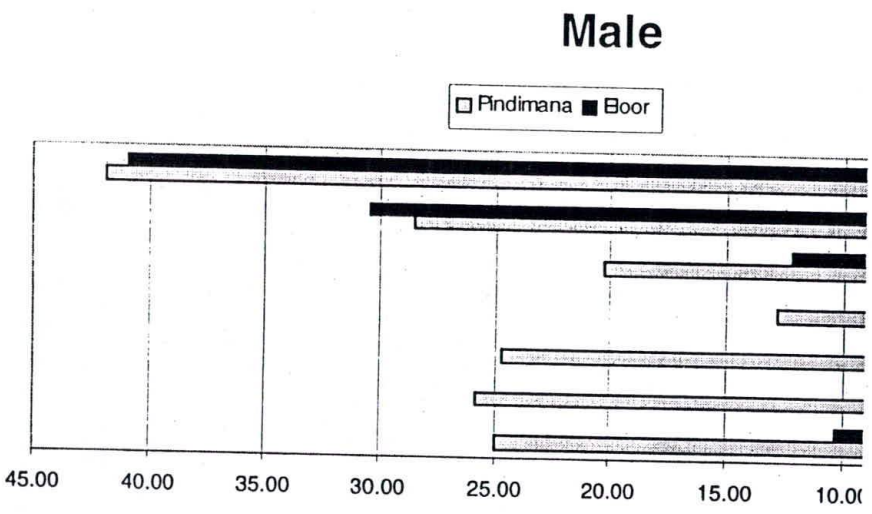
CHART-12: Diseases of the skin & subcutaneous tissue- Chapter 12 ICD-10 (International Classification of Diseases)

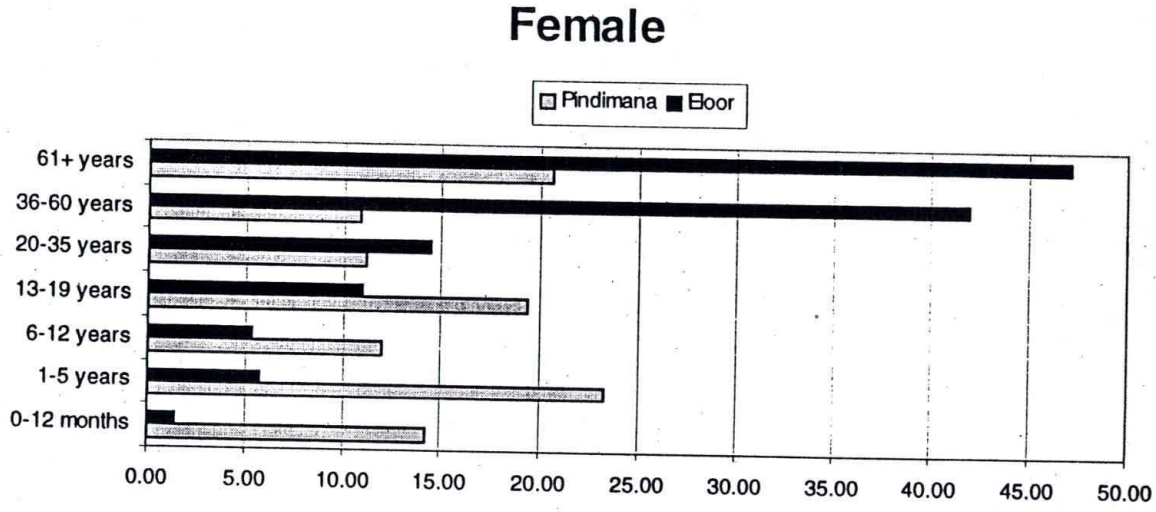




Age Group	A		B		C		A+B+C		(A+B+C)	(A+B+C)	Affected	Affected	Affected Population D		Total Population D		Affected Male	Affected Female
	male	female	male	female	male	female	male	female	Total Population - Male	Total Population Female	(A+B+C) Population (%) male	(A+B+C) Population (%) female	male	female	male	female	(D) Population (%)	(D) Population (%)
0-12 months	1	2	0	0	1	0	2	2	77	71	2.60	2.82	0	0	8	14	0.00	0.00
1-5 years	13	3	5	5	5	2	23	10	256	225	8.98	4.44	3	1	58	43	5.17	2.33
6-12 years	17	10	5	7	5	4	27	21	314	318	8.60	6.60	1	1	85	67	1.18	1.49
13-19 years	11	8	9	3	6	5	26	16	356	355	7.30	4.51	1	5	70	88	1.43	5.68
20-35 years	33	16	10	25	15	11	58	52	1212	1104	4.79	4.71	7	12	217	233	3.23	5.15
36-60 years	28	35	31	35	25	27	84	97	1168	1206	7.19	8.04	6	11	249	248	2.41	4.44
61+ years	6	7	14	12	8	9	28	28	376	418	7.45	6.70	5	11	129	126	3.88	8.73

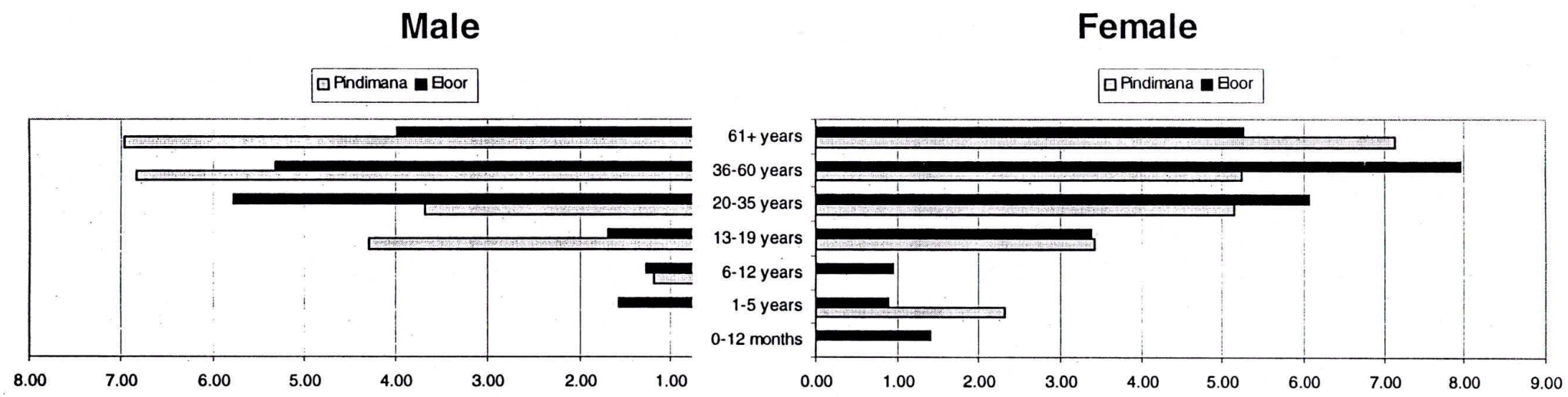
CHART-13: Diseases of the musculoskeletal system & connective tissue- Chapter 13 ICD 10 (International Classification of Diseases)





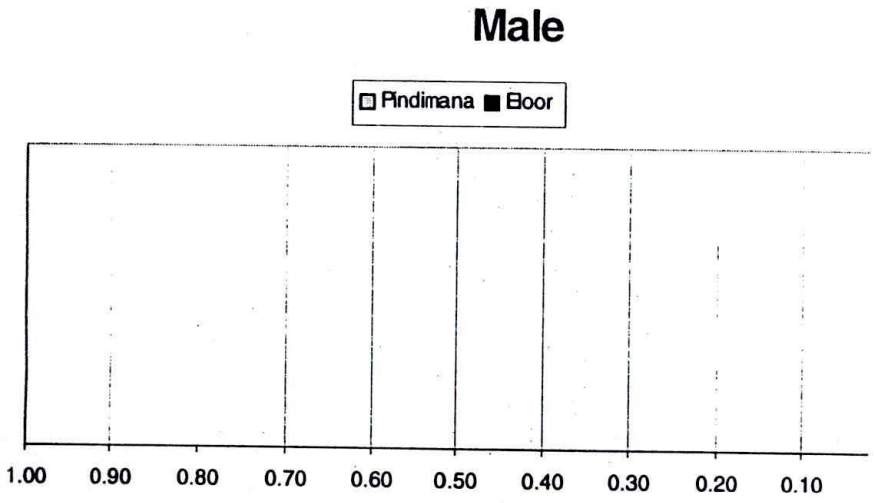
Age Group	A		B		C		A+B+C		(A+B+C)	(A+B+C)	Affected	Affected	Affected Population D		Total Population D		Affected Male	Affected Female
	male	female	male	female	male	female	male	female	Total Population - Male	Total Population Female	(A+B+C) Population (%) male	(A+B+C) Population (%) female	male	female	male	female	(D) Population (%)	(D) Population (%)
0-12 months	2	0	3	1	3	0	8	1	77	71	10.39	1.41	2	2	8	14	25.00	14.29
1-5 years	7	6	2	6	3	1	12	13	256	225	4.69	5.78	15	10	58	43	25.86	23.26
6-12 years	12	5	3	6	6	6	21	17	314	318	6.69	5.35	21	8	85	67	24.71	11.94
13-19 years	13	22	2	8	6	9	21	39	356	355	5.90	10.99	9	17	70	88	12.86	19.32
20-35 years	55	53	42	39	52	67	149	159	1212	1104	12.29	14.40	44	26	217	233	20.28	11.16
36-60 years	126	162	90	145	139	199	355	506	1168	1206	30.39	41.96	71	27	249	248	28.51	10.89
61+ years	52	54	52	69	50	74	154	197	376	418	40.96	47.13	54	26	129	126	41.86	20.63

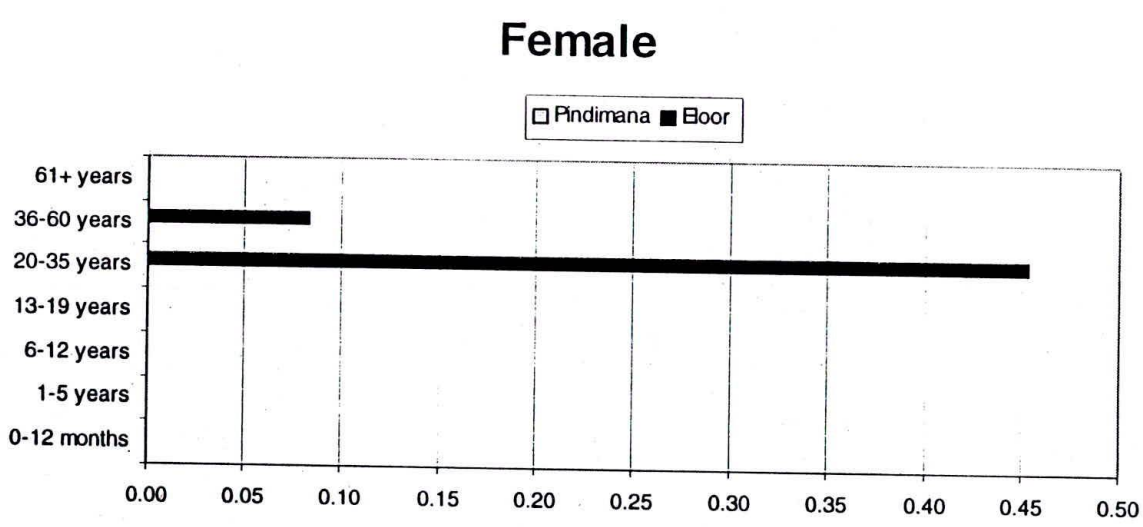
CHART-14: Diseases of the genitourinary system - Chapter 14 ICD-10 (International Classification of Diseases)



Age Group	A		B		C		A+B+C		(A+B+C)	(A+B+C)	Affected	Affected	Affected Population D		Total Population D		Affected Male	Affected Female
	male	female	male	female	male	female	male	female	Total Population - Male	Total Population Female	(A+B+C) Population (%) male	(A+B+C) Population (%) female	male	female	male	female	(D) Population (%)	(D) Population (%)
0-12 months	0	0	0	0	0	1	0	1	77	71	0.00	1.41	0	0	8	14	0.00	0.00
1-5 years	0	1	1	1	3	0	4	2	256	225	1.56	0.89	0	1	58	43	0.00	2.33
6-12 years	1	1	1	1	2	1	4	3	314	318	1.27	0.94	1	0	85	67	1.18	0.00
13-19 years	1	2	2	2	3	8	6	12	356	355	1.69	3.38	3	3	70	88	4.29	3.41
20-35 years	24	26	24	20	22	21	70	67	1212	1104	5.78	6.07	8	12	217	233	3.69	5.15
36-60 years	20	25	19	42	23	29	62	96	1168	1206	5.31	7.96	17	13	249	248	6.83	5.24
61+ years	4	4	5	9	6	9	15	22	376	418	3.99	5.26	9	9	129	126	6.98	7.14

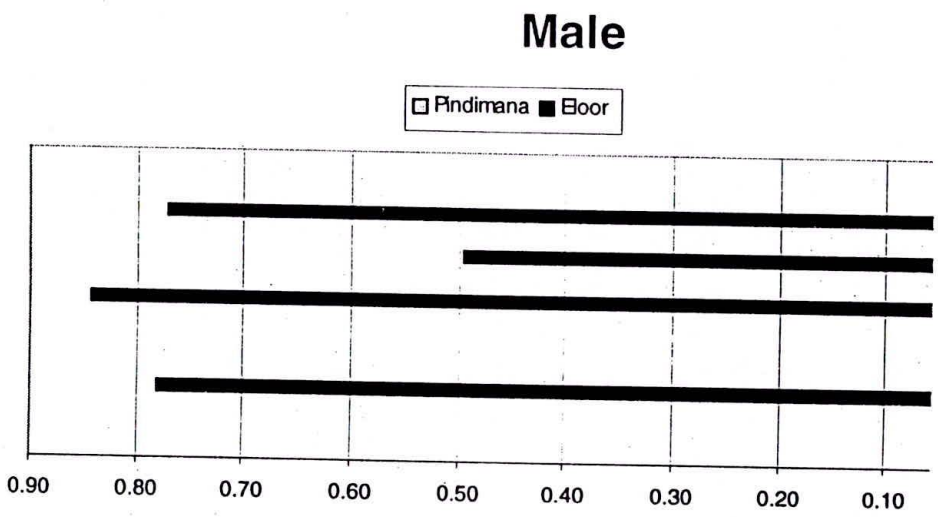
CHART-15: Pregnancy, childbirth and the puerperium - Chapter 15 ICD-10 (International Classification of Diseases)

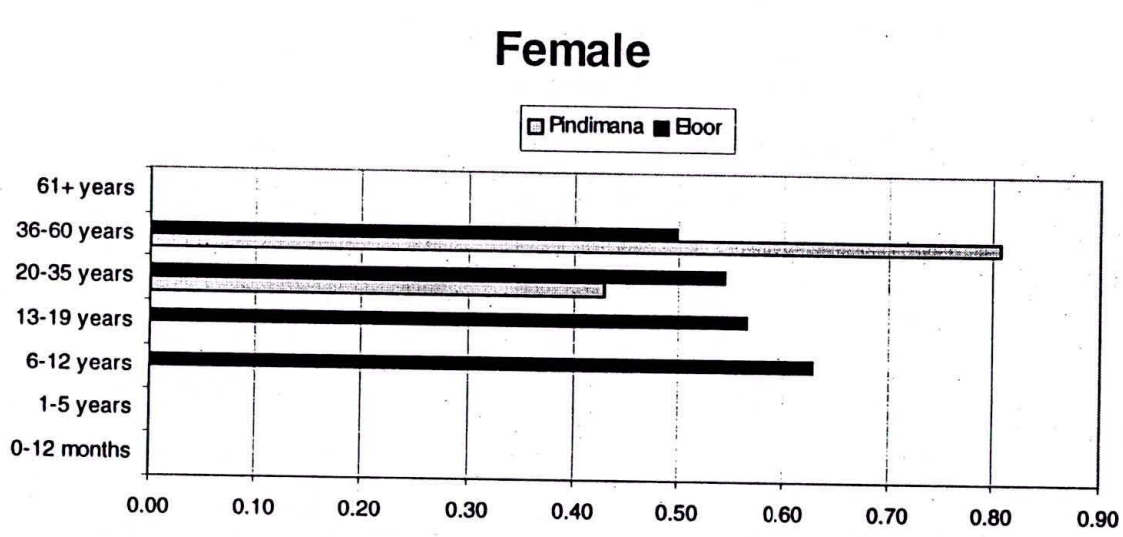




Age Group	A		B		C		A+B+C		(A+B+C)	(A+B+C)	Affected	Affected	Affected Population D		Total Population D		Affected Male	Affected Female
	male	female	male	female	male	female	male	female	Total Population - Male	Total Population Female	(A+B+C) Population (%) male	(A+B+C) Population (%) female	male	female	male	female	(D) Population (%)	(D) Population (%)
0-12 months	0	0	0	0	0	0	0	0	77	71	0.00	0.00	0	0	8	14	0.00	0.00
1-5 years	0	0	0	0	0	0	0	0	256	225	0.00	0.00	0	0	58	43	0.00	0.00
6-12 years	0	0	0	0	0	0	0	0	314	318	0.00	0.00	0	0	85	67	0.00	0.00
13-19 years	0	0	0	0	0	0	0	0	356	355	0.00	0.00	0	0	70	88	0.00	0.00
20-35 years	0	2	0	2	0	1	0	5	1212	1104	0.00	0.45	0	0	217	233	0.00	0.00
36-60 years	0	0	0	0	0	1	0	1	1168	1206	0.00	0.08	0	0	249	248	0.00	0.00
61+ years	0	0	0	0	0	0	0	0	376	418	0.00	0.00	0	0	129	126	0.00	0.00

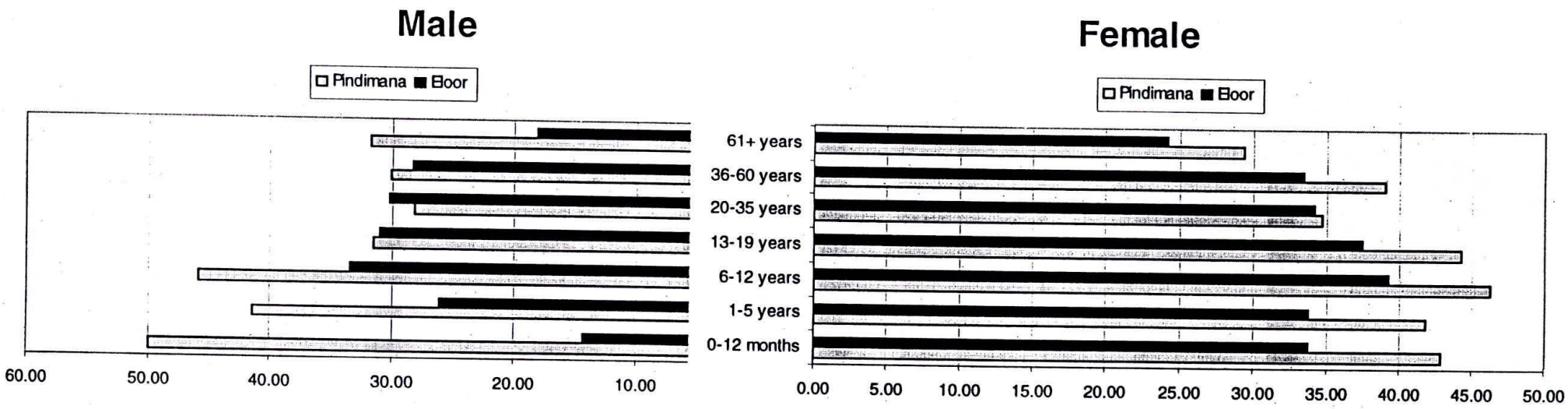
CHART-16: Congenital malformations,deformations & chromosomal abnormal - Chapter 17 ICD-10 (International Classification of Diseases)





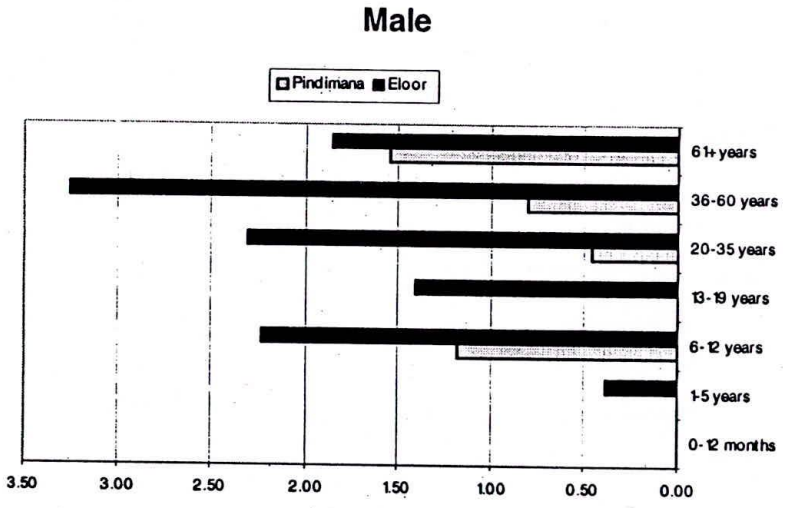
Age Group	A		B		C		A+B+C		(A+B+C)	(A+B+C)	Affected	Affected	Affected Population D		Total Population D		Affected Male	Affected Female
	male	female	male	female	male	female	male	female	Total Population - Male	Total Population Female	(A+B+C) Population (%) male	(A+B+C) Population (%) female	male	female	male	female	(D) Population (%)	(D) Population (%)
0-12 months	0	0	0	0	0	0	0	0	77	71	0.00	0.00	0	0	8	14	0.00	0.00
1-5 years	0	0	0	0	2	0	2	0	256	225	0.78	0.00	0	0	58	43	0.00	0.00
6-12 years	0	0	0	1	0	1	0	2	314	318	0.00	0.63	0	0	85	67	0.00	0.00
13-19 years	2	0	0	1	1	1	3	2	356	355	0.84	0.56	0	0	70	88	0.00	0.00
20-35 years	1	3	3	1	2	2	6	6	1212	1104	0.50	0.54	0	1	217	233	0.00	0.43
36-60 years	5	2	3	1	1	3	9	6	1168	1206	0.77	0.50	0	2	249	248	0.00	0.81

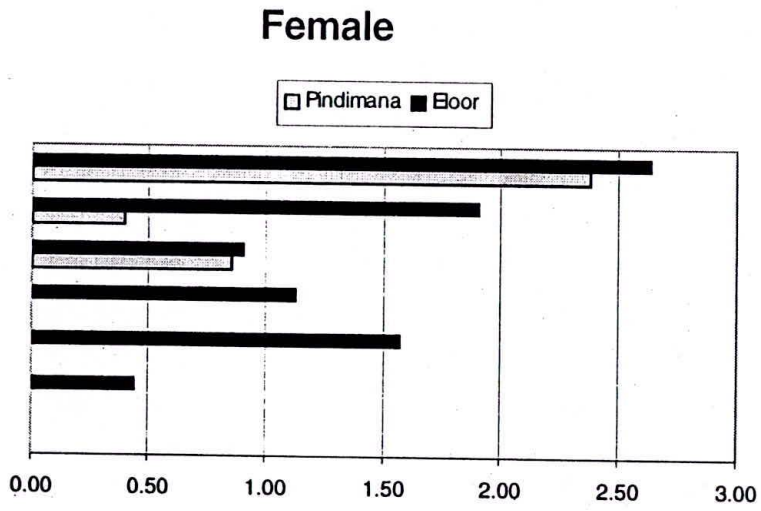
CHART-17: Symptoms, signs & abnormal clinical and lab. findings, not elsewhere classified - Chapter 18 ICD-10 (International Classification of Diseases)



Age Group	A		B		C		A+B+C		(A+B+C)	(A+B+C)	Affected	Affected	Affected Population D		Total Population D		Affected Male	Affected Female
	male	female	male	female	male	female	male	female	Total Population - Male	Total Population Female	(A+B+C) Population (%) male	(A+B+C) Population (%) female	male	female	male	female	(D) Population (%)	(D) Population (%)
0-12 months	4	10	3	6	4	8	11	24	77	71	14.29	33.80	4	6	8	14	50.00	42.86
1-5 years	29	30	18	19	20	27	67	76	256	225	26.17	33.78	24	18	58	43	41.38	41.86
6-12 years	41	42	24	39	40	44	105	125	314	318	33.44	39.31	39	31	85	67	45.88	46.27
13-19 years	40	52	22	37	48	44	110	133	356	355	30.90	37.46	22	39	70	88	31.43	44.32
20-35 years	119	135	106	103	141	139	366	377	1212	1104	30.20	34.15	61	81	217	233	28.11	34.76
36-60 years	110	145	91	111	129	147	330	403	1168	1206	28.25	33.42	75	97	249	248	30.12	39.11

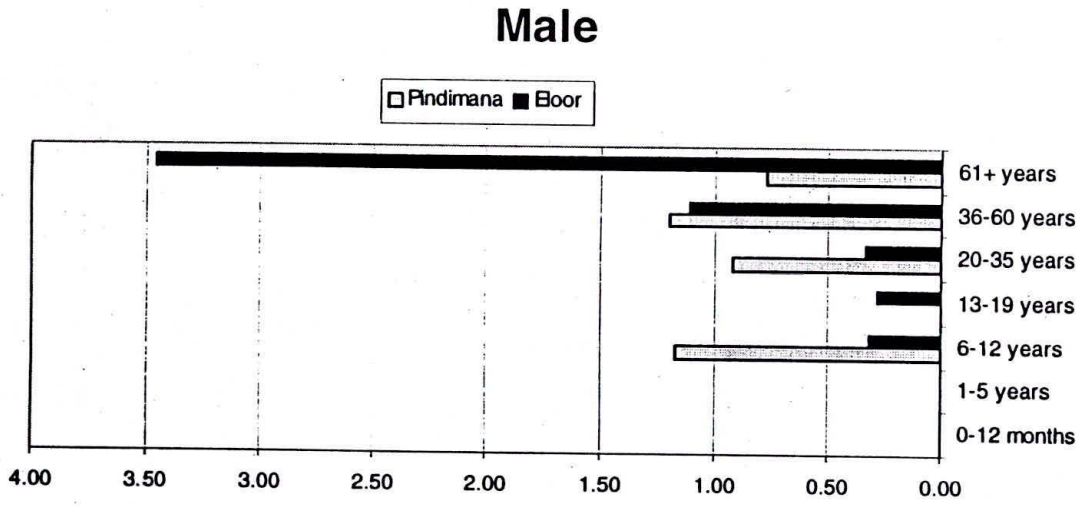
CHART-18: Injury, poisoning & certain other consequences of external causes- Chapter 19 ICD 10 (International Classification of Diseases)

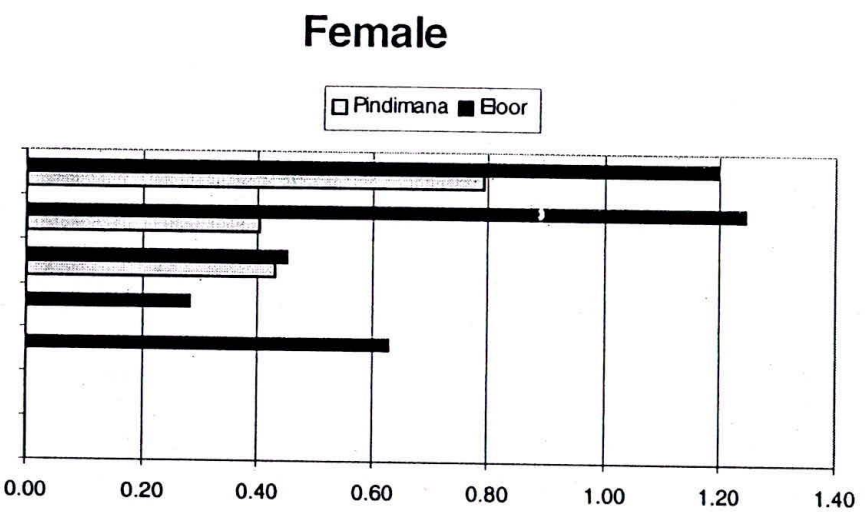




Age Group	A		B		C		A+B+C		(A+B+C)	(A+B+C)	Affected	Affected	Affected Population D		Total Population D		Affected Male	Affected Female
	male	female	male	female	male	female	male	female	Total Population - Male	Total Population Female	(A+B+C) Population (%) male	(A+B+C) Population (%) female	male	female	male	female	(D) Population (%)	(D) Population (%)
0-12 months	0	0	0	0	0	0	0	0	77	71	0.00	0.00	0	0	8	14	0.00	0.00
1-5 years	0	0	0	0	1	1	1	1	256	225	0.39	0.44	0	0	58	43	0.00	0.00
6-12 years	1	2	4	0	2	3	7	5	314	318	2.23	1.57	1	0	85	67	1.18	0.00
13-19 years	3	3	0	1	2	0	5	4	356	355	1.40	1.13	0	0	70	88	0.00	0.00
20-35 years	7	4	13	1	8	5	28	10	1212	1104	2.31	0.91	1	2	217	233	0.46	0.86
36-60 years	16	12	9	4	13	7	38	23	1168	1206	3.25	1.91	2	1	249	248	0.80	0.40

CHART-19: External causes of morbidity & mortality- Chapter 20 (International Code of Diseases)

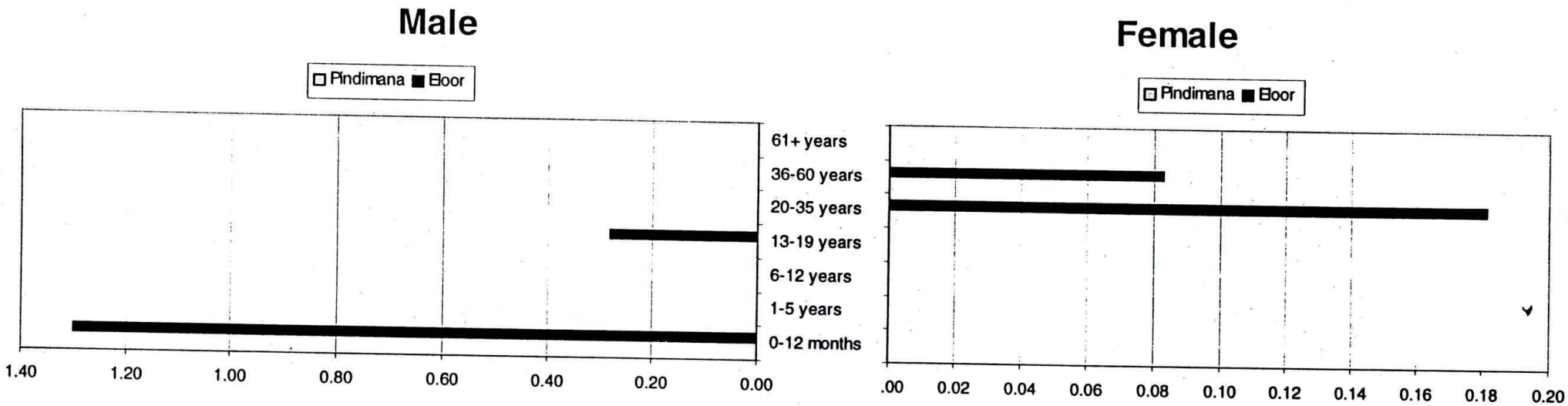




Age Group	A		B		C		A+B+C		(A+B+C)	(A+B+C)	Affected	Affected	Affected Population D		Total Population D		Affected Male	Affected Female
	male	female	male	female	male	female	male	female	Total Population - Male	Total Population Female	(A+B+C) Population (%) male	(A+B+C) Population (%) female	male	female	male	female	(D) Population (%)	(D) Population (%)
0-12 months	0	0	0	0	0	0	0	0	77	71	0.00	0.00	0	0	8	14	0.00	0.00
1-5 years	0	0	0	0	0	0	0	0	256	225	0.00	0.00	0	0	58	43	0.00	0.00
6-12 years	1	1	0	1	0	0	1	2	314	318	0.32	0.63	1	0	85	67	1.18	0.00
13-19 years	1	1	0	0	0	0	1	1	356	355	0.28	0.28	0	0	70	88	0.00	0.00
20-35 years	2	2	2	3	0	0	4	5	1212	1104	0.33	0.45	2	1	217	233	0.92	0.43
36-60 years	9	8	3	4	1	3	13	15	1168	1206	1.11	1.24	3	1	249	248	1.20	0.40
61+ years	8	2	4	2	1	1	13	5	376	418	3.46	1.20	1	1	129	126	0.78	0.79

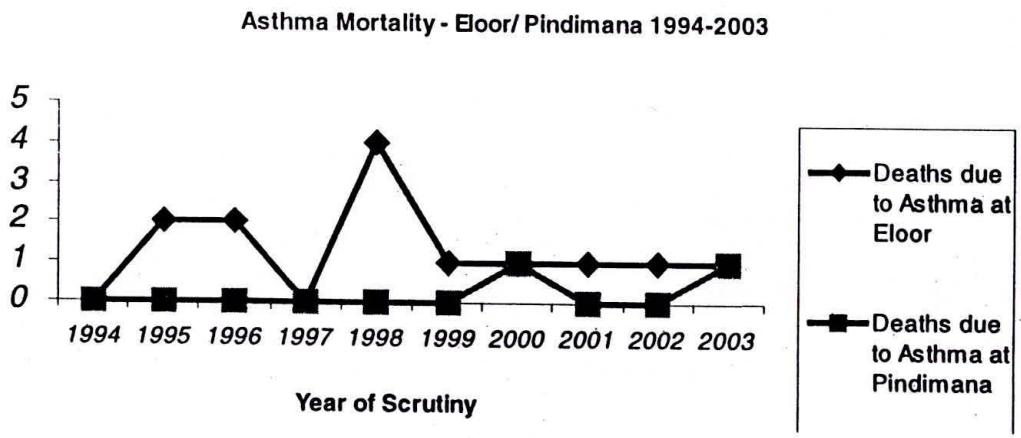
Questionnaires

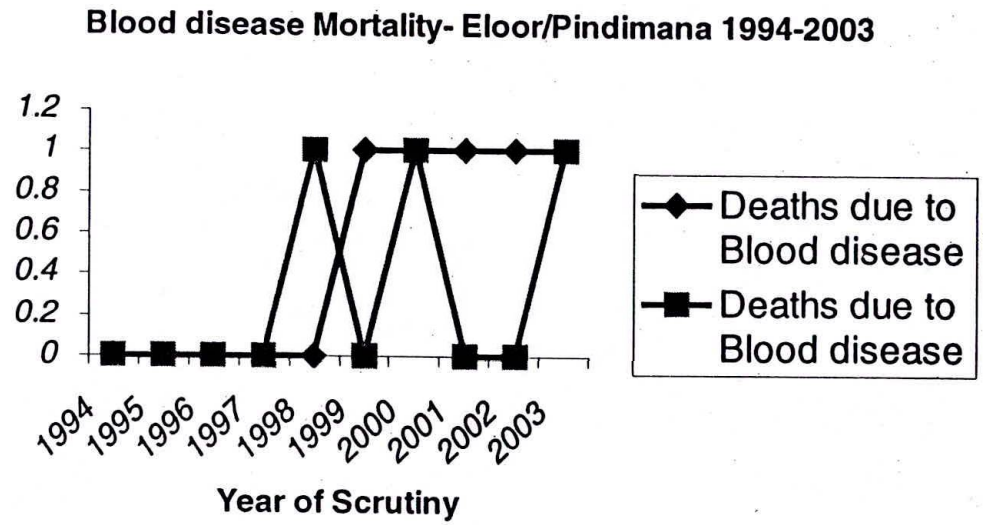
CHART-20: Factors influencing health status & contact with health services- Chapter 21 ICD-10 (International Classification of Diseases)



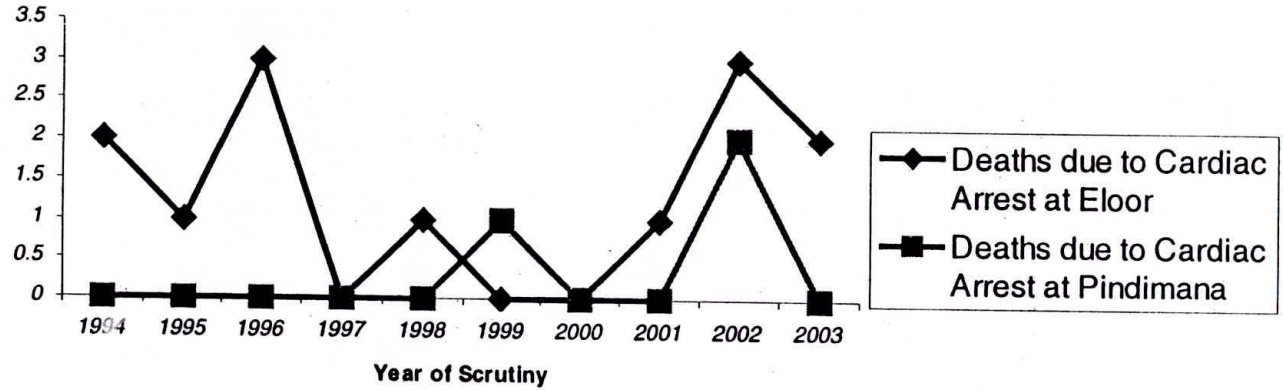
Age Group	A		B		C		A+B+C		(A+B+C)	(A+B+C)	Affected	Affected	Affected Population D		Total Population D		Affected Male	Affected Female
	male	female	male	female	male	female	male	female	Total Population - Male	Total Population Female	(A+B+C) Population (%) male	(A+B+C) Population (%) female	male	female	male	female	(D) Population (%)	(D) Population (%)
0-12 months	0	0	1	0	0	0	1	0	77	71	1.30	0.00	0	0	8	14	0.00	0.00
1-5 years	0	0	0	0	0	0	0	0	256	225	0.00	0.00	0	0	58	43	0.00	0.00
6-12 years	0	0	0	0	0	0	0	0	314	318	0.00	0.00	0	0	85	67	0.00	0.00
13-19 years	1	0	0	0	0	0	1	0	356	355	0.28	0.00	0	0	70	88	0.00	0.00
20-35 years	0	0	0	0	0	2	0	2	1212	1104	0.00	0.18	0	0	217	233	0.00	0.00
36-60 years	0	1	0	0	0	0	0	1	1168	1206	0.00	0.08	0	0	249	248	0.00	0.00
61+ years	0	0	0	0	0	0	0	0	376	418	0.00	0.00	0	0	129	126	0.00	0.00

CHART-21: Mortality figures

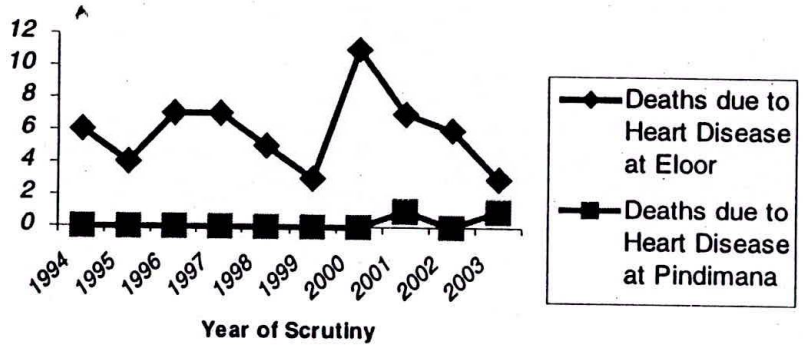




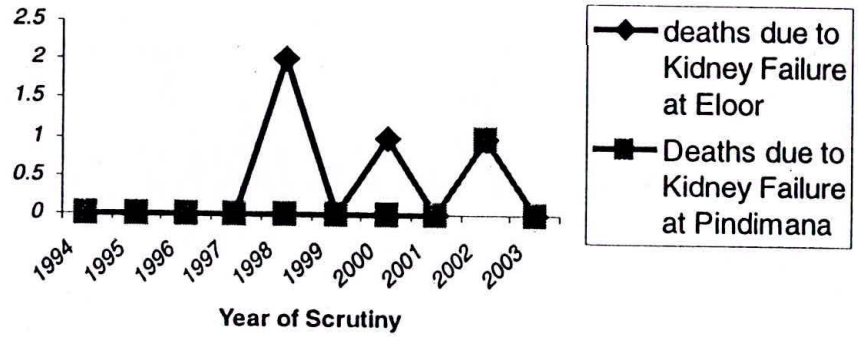
Cardiac Arrest Mortality - Eloor/Pindimana 1994-2003



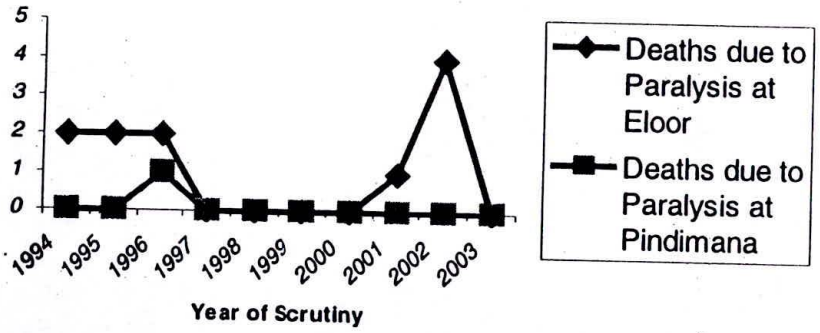
Heart Disease Mortality - Eloor/Pindimana 1994-2003



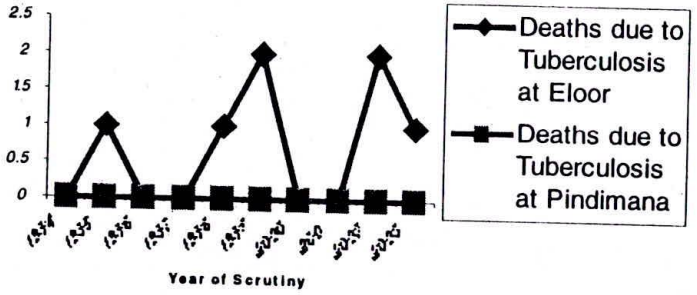
Kidney Failure Mortality - Eloor/Pindimana 1994-2003



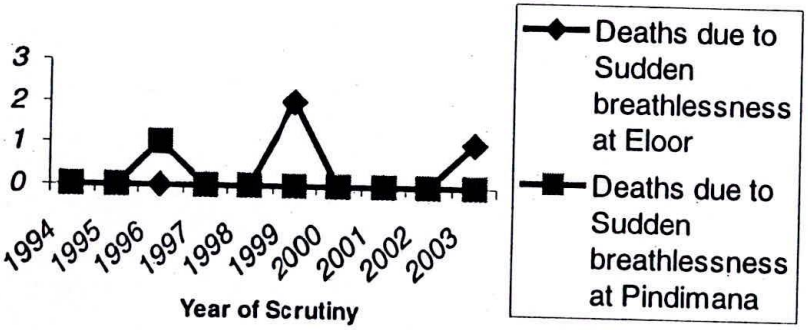
Paralysis Mortality - Eloor/Pindimana 1994-2003

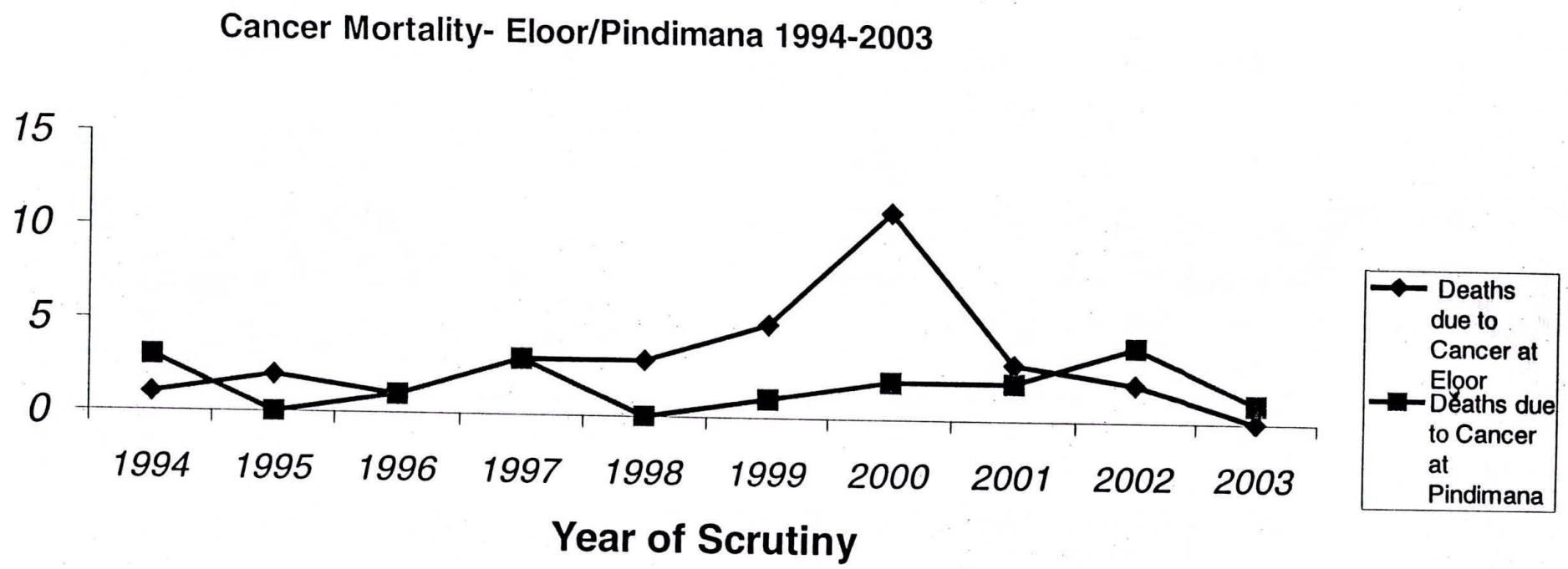


Tuberculosis Mortality - Eloor/Pindimana 1994-2003

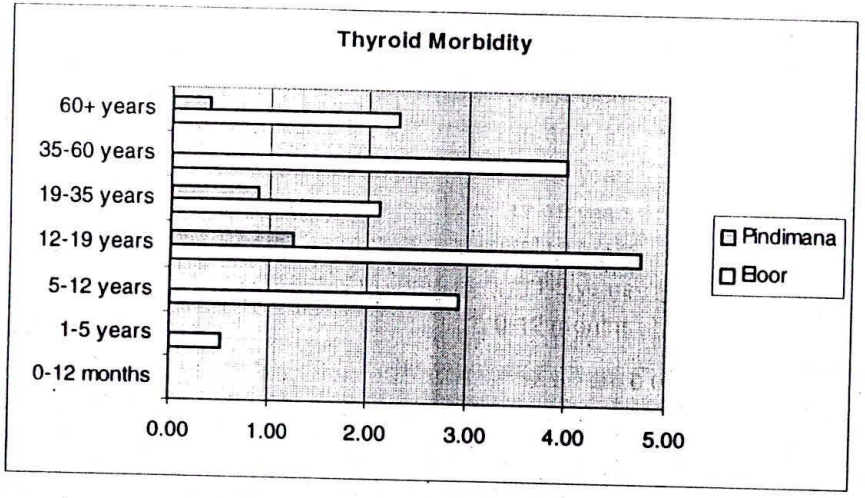


Sudden Breathlessness Mortality - Eloor/Pindimana 1994-2003




Cancer Mortality- Eloor/Pindimana 1994-2003
15
10
5
0
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year of Scrutiny
Deaths due to Cancer at Eloor
Deaths due to Cancer at Pindimana

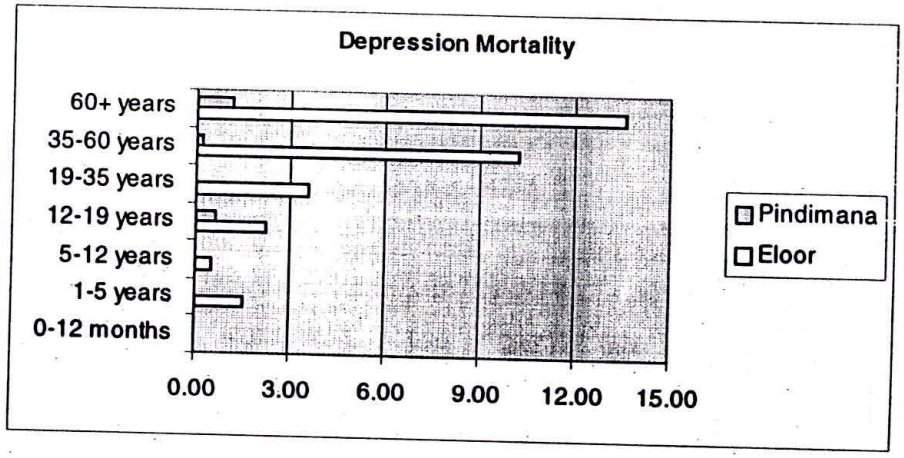
Thyroid



Age Group	A	B	C	Affected ELOOR Population (%)	D	Affected Population in Pindimana (%)
0-12 months	0	0	0	0.00	0	0
1-5 years	0	0	1	0.52	0	0
5-12 years	3	1	2	2.92	0	0
12-19 years	9	0	2	4.74	2	1.265822785
19-35 years	8	4	4	2.13	4	0.888888889
35-60 years	11	7	14	3.99	0	0
60+ years	2	2	2	2.31	1	0.390625
				16.61		2.545336674

Increased risk at Eloor **6.526522877**

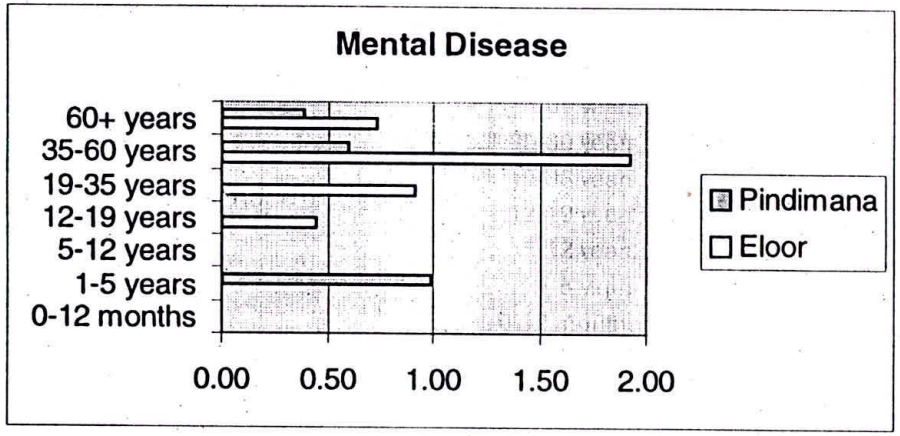
Depression



Age Group	A	B	C	Affected ELOOR Population (%)	D	Affected Population in Pindimana (%)
0-12 months	0	0	0	0.00	0	0
1-5 years	2	0	0	1.54	0	0
5-12 years	1	0	0	0.54	0	0
12-19 years	5	0	0	2.25	1	0.6329114
19-35 years	18	6	2	3.56	0	0
35-60 years	63	10	4	10.24	1	0.2008032
60+ years	28	5	1	13.62	3	1.171875
				31.76		2.00559

Increased risk at Eloor **15.83538**

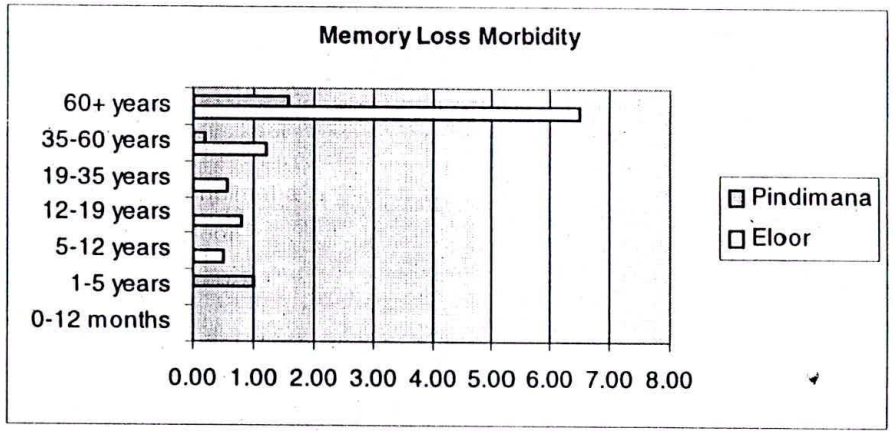
Mental Disease



Age Group	A	B	C	Affected ELOOR Population (%)	D	Affected Population in Pindimana (%)
0-12 months	0	0	0	0.00	0	0
1-5 years	0	0	0	0.00	1	0.990099
5-12 years	0	0	0	0.00	0	0
12-19 years	1	0	0	0.45	0	0
19-35 years	3	1	3	0.91	0	0
35-60 years	9	2	4	1.93	3	0.6024096
60+ years	1	1	0	0.73	1	0.390625
				4.02		1.983134

Increased risk at Eloor **2.025745**

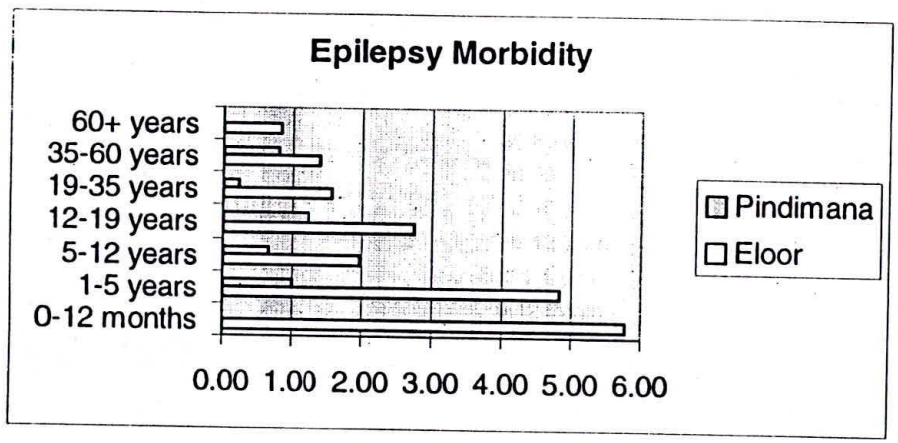
Memory Loss



Age Group	A	B	C	Affected ELOOR Population (%)	D	Affected Population in Pindimana (%)
0-12 months	0	0	0	0.00	0	0
1-5 years	0	0	0	0.00	1	0.990099
5-12 years	0	1	0	0.50	0	0
12-19 years	1	0	1	0.79	0	0
19-35 years	3	1	0	0.55	0	0
35-60 years	5	3	1	1.19	1	0.2008032
60+ years	9	6	2	6.48	4	1.5625
				9.51		2.7534022

Increased risk at Eloor **3.455678**

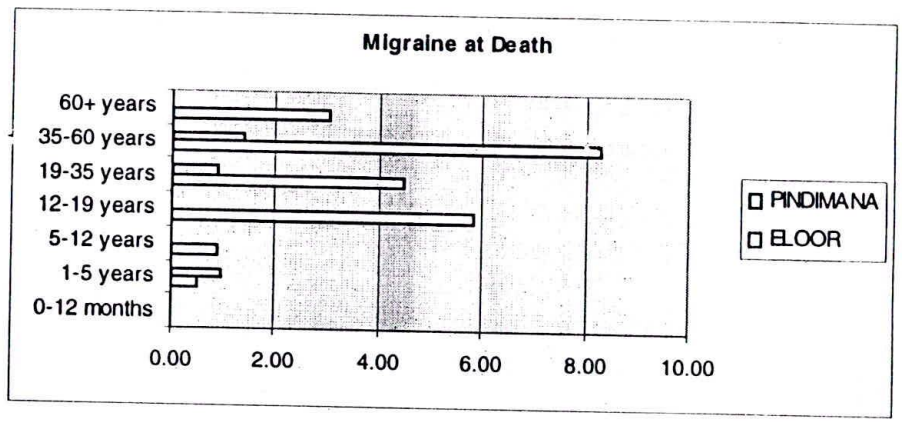
Epilepsy



Age Group	A	B	C	Affected ELOOR Population (%)	D	Affected Population in Pindimana (%)
0-12 months	1	1	1	5.76	0	0.00
1-5 years	4	2	1	4.82	1	0.99
5-12 years	2	1	1	1.98	1	0.66
12-19 years	2	3	1	2.74	2	1.27
19-35 years	4	6	2	1.58	1	0.22
35-60 years	3	4	4	1.39	4	0.80
60+ years	2	0	0	0.83	0	0.00
				19.12		3.9392516

Increased risk at Eloor 4.8533023

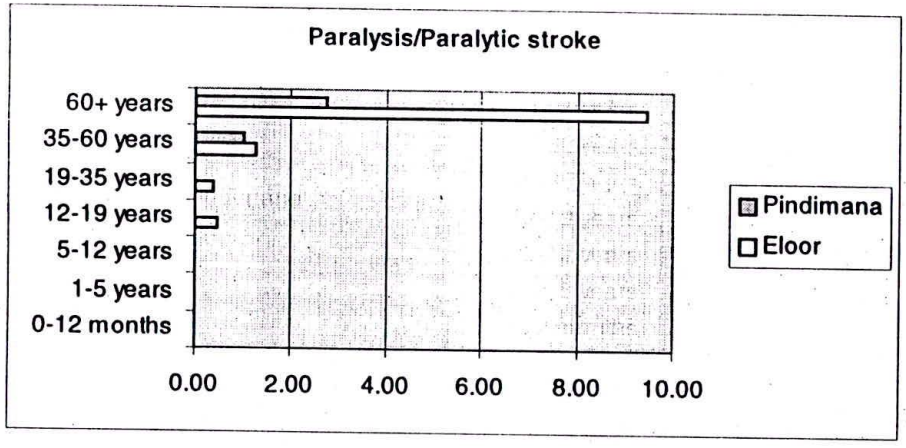
Migraine



Age Group	A	B	C	Affected ELOOR Population (%)	D	Affected Population in Pindimana (%)
0-12 months	0	0	0	0.00	0	0
1-5 years	0	0	1	0.52	1	0.990099
5-12 years	0	1	1	0.90	0	0
12-19 years	7	4	2	5.84	0	0
19-35 years	12	13	9	4.46	4	0.8888889
35-60 years	23	17	26	8.31	7	1.4056225
60+ years	1	7	1	3.05	0	0
				23.08		3.2846104

Increased risk at Eloor 7.0253247

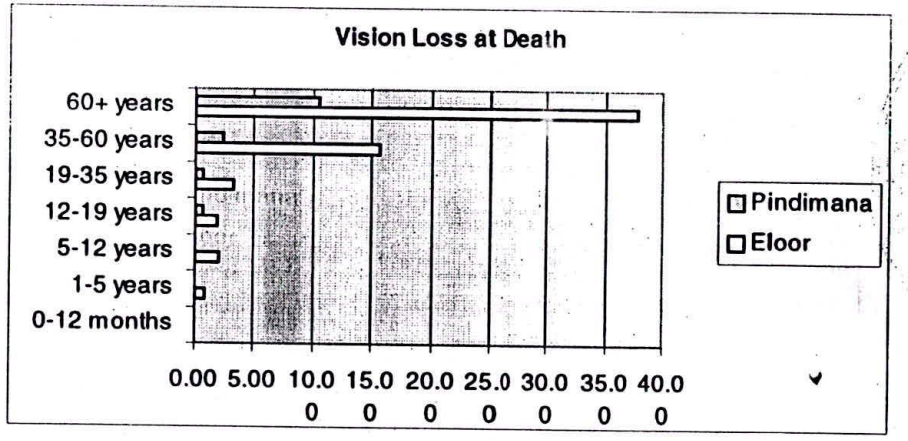
Paralysis and Paralytic Stroke



Age Group	A	B	C	Affected ELOOR Population (%)	D	Affected Population in Pindimana (%)
0-12 months	0	0	0	0.00	0	0
1-5 years	0	0	0	0.00	0	0
5-12 years	0	0	0	0.00	0	0
12-19 years	1	0	0	0.45	0	0
19-35 years	0	1	2	0.37	0	0
35-60 years	1	5	4	1.26	5	1.0040161
60+ years	8	14	4	9.44	7	2.734375
				11.52		3.7383911

Increased risk at Eloor **3.0808499**

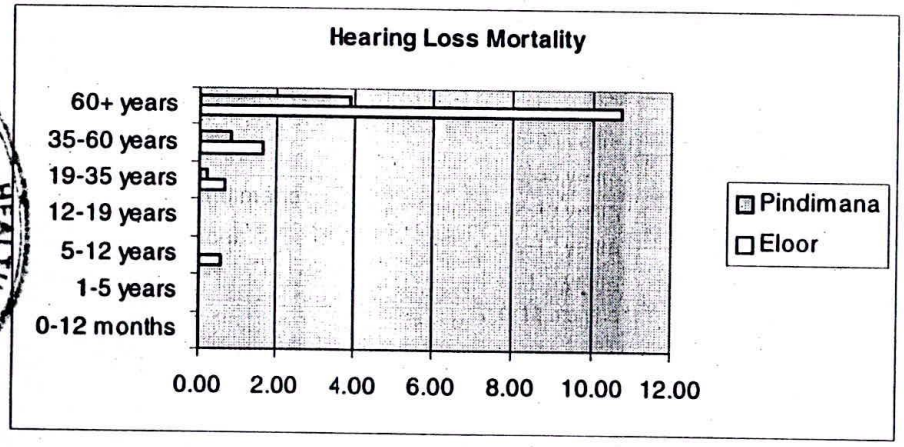
Vision Loss



Age Group	A	B	C	Affected ELOOR Population (%)	D	Affected Population in Pindimana (%)
0-12 months	0	0	0	0.00	0	0
1-5 years	1	0	0	0.77	0	0
5-12 years	3	0	1	2.02	0	0
12-19 years	3	1	2	1.82	1	0.6329114
19-35 years	10	8	6	3.17	3	0.6666667
35-60 years	28	42	55	15.63	12	2.4096386
60+ years	28	36	35	37.78	27	10.546875
				61.19		14.256092

Increased risk at Eloor **4.2919149**

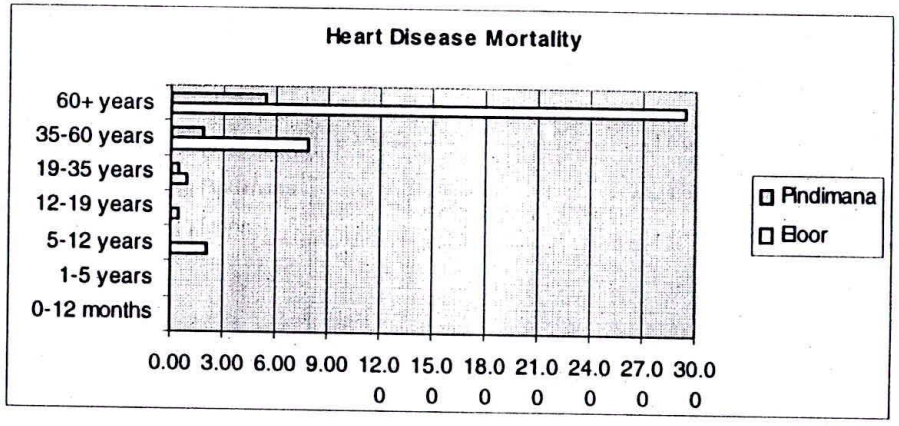
Hearing Loss Mortality



Age Group	A	B	C	Affected ELOOR Population (%)	D	Affected Population in Pindimana (%)
0-12 months	0	0	0	0.00	0	0
1-5 years	0	0	0	0.00	0	0
5-12 years	1	0	0	0.54	0	0
12-19 years	0	0	0	0.00	0	0
19-35 years	2	2	1	0.66	1	0.2222222
35-60 years	4	3	6	1.62	4	0.8032129
60+ years	7	10	11	10.71	10	3.90625
				13.53		4.9316851

Increased risk at Eloor **2.7433386**

Heart Disease

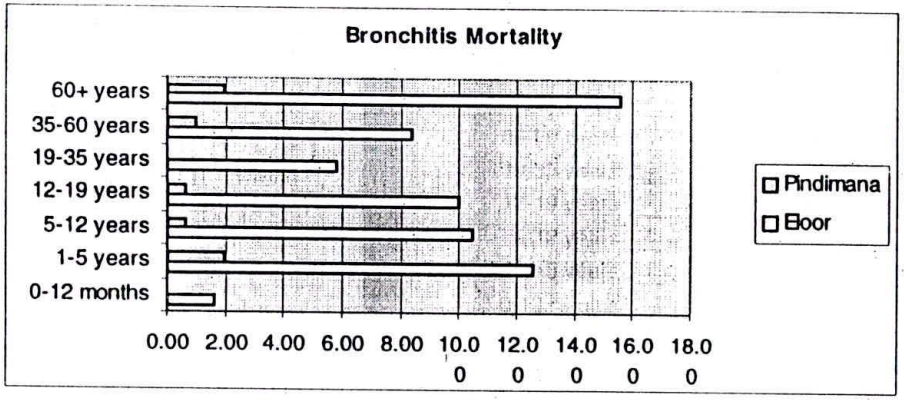


Age Group	A	B	C	Affected ELOOR Population (%)	D	Affected Population in Pindimana (%)
0-12 months	0	0	0	0.00	0	0
1-5 years	0	0	0	0.00	0	0
5-12 years	1	3	0	2.04	0	0
12-19 years	0	1	0	0.50	0	0
19-35 years	3	4	0	0.95	2	0.4444444
35-60 years	24	25	11	7.84	9	1.8072289
60+ years	23	40	17	29.37	14	5.46875
				40.70		7.7204234

Increased risk at Eloor **5.2723343**

OH-100 P03

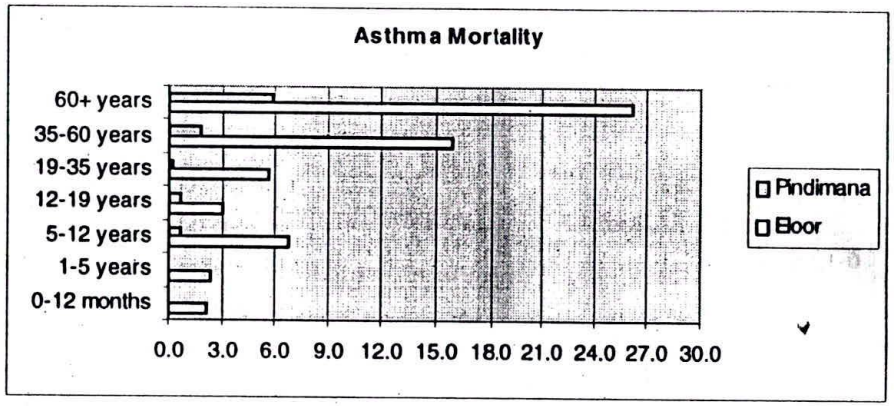
Bronchitis



Age Group	A	B	C	Affected ELOOR Population (%)	D	Affected Population in Pindimana (%)
0-12 months	0	0	1	1.59	0	0
1-5 years	8	2	10	12.56	2	1.980198
5-12 years	11	1	10	10.46	1	0.6578947
12-19 years	10	2	13	9.97	1	0.6329114
19-35 years	15	0	31	5.79	0	0
35-60 years	22	3	45	8.40	5	1.0040161
60+ years	11	0	26	15.53	5	1.953125
				64.32		6.2281452

Increased risk at Eloor **10.326668**

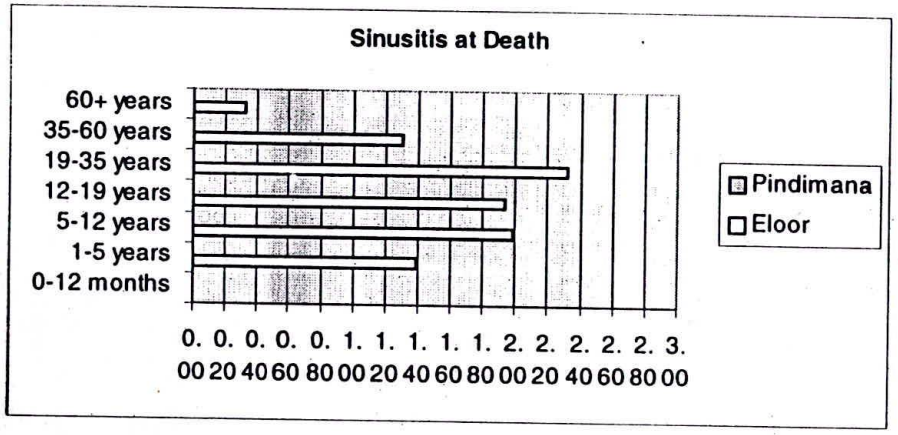
Asthma



Age Group	A	B	C	Affected ELOOR Population (%)	D	Affected Population in Pindimana (%)
0-12 months	0	1	0	2.17	0	0
1-5 years	0	3	1	2.36	0	0
5-12 years	1	6	8	6.75	1	0.6578947
12-19 years	1	1	6	3.01	1	0.6329114
19-35 years	8	28	7	5.61	1	0.2222222
35-60 years	42	53	27	15.85	9	1.8072289
60+ years	18	31	21	26.14	15	5.859375
				61.90		9.1796323

Increased risk at Eloor **6.7430415**

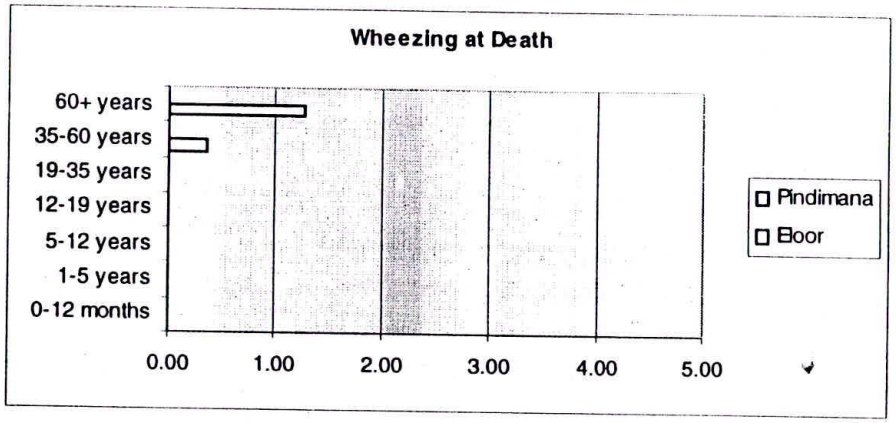
Sinusitis



Age Group	A	B	C	Affected ELOOR Population (%)	D	Affected Population in Pindimana (%)
0-12 months	0	0	0	0.00	0	0
1-5 years	1	1	0	1.38	0	0
5-12 years	2	1	1	1.98	0	0
12-19 years	2	0	3	1.93	0	0
19-35 years	4	8	6	2.32	0	0
35-60 years	4	4	2	1.30	0	0
60+ years	0	1	0	0.32	0	0
				9.24		0

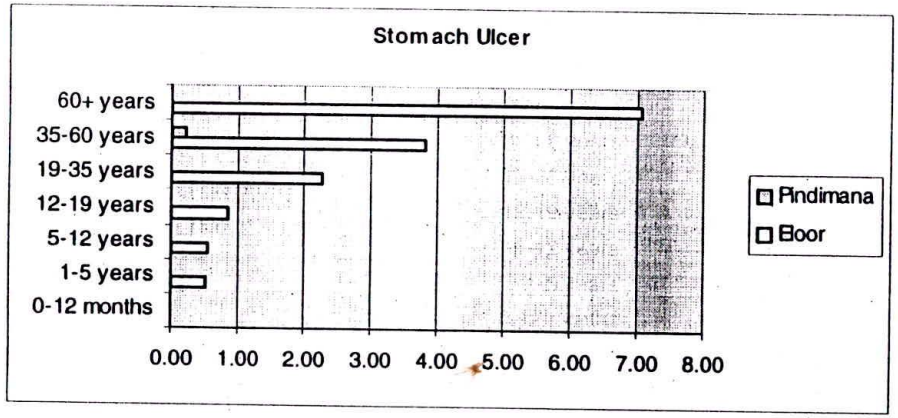
Increased risk at Eloor

Wheezing



Age Group	A	B	C	Affected ELOOR Population (%)	D	Affected Population in Pindimana (%)
0-12 months	0	0	0	0.00	0	0
1-5 years	0	0	0	0.00	0	0
5-12 years	0	0	0	0.00	0	0
12-19 years	0	0	0	0.00	0	0
19-35 years	0	0	0	0.00	0	0
35-60 years	1	0	2	0.36	0	0
60+ years	0	0	3	1.27	0	0

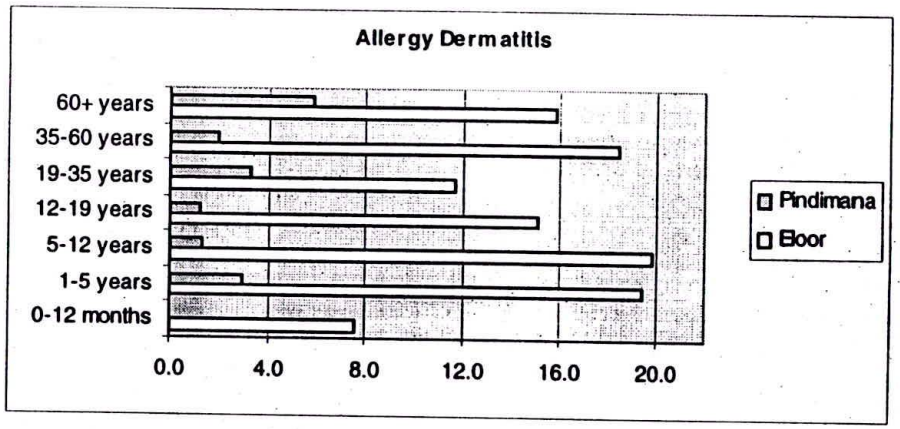
Stomach Ulcers



Age Group	A	B	C	Affected ELOOR Population (%)	D	Affected Population in Pindimana (%)
0-12 months	0	0	0	0.00	0	0
1-5 years	0	0	1	0.52	0	0
5-12 years	1	0	0	0.54	0	0
12-19 years	0	1	1	0.84	0	0
19-35 years	0	11	7	2.26	0	0
35-60 years	5	14	11	3.81	1	0.2008032
60+ years	3	13	4	7.05	0	0
				15.02		0.2008032

Increased risk at Eloor **74.78257**

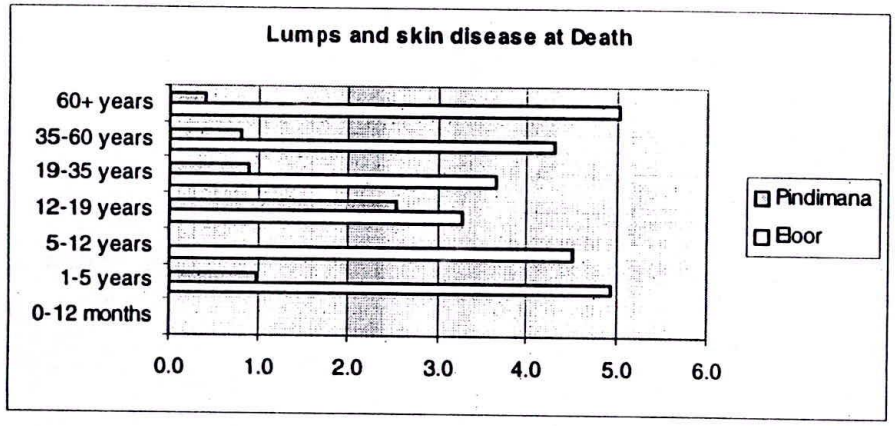
Allergy Dermatitis



Age Group	A	B	C	Affected ELOOR Population (%)	D	Affected Population in Pindimana (%)
0-12 months	3	0	1	7.59	0	0
1-5 years	17	7	4	19.44	3	2.970297
5-12 years	24	9	6	19.88	2	1.3157895
12-19 years	17	10	7	15.06	2	1.2658228
19-35 years	42	29	17	11.73	15	3.3333333
35-60 years	53	52	38	18.43	10	2.0080321
60+ years	10	21	12	15.86	15	5.859375
				107.99		16.75265

Increased risk at Eloor **6.4462183**

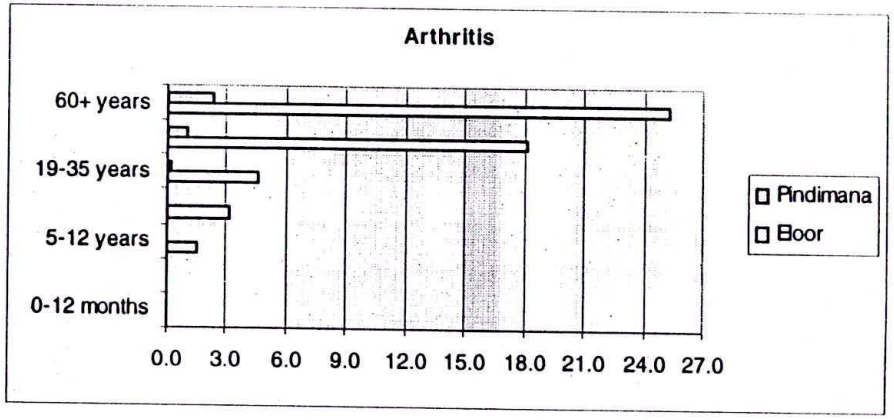
Lumps on Body and Skin Disease



Age Group	A	B	C	Affected ELOOR Population (%)	D	Affected Population in Pindimana (%)
0-12 months	0	0	0	0.00	0	0
1-5 years	2	3	3	4.93	1	0.990099
5-12 years	5	2	2	4.51	0	0
12-19 years	2	2	4	3.28	4	2.5316456
19-35 years	10	9	9	3.65	4	0.8888889
35-60 years	12	10	12	4.31	4	0.8032129
60+ years	6	4	3	5.02	1	0.390625
				25.70		5.6044713

Increased risk at Eloor **4.5857298**

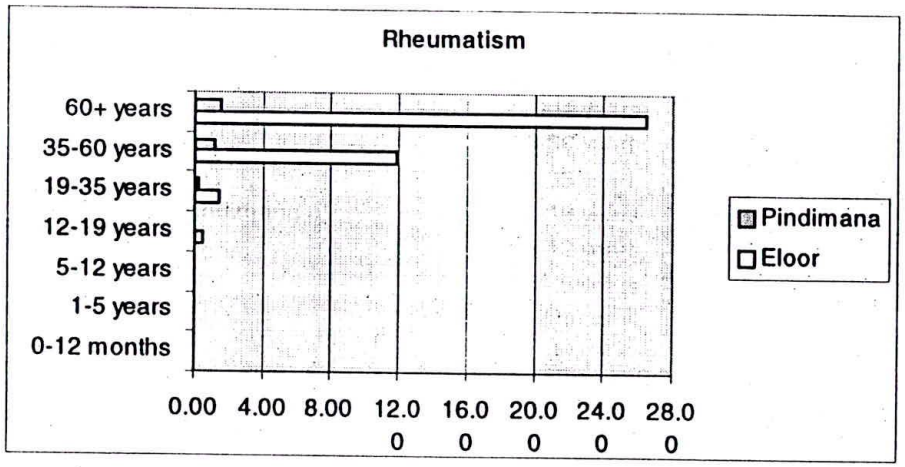
Arthritis



Age Group	A	B	C	Affected ELOOR Population (%)	D	Affected Population in Pindimana (%)
0-12 months	0	0	0	0.00	0	0
1-5 years	0	0	0	0.00	0	0
5-12 years	1	2	0	1.54	0	0
12-19 years	1	4	2	3.14	0	0
19-35 years	6	18	12	4.61	1	0.2222222
35-60 years	20	74	48	18.12	5	1.0040161
60+ years	8	36	25	25.26	6	2.34375
				52.67		3.5699883

Increased risk at Eloor **14.754066**

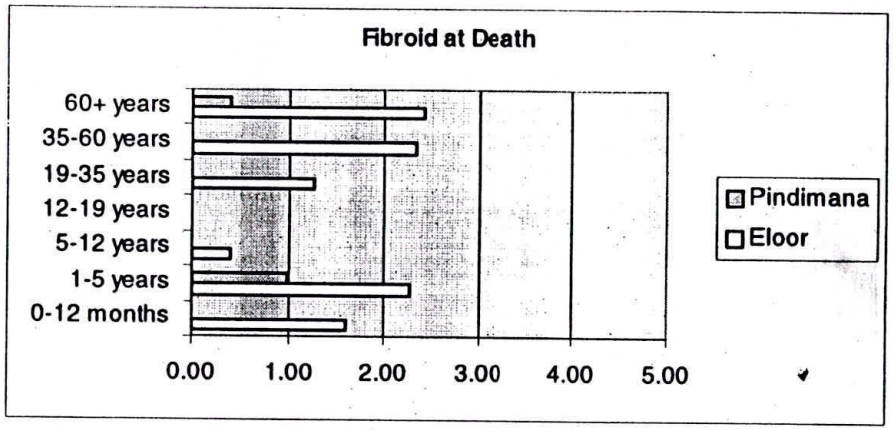
Rheumatism



Age Group	A	B	C	Affected ELOOR Population (%)	D	Affected Population in Pindimana (%)
0-12 months	0	0	0	0.00	0	0
1-5 years	0	0	0	0.00	0	0
5-12 years	0	0	0	0.00	0	0
12-19 years	1	0	0	0.45	0	0
19-35 years	1	6	4	1.40	1	0.2222222
35-60 years	12	54	26	11.86	6	1.2048193
60+ years	18	36	18	26.46	4	1.5625
				40.16		2.989541

Increased risk at Eloor **13.43509**

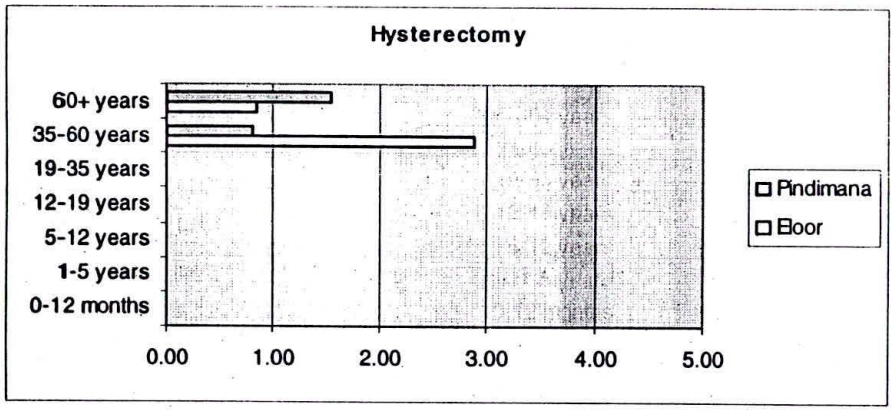
Fibroid at Death



Age Group	A	B	C	Affected ELOOR Population (%)	D	Affected Population in Pindimana (%)
0-12 months	0	0	1	1.59	0	0
1-5 years	0	2	2	2.26	1	0.990099
5-12 years	0	0	1	0.40	0	0
12-19 years	0	0	0	0.00	0	0
19-35 years	2	3	5	1.27	0	0
35-60 years	6	3	10	2.33	0	0
60+ years	0	1	5	2.43	1	0.390625
				10.28		1.380724

Increased risk at Eloor **7.4434971**

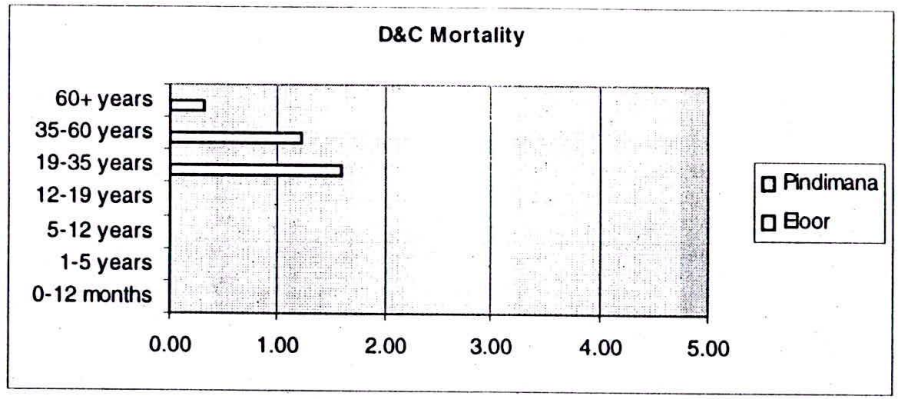
Hysterectomy



Age Group	A	B	C	Affected ELOOR Population (%)	D	Affected Population in Pindimana (%)
0-12 months	0	0	0	0.00	0	0
1-5 years	0	0	0	0.00	0	0
5-12 years	0	0	0	0.00	0	0
12-19 years	0	0	0	0.00	0	0
19-35 years	0	0	0	0.00	0	0
35-60 years	3	10	10	2.88	4	0.8032129
60+ years	0	0	2	0.84	4	1.5625
				3.73		2.3657129

Increased risk at Eloor **1.5752201**

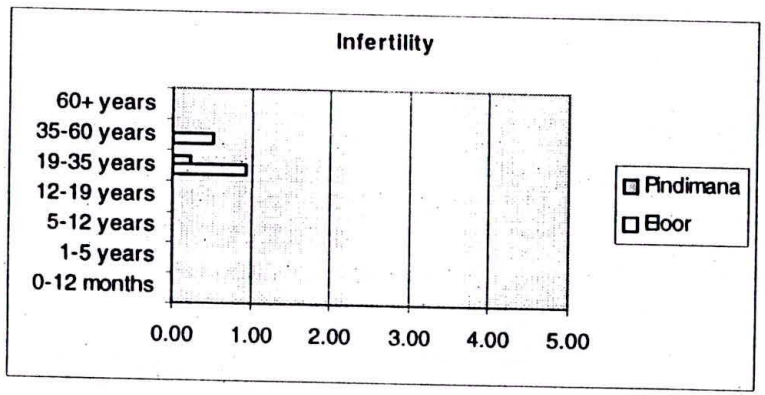
D & C



Age Group	A	B	C	Affected ELOOR Population (%)	D	Affected Population in Pindimana (%)
0-12 months	0	0	0	0.00	0	0
1-5 years	0	0	0	0.00	0	0
5-12 years	0	0	0	0.00	0	0
12-19 years	0	0	0	0.00	0	0
19-35 years	3	8	1	1.58	0	0
35-60 years	2	7	0	1.22	0	0
60+ years	0	1	0	0.32	0	0
				3.12		0

Increased risk at Eloor ~

Infertility



Age Group	A	B	C	Affected ELOOR Population (%)	D	Affected Population in Pindimana (%)
0-12 months	0	0	0	0.00	0	0
1-5 years	0	0	0	0.00	0	0
5-12 years	0	0	0	0.00	0	0
12-19 years	0	0	0	0.00	0	0
19-35 years	2	3	2	0.91	1	0.2222222
35-60 years	1	2	1	0.52	0	0
60+ years	0	0	0	0.00	0	0
				1.43		0.2222222

Increased risk at Eloor **6.4274339**

APPENDIX 7: LIST OF RESOURCES FOR COMMUNITY AND RESEARCH GROUPS (Community Health Assessment Guidebooks)

India:

Title: The Manual of Lay Epidemiology
Contact: The Community Health Cell
Address: # 367, Srinivasa Nilaya,
Jakkasandra 1th Main????
Koramangla Block 1
Bangalore-560034
Tel: +91-80-5525372/ 5531518
Website: www.sochara.org , www.phmindia.org
Description: The Community Health Cell is a group of Organised Health Professionals based in Bangalore, India dedicated to the cause of "Health for All" and the paradigm shift from 'disease-treatment' to 'health-preservation'. Their Library is a fabulous collection of rare manuscripts from around the world, most of them original works.

Canada

Title: Community Sustainability Auditing Resource Kit
Contact: University of Victoria
Address: PO Box 1700 STN CSC,
Victoria, BC V8W 2Y2
Canada
Tel: 250-721-7211
Web site: http://web.uvic.ca/~csap/frbc/reskit/menu.html
Description: An online resource for sustainable community auditing. This kit is mainly intended for communities with a threatened resource-based economy and has useful information about the development and use of sustainability auditing protocols.

Title: Environment and Sustainable Development Indicators (ESDI) Initiative
Contact: National Roundtable on Environment and the Economy
Address: National Round Table on the Environment and the Economy
344 Slater Street, Suite 200
Ottawa, Ontario K1R 7Y3
Canada
Tel: 613-992-7189
E-mail: admin@nrtee-trnee.ca
Web site: http://www.nrteetrnee.
ca/eng/programs/Current_Programs/SDIndicators/Approach_to_Indi
cators/SDIndicators_Approach_e.htm
Description: A three-year project aimed at developing and testing indicators. Workshops are available for training in indicator selection and data gathering.

Title: Pilot Project to Develop a Community Health Measure for Small and Rural Communities
Contact: The Canadian Federation of Agriculture and Federation of Canadian Municipalities
Address: Federation of Canadian Municipalities
24 Clarence Street
Ottawa, Ontario K1N 5P3
Canada
Tel: 613-241-5221
E-mail: federation@fcm.ca

Web site: http://www.fcm.ca/english/national/ruralhealth-e.pdf
Description: This web site provides a description of a 1999 pilot project in three small Canadian communities. The report presents suggestions to be used as tools for small and rural communities to undertake future community discussion and action.

Title: Signs of Progress, Signs of Caution
Contact: Ontario Healthy Communities Coalition
Address: 1202-415 Yonge Street
Toronto, Ontario M5B 2E7
1-800-766-3418
Web site: http://www.opc.on.ca/ohcc/publications/signs/signspdf.htm
Description: The goal of this guidebook is to help the user(s) make "communities healthier and more sustainable". A number of steps necessary for developing health and sustainability indicators are described and worksheets to accompany each step are provided. A useful listing of potential indicators of health and sustainability is also included.

Title: Sustainable Community Indicators Program – User's Manual
Contact: CMHC and Environment Canada
Address: scip-pidd@ec.gc.ca
Web site: http://www.ec.gc.ca/scip-pidd/English/indicators.cfm
Description: Detailed manual and guide to conceptualizing sustainability, identifying target markets, choosing a framework and developing and evaluating indicators. The manual accompanies the Sustainable Community
Indicators Program database. A copy of the database and manual can be downloaded from the address listed above.

Title: Sustainable Community Resource Package
Contact: Ontario Roundtable on Environment and Economy
Address: The Ontario Roundtable was disbanded in 1995, but the resource can found at the web site listed below.
Web site: http://www.law.ntu.edu.tw/sustain/intro/ortee/
Description: A resource package on sustainable communities featuring case studies of community sustainability initiatives in Ontario. This package also provides a step-by-step guide to profiling a community including methods for looking at community activities in terms of four quadrants: environmental,
economic, social and health. The package also outlines action plans and evaluation processes for healthy community development as well as literature about models of sustainable community living.

United States

Title: Check Your Success. A Guide to Developing Indicators for Community Based Environmental Projects.
Contact: Department of Urban Affairs and Planning, Virginia Tech, US. EPA
Address: Dr. JoAnne Carmin
Department of Urban Affairs and Planning
105 Architecture Annex, MC 0113
Virginia Polytechnic Institute and State University
Blacksburg, VA 24061
USA
Tel: 540-231-5426
Web site: http://www.uap.vt.edu/checkyoursuccess
Description: Although the primary focus of this guide is environmental, the authors adopt a broad vision of environment (social, economic, environmental, social and organizational). The first part of the manual provides information on the benefits of developing and measuring indicators and then leads into a number of case studies. One of the most useful sections of this book is the

"Indicator Workshop" which is presented in the appendices. This section is easy to follow and contains a number of useful worksheets and exercises.

Title: Community Based Environmental Protection: A Resource Book for Protecting Ecosystems and Communities.

Contact: US EPA
Address: Community Based Environmental Protection
1200 Pennsylvania Avenue, NW
Mail Code 1807T
Washington, DC 20460
USA
Tel: 202-566-2182
Web site: http://www.epa.gov/ecocommunity/tools/resourcebook.htm

Description: This resource book includes sections on how and why to select and use community indicators. It also includes discussion of how the ecosystem is integrally linked to the economy and to the quality of life and social aspects of each community. The guide is available in PDF format on the US Environmental Protection Agency web site.

Title: The Community Health Indicators Handbook

Contact: Redefining Progress
Address: One Kearny Street
Fourth Floor
San Francisco, CA 94108
USA
Tel: 415-481-1191
Toll Free: 1-800-896-2100
Web site: www.rprogress.org

Description: A detailed handbook for creating measures of community health, wellbeing and sustainability progress toward community sustainability. The handbook contains extensive information on community indicators including a step-by-step guide to developing an indicator project, a glossary, case studies, resources and a national directory of indicator projects.

Title: Community Outcomes Toolkit

Web site: http://ag.arizona.edu/fcr/fs/nowg/prodev_newlinks.html

Description: This toolkit is part of the University of Arizona's web site for Evaluating National Outcomes. It contains a step-by-step plan for identifying and evaluating community building indicators. The web site provides examples of indicators and lists tools and resources available to help communities set goals and develop, measure and evaluate community indicators.

Title: The Community Toolbox

Contact: ToolBox@ukans.edu
Web site: http://ctb.lsi.ukans.edu/tools/EN/tools_toc.htm

Description: This web site was created by the University of Kansas Work Group on Health Promotion and Community Development in Lawrence, Kansas. The core of the Tool Box is the "how-to tools." The how-to sections use simple language to explain how to do the different tasks necessary for community health and development. There are sections on developing indicators, leadership, strategic planning, community assessment, advocacy, grant writing and evaluation. Each section includes a description of the task, advantages of doing it, step-by-step guidelines, examples, checklists of points to review and training materials.

Title: Community Visioning and Strategic Planning Handbook

Web site: The handbook is available at
www.scs.unt.edu/classes/CSAG/5790/001/CmtyVisioning/com_visioning_handbook1.htm

Description: The University of North Texas has posted this community visioning and strategic planning handbook on its student web site. The handbook was developed through a grant from the

Ford Foundation and the Carnegie Corporation of New York and produced by the Alliance for National Renewal and the National Civic League. It presents steps toward developing a "community vision" and includes sections on selecting and evaluating key performance areas.

Title: Green Communities Assistance Kit

Contact: r3green@epa.gov

Web site: http://www.epa.gov/greenkit/indicator.htm#select

Description: The US Environmental Protection agency has a Green Communities Project Web site that details how to select, use, evaluate and report on community indicators..

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Title: Guide to Sustainable Community Indicators

Contact: Maureen Hart

Address: Sustainable Measures

P.O. Box 361

North Andover, MA 01845

USA

Tel: 978-975-1988

Web site: http://www.sustainablemeasures.com/

Description: This comprehensive guide covers all the steps necessary for developing indicators. It begins with a description of the issues associated with sustainability, and then leads the reader through the necessary steps for organizing and measuring sustainability indicators. The appendices contain helpful information such as: a listing of community indicators used by other projects, resources and examples of other community indicator projects.

Title: Measuring Community Success and Sustainability: An Interactive Workbook

Contact: Northern Central Regional Center for Rural Development

Address: Iowa State University

108 Curtiss Hall

Ames, IA 50011-1050

USA

Tel: 515-294-8321

Web site: http://www.ncrcrd.iastate.edu

Description: This guide was developed to help communities learn how to measure the effects of rural development and conservation efforts. The focus of the guide is on five key outcomes that were developed by rural communities. The outcomes range from "increase in knowledge, skills and ability of local people" to "appropriately diverse and healthy economics". The guide begins with a general introduction to measuring indicators and then outlines a measurement plan and year-end assessment for each of the five outcomes stated.

Title: Monitoring Community Sustainability

Contact: Izaak Walton League

Address: 707 Conservation Lane

Gaithersburg, MD 20878

USA

Tel: (301) 548-0150

Toll-Free: (800) IKE-LINE (453-5463)

E-Mail: general@iwla.org or sustain@iwla.org

Web site: http://www.iwla.org/sep/pubs/monitor.html

Description: This 23-page workshop guide, published in 1998, provides directions for identifying and measuring indicators that reflect a community's progress toward goals that promote sustainability.

Title: Neighborhood Sustainability Indicators Guidebook

Ford Foundation and the Carnegie Corporation of New York and produced by the Alliance for National Renewal and the National Civic League. It presents steps toward developing a "community vision" and includes sections on selecting and evaluating key performance areas.

Title: Green Communities Assistance Kit

Contact: r3green@epa.gov

Web site: http://www.epa.gov/greenkit/indicator.htm#select

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Web site: http://www.iwla.org/sep/pubs/monitor.html

Description: This 23-page workshop guide, published in 1998, provides directions for identifying and measuring indicators that reflect a community's progress toward goals that promote sustainability.

Title: Neighborhood Sustainability Indicators Guidebook

Contact: Crossroads Resource Center
Address: P.O. Box 7423
Minneapolis, Minnesota 55407
USA
Tel: 612-869-8664
kmeter@crcworks.org
Web site: http://www.crcworks.org/guide.pdf
Description: This guidebook was produced for the Urban Ecology Coalition of Minneapolis. It is aimed at building "strong, self-determined, sustainable communities." The guidebook defines "neighborhood sustainability indicators" and provides a guide to developing and refining indicators.

Title: Outcomes Toolkit: The Results Oriented System for Community Improvement

Contact: Michael Bilton, Director, ACT National Outcomes Network
Address: The Healthcare Forum Foundation
180 Montgomery St. Suite 1520
San Francisco, CA 94104
USA
Tel: 415-248-8411
Fax: 415-248-0411
E-mail: mbilton@healthforum.com
Web site: www.act-toolkit.com
Description: Web-based application for developing and tracking community indicators. On this web site, stakeholders can develop a community profile, receive technical assistance in developing indicators and share information.

Title: Sustainability Starts in your Community

Contact: earthday@earthday.net.
Address: **Earthday Washington, D.C., USA**
1616 P Street NW, Suite 200
Washington, D.C. 20036 USA
Tel: 202-518-0044
Fax: 202-518-8794

Earthday Seattle, USA
811 First Avenue, Suite 466
Seattle, WA 98104 USA
Tel: 206-876-2000
Fax: 206-876-2015
Web site: http://www.earthday.net/pdf/goals/Sustainability_Guide.pdf
Description: This community indicator guide was produced in April 2002 by Redefining Progress and Earth Day Network. It is a step-by-step guide to developing and reviewing community indicators. The guide also provides suggestions for ways to involve the larger community in indicator projects.

Title: Sustainable Community Indicators: a Review of National Methods and Suggestions

Contact: Long Island University, Institute for Sustainable Development
Web site: www.luinet.edu/sustain/si.html
Description: Review and comparison of ten leading indicator projects, definitions of sustainability and indicators and discussion of how to start an indicator project. Online tools are also available toward developing and maintaining community indicator projects.

Title: The Sustainable Development Toolkit

Contact: John Lambie, Director, Florida House, Institute for Sustainable

Developmentjl@i4sd.org
Address: Florida House Institute for Sustainable Development, Inc.
4600 Beneva Road
Sarasota, Florida 34233
USA
Tel: 941-927-2020
Web site: http://www.i4sd.org/toolkit.htm
Description: A toolkit of process and design tools to support citizen-based sustainable community development planning processes. One of the sections in the toolkit is aimed at helping citizens and other stakeholders develop sustainable community indicators.

Europe

Title: Cities Environment Reports On the Internet (CEROI)
Contact: CEROI Secretariat
Address: UNEP/GRID-Arendal
Longum Park
Service Box 706
N-4808 Arendal
Norway
Fax: +47 37 03 50 50
E-mail:ceroi@grida.no
Web site: http://www.ceroi.net/ind/index.htm
Description: This project follows up on Chapter 40 of Agenda 21. CEROI provides a template and software including an Encyclopedia of Indicators for member cities wishing to create and use indicator data on the Internet.
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Title: Communities Count: The LITMUS Test
Contact: New Economics Foundation
Address: Cinnamon House
6-8 Cole Street
London SE1 4YH
UK
Tel: 020-7407 7447
Web site: http://www.neweconomics.org/uploadstore/pubs
Description: This useful guidebook describes the necessary steps to develop and monitor indicators. It also describes the approach taken and lessons learned from the LITMUS project (local indicators to monitor urban
sustainability). The guide is user friendly and easy to follow.

Title: The Dashboard of Sustainability
Contact: Consultative Group on Sustainable Development Indicators (CGSDI)
Address: CGSDI Secretariat
International Institute for Sustainable Development
161 Portage Avenue East, 6th Floor
Winnipeg, Manitoba R3B 0Y4
Canada
Tel: +1-204-958-7700
E-mail: phardi@iisd.ca
Web site: http://www.iisd.org/cgsdi/intro_dashboard.htm
Description: The Dashboard of Sustainability is an online tool designed to be understood by experts, the media, policy-makers and the general public. Using the metaphor of a vehicle's instrument panel, it displays countryspecific assessments of economic, environmental, social and institutional performance toward (or away from) sustainability.

Title: Local Quality of Life Counts
Contact: Mark Jeffcote, Sustainable Development Advisor
Address: Department of the Environment, Transport and the Regions
Free Literature
PO Box 236
Wetherby LS23 7NB
UK
Tel: 0870 1226 236
Web site: http://www.defra.gov.uk/environment/sustainable/index.htm
Or http://www.la21-uk.org.uk
Description: A handbook offering a guide for measuring sustainable development and quality of life in local communities. It presents a menu of 29 indicators, guidance for preparing community strategies and developing indicators, suggested methodologies for collecting data, a checklist of issues to stimulate discussion and a list of eight "best value" performance indicators.
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Title: Local Sustainability: Campaign Interactive.
Contact: European Commission
Mr. Anthony Payne
Campaign Co-ordinator & Head of Office
E-mail: campaign.anthony@skynet.be
Address: European Sustainable Cities & Towns Campaign
Rue de Trèves/Trierstraat 49-51
box 3
B - 1040
Brussels
Phone: +32 2 230 53 51
E-mail: campaign.office@skynet.be
Web site: http://www.sustainable-cities.org/sub12a.html
Description: The European good practices Information Service and Best Practices Database. Contains examples of good practices and policy documents on sustainability and the urban environment.
Title: Towards a Local Sustainability Profile
Contact: Ambiente Italia
Address: Instituto di Ricerche (responsabile del coordinamento scientifco)
all'attenzione di Claudia Semenza
Via Poerio 39
20129 Milano, Italy
Tel: 0039 02 277441
E-mail: ecip@ambienteitalia.it.
Web site: http://www.sustainable-cities.org/indicators/index2.htm
Description: The European Common Indicators is a monitoring initiative focused on sustainability at the local level. The project is ongoing and accepting new participants. Support services are provided to participating authorities during the testing phase: technical support (scientific expertise, helpdesk, workshops, etc.), methodological development, pilot activities on the Ecological Footprint, good practice collection and exchange, dissemination activities, and evaluation, reporting, recommendations and guidelines.
Title: Urban Indicators Toolkit
Contact: United Nations Center for Human Settlements (Habitat)
Address: Global Urban Observatory and Statistics
Urban Secretariat, UNCHS (Habitat)
PO Box 30030

Nairobi
Kenya
Tel: 254-2-623119
Fax: 254-2-623050
E-mail: guo@unchs.org
Web site: www.urbanobservatory.org/indicators>
Description: UNCHS offers a toolkit and guide for cities participating in the implementation of the Habitat Agenda. The guide includes detailed indicator methodology sheets and examples of toolkit spreadsheets for
reporting.

Title: WHO Healthy Cities Project
Contact: WHO Center for Urban Health
WHO Regional Office for Europe, Healthy Cities Project
Address: 8 Scherfigsvej
DK-2100 Copenhagen
Denmark
Tel: 45 39 17 12 24
Web site: http://www.who.dk/healthy-cities/hcp.htm
Description: Worksheets for 32 urban health indicators are presented in this booklet. The indicators listed have been developed from the data collected from the European Healthy Cities project. The worksheets provide definitions, methods of calculation, unit of measurement and a number of other descriptors.

APPENDIX 8: THE ABRIDGED ETHNOGRAPHIC INTERVIEWS AT ELOOR.

A8.1 TESTIMONIES OF SENIOR CITIZENS:

(the addresses of the respondents have been altered in the interest of their safety and confidentiality)

Name: SP Sadananda Pillai
Age: 75
Address: Eloor

He is a resident of the locality for the past 75 years. An employee of Ogale Glass Factory, he retired from there.

Pollution in Eloor is a serious problem. Water is a major cause for concern here. None of the ground wells have any amount of water and they all are forced to depend on the water authority. This distribution is far from regular.

He still remembers the time before all the companies came. There were a number of houses here in this area. On an average, each coconut tree yielded 40 coconuts then. This was also a major source of the local people's livelihood. Nowadays they hardly can get good coconuts and they are far from sufficient even for a single family. Then again a lot of medicinal plants seen then are hardly to be seen nowadays.

The pollution in the area has made him Asthmatic. There a lot of people like him here. The people living here have a lot of allergic complaints; some of them have skin allergies while others have various scalp infections etc.

A8.2 Name: EM Sundareshan
Address: The Cooperative Bank, Eloor

As told by the person himself. He has always been here. Going down memory lane he remembers the existence of just two factories way back then. They were FACT and TCC. There was a small rubber plantation near these factories. He still remembers bathing in the periyar when he was very small. Just 25 years ago this became impossible because of irritation that it caused to the skin and eyes.

He strongly feels that it was with the coming of Merchem Factory that people began complaining of breathing difficulties and chest pain, and other respiratory illnesses. For years the mercury that flows out of TCC has killed almost all fish in the river. But the mercury does not go away. It is entering all the bodies of people living in and around the river who come in contact with the water here.

A8.3 Name: VS Sultan
Address: Eloor south
Age: 70 years

He has been living here all his life. The China nets and toddy shops have been his chief source of income and livelihood. That was sufficient to look after his family well. Then he got a job in the Indian Aluminium Company and worked there for 32 years. Looking back on yester years he feels people never ever went to English doctors. The medicinal plants were all that was required to heal then of their little ailments. Whereas his coconut trees yielded 700 coconuts then today he can hardly get 100 coconuts. His brother had serious Asthma problems, which he feels is largely due to the pollution in the area. Both his brother and his son died due to severe asthma attacks. Even the domestic animals that flourished in these parts no more can be seen living healthily here if at all they manage to survive.

A8.4 Name: Ali Raj
Address: Manamthuruthu
Age: 75 years.

He has been in the fishing business for the past 60 years. During his early days he still remembers the bounty of fish that had always his pocket full of money. But all that has changed now. For the past two years he has been unable to go out fishing due to his Asthma. Before the coming in of companies, there was no shortage of water and the ground well was sufficient for every household. Domestic animals have also slowly vanished. It's been nearly 20 years that the company wastes have caused serious damage to the fauna here. In a river that had innumerable china nets to catch fish, now you hardly see them; the river itself has become murky.

A8.5 Name: Jacob VM
Address: Eloor

Age: 53 years

For the past 70 years he has been a resident of Eloor. His father was an employee of a nearby mill. He has 10 children of which three are no more. Fishing had always been the family's chief livelihood. He still remembers that before the companies came, each day's catch came to up to 750 kgs of fish. None of the kind of illnesses was even known to them then.
When the companies started dumping their wastes into the river (which he feels was when he was 15 years old or so) all the fish began mysteriously dying. Apart from fishing, they also had a lot of domestic animals. But today none of them can be seen in this part of Kerala. Whereas in his youth they used to get around 40 healthy bunches full of coconuts per tree, today they hardly manage two nuts per tree.
When the factories came, a lot of people started coming in with their families. But he feels the locals per se hardly found any employment in these factories. The river could boast of various kinds of prawns and shrimp but sadly none of the catches today manage even one of its kind. Equally distressing is this water shortage in the area. He does know that all these are direct outcomes of the pollution of the river and surrounding areas.

A8.6 Name: Prema
Address: Eloor South.

As told by herself. It was in 1961 that her parents returned to their ancestral home in Eloor from Bombay. She was a student of class1 then. The only factory in the area was FACT. She had no health problems whatsoever when she came here. It was their father's death that had brought them to Eloor where they had an own house and some property to call their own. When she was in class 8 there was a chlorine leak from the TCC factory. Recollecting memories of that day, she says she remembers running to school and falling faint in the school corridors. The school authorities admitted her in JNM hospital and she regained consciousness three days later. Her health woes have started ever since then. She gets breathing difficulty and bouts of unconsciousness whenever the fumes are very strong. Chronic Cough has been with her ever since then. She spends around 400 rupees every month on barely keeping away from the major bouts of breathlessness and cough. None of the doctors have conclusively told her that her health will see a fine day. Her husband too suffers from breathlessness.

Talking of her surroundings, she still can remember the number of domestic animals that were seen in and around Eloor in those days. She does not believe that the local community has benefited from all the factories. A few that got jobs carried on in their jobs and hence traditional livelihoods have totally been wiped out. The factories and the pollution have also led to a serious water shortage. The ground well in their house no longer can be used for the quality of water it has. But she cannot use the water supplied by the authorities for its chlorine content. So she manages with the well water available.

Factories have led to varied problems not the mention the spate of health complaints it has caused to the people living here. She wonders how she can inch forward her difficult life.

A9 TESTIMONIES OF PARENTS ABOUT AFFECTED CHILDREN:
(the names and addresses of the respondents have been altered in the interest of their safety and confidentiality)

A9.1 Name of Child: Bidhan
Age: 2 years
Address: Eloor
Father's name: Ananthapadmanabhan
Mothers name: Kavitha

As Told by the father. It was in 1965 that the family settled down in Eloor. The wife's maternal home is in the district of Alleppey. They had a baby boy by tubular pregnancy the delivery of which was by caesarean section. The baby, Bidhan was diagnosed as 40% mentally retarded. Two years old now, he still has difficulty in walking. There are occasional attacks of fits in between. Doctors in Amrita Hospital, Cochin are treating the baby. He has speech difficulties as well. The medicines being administered are Norma Brain and Digital2.5mg.
Others in the family do complain of severe headaches and bouts of breathing difficulty. They have already spent around 2 lakhs on the child's treatment. Though Physiotherapy was also advised they have discontinued the same due to its high costs.
The child's aunty ,Sarasamma has been in Eloor for the past six months. She is pregnant now and ever since she has been here she has acute headaches and breathing problems. Previously a resident of Cherthallai locality, Sarasamma admits that she has never ever had such health complaints. Living in the vicinity of the Leather factory and inhaling the ammonia fumes has led to a major deterioration of their health, they family avers.

A9.2. NAME OF baby: Gopal
Age: 7 months
Address: Aluppuram

As told by the baby's mother, Vinuta.
Marriage brought her to Eloor three years ago from her home in trivendrum. Pollution in Eloor has caused a whole lot of problems in her health. Consuming the water in this locality has led to discoloration of her teeth during her pregnancy, her sugar levels shot up which had to be checked with Insulin shots. The baby was delivered by Caesarean section and weighed 3.250kgs at birth. Since the time of her birth, the baby has had respiratory problems. Chronic Cough is one of the many that keep surfacing. An unusual skin problem seems to be troubling the baby as well. A normal bath gives rise to redness and rashes all over the body of the baby that has then to be treated. (Each treatment costs 5000-6000 Rupees.) unable to afford this they are now consulting a homeopath in Cherthallai regularly. She feels that the poisonous fumes are more during the monsoon. The fumes are almost always coupled with a stinking smell. When she goes to her maternal home in Trivandrum, she does not have any of the health complaints that she has here. The present house they are staying is slightly better than their previous residence in the staff quarters. It was the unbearable pollution that compelled the shift to

their present place of residence. But they sadly have realized that nowhere around Eloor can be really safe from pollution.

A9.3 Name of the child: Tito
Age: 2 1/2 years
Address: Eloor South

As told by the mother, Aditi. She is from Chirayil. Marriage brought her to Eloor four years back. Her husband works in Saudi Arabia. She was also in Saudi Arabia for a while. That was where the baby was conceived and delivered. Medical history during pregnancy was uneventful. The baby weighed 2.800 kgs at birth. All the regular vaccinations were administered on time. When the baby was a year old, they returned to Eloor. Ever since there has been a spate of health problems. They stay hardly 200 meters away from the Merchem factory and HIL factory yards. The baby has had chronic cough and phlegm since his stay here. Every time antibiotics have been administered. If the fumes are unbearable, there is also a bate of cough. Doctor visits have now become a regular routine affair for this family. Not to mention the drain of money associated with every visit. They can hardly bare to bathe the baby for fear of it falling ill. A couple of times they have had to rush him to the hospital at night. Febrile temperatures are many a time over the 100 mark. Smitha also says that none of these bother them when they are away form this place. Before marriage she has never had serious health problems. Ever since she has been here, she has had frequent bouts of headaches. Whenever the fumes are let out from the adjoining companies she gets acute feelings of Nausea as well.

A9.4 Name of infant: Sanjiv
Age: 1 1/2 years
Address: Eloor North

As told by the mother, Nina. It's been ten years since she came here from her maternal home in Pookattupadiyil. Her husband is an Autorickshaw driver. She feels it's at night that the fumes are unbearable. This does cause a fair amount of breathing difficulty as well. It also causes strange rashes in the baby's body with a lot of redness and itching. At nights this is fairly severe too. It has been traced to the water available in the area. They have totally stopped using the ground water available in their well making them fully dependant on the public distribution system. The baby had been very normal at birth and they had given him all the normal vaccination. A fever triggered off a seizure and required hospital stay and treatment for a month. The temperature has gone up to around 104 degrees during these fever bouts.
The fumes cause a lot of discomfort for everyone in the family. Cough and breathing difficulty are very common. She finds none of these complaints in her home in Pookattupadiyil. The baby is being administered Valium 2.5 mg every time for the seizures. During monsoons the rainwater that clogs and wells up creates rashes in their legs.

A9.5 Name of the children: Divya, (5) Ashesh (3)
Address: Manjummil

Name: Kavitha Gubra

Kavitha says they have been in Eloor for the past one year. Before this they were in Palarivattom, Cochin. Divya was born in the Lissy hospital, Cochin and weighed 3.100 kgs at birth and the younger one Sneha, was born in the Medical Center, Cochin. She weighed 3.250 at the time of birth. They have both been given all the stipulated vaccination shots. They have had a lot of health complaints ever since they have been in Eloor. The elder daughter has had a lot of respiratory troubles along with headaches. They frequently have been falling ill because of which a fair amount of money goes into medical treatment alone. There have been times when they have had to shell out 150 rupees per day. They had always been healthy in Palarivattom. Their illnesses seem to be more during the monsoons when there are more fumes and then the whole family suffers from headaches and nausea. The brief stay of a year in this vicinity has caused so much of health related discomfort to the children as well as everyone in the family.

A9.6 Name of Child : Sameera
Age: 3 years
Address: Manjummel.

They have been residents of this locality for many generations. Adarshan, the child's father has been married for three years now. The baby was delivered in MAJ hospital and weighed 2.900 kgs. The mother had taken proper care and followed all doctoral advice during her pregnancy. However the baby has severe cough, fever and breathing difficulty. They have been incurring huge costs over the child's treatment alone. Over 10,000 rupees were spent in the Medical Center, Cochin alone.

It is during the dusk that obnoxious fumes and the strong smells fill the place. In fact the family feels that over the past four or five years this has increased manifold. They have switched over from Allopathy to homeopathy treatment for the child. The main reason for the witch was the monetary one. In spite of this they end up spending over 200 rupees each visit.

A9.7 Name of the infant: Ramapati
Address: Manjummel

As told by the grandfather, Shailendra Pannikar
The family has been living here since the 70s. Shailendra Panikkar was working in FACT in the Product Issue Department as Supervisor. He retired in 1989 and has had a lot of health problems since. He has sever joint pain and a nagging back problem. His younger daughter, Jayasri stays with him. She has a daughter by name, Reshma. She is three years old. The child has already had three heart surgeries done on her. There was a problem of insufficient blood circulation from the heart to the lungs. This was the reason for the first operation. Then the second surgery was to correct a hole in her heart. After these two medical interventions she had a severe digestion problem that necessitated a third surgery.

Appendix 9: LIST OF CHEMICALS RELEASED, USED AND PRODUCED BY THE KEY CHEMICAL INDUSTRIES.(Extracted from Greenpeace Compilation on Toxicity and Health Effects)

4.1 Hindustan Insecticides Ltd, Udyogamandal Industrial Estate,Kerala.

4.1.1. Greenpeace Investigation of December,1999.

4.1.2 HIL Raw Materials/Intermediates

- 4.1.2.a Benzene
- 4.1.2.b Chlorine
- 4.1.2 c Carbon Tetra Chloride
- 4.1.2.d Hexachlorocyclopentadiene(HCCP)
- 4.1.2.eThionyl Chloride
- 4.1.2.f Hydrochloric Acid
- 4.1.2.g Sulfuric Acid
- 4.1.2.h Toluene
- 4.1.2.i Epichlorohydrine
- 4.1.2.j Oleum

4.1.3 HIL Products

- 4.1.3.a DDT
- 4.1.3.b Endosulfan
- 4.1.3.c Dicofol
- 4.1.3.d Hydrochloric Acid
- 4.1.3.eSulfuric Acid

4.1.4 HIL Effluent

- 4.1.4.a DDT
- 4.1.4.b Endosulfan
- 4.1.4.c BHC
- 4.1.4.d Chlorides
- 4.1.4.e Sulfates

4.1.5 HIL Air Emissions

- 4.1.5.a Chlorine
- 4.1.5.bSulfur Dioxide
- 4.1.5.c Carbon Monoxide
- 4.1.5.d Hydrochloric Acid Mist

4.2 Merchem Ltd,Udyogamandal Industrial Estate,Kerala.

4.2.1 ML Raw Materials/Intermediates'

- 4.2.1.a Aniline
- 4.2.1.b Carbon Disulfide
- 4.2.1.c Toluene
- 4.2.1.d Zinc Sulfate
- 4.2.1 e Chlorine
- 4.2.1.f Dicyclohexyl Amine
- 4.2.1.g Morpholine
- 4.2.1.h Sodium Sulfate
- 4.2.1.i Hydrochloric Acid
- 4.2.1.j Sulfuric Acid
- 4.2.1.k Hexachlorobenzene

4.2.2 ML Products

- 4.2.2.a Mercaptobenzothiazole(MBT)
- 4.2.2.bDibenzothiazyldisulphide
- 4.2.2.c N-cyclohexyl1,2benzothiazyl sulfanamide
- 4.2.2.d ZMBT

4.2.3 ML Effluent

- 4.2.3.a Zinc
- 4.2.3.b Sulfides

4.2.4 ML Air Emissions

- 4.2.4.a Sulphur Dioxide

4.3 FACT, Udyogamandal Industrial Estate,Kerala

4.3.1 FACT-AMMONIA PLANT

4.3.1.1 FACT Raw Materials/Intermediates'

4.2.1.1.a Naphtha

4.3.1.2 FACT Products

4.3.1.2.a Ammonia

4.3.1.2.b Carbon Dioxide

4.3.1.2.c Synthetic Gas

4.3.1.3 FACT Effluent

4.3.1.3.a Ammonium Nitrate

4.3.1.3.b Nitrates

4.3.1.4 FACT Air Emissions

4.3.1.4.a Sulphur Dioxide

4.3.2 FACT-PETROCHEMICAL PLANT

4.3.2.1 FACT Raw Materials/Intermediates'

4.3.2.1.a Benzene

4.3.2.1.b Hydrogen

4.3.2.1.c Oleum

4.3.2.1.d Ammonia

4.3.2.1.e Carbon Dioxide

4.3.2.1.f Caustic Soda

4.3.2.2 FACT Products

4.3.2.2.a Caprolactum

4.3.2.2.b Soda Ash

4.3.2.2.c Nitric Acid

4.3.2.2.d Ammonium Sulphate solution

4.3.2.3 FACT Effluent

4.3.2.3.a Free Ammonia

4.3.2.3.b.Ammonium Nitrate

4.3.2.3.c Nitrates

4.3.2.3.d Phenolic

4.3.2.4 FACT Air Emissions

4.3.2.4.a Sulphur Dioxide

4.3.2.4.b Ammonia

4.3.2.4.c Carbon Monoxide

4.3.3 FACT-Ltd.-Udyogamandal Division

4.3.3.1 FACT Raw Materials/Intermediates' Toxicity and Health Data Sheets

4.3.3.1.a Naphtha

4.3.3.1.b Sulphur

4.3.3.1.c Rock Phosphate

4.3.3.2 FACT Products

4.3.3.2.a Ammonium Phosphate

4.3.3.2.b Ammonium Sulphate

4.3.3.2.c Sulphuric Acid

4.3.3.2.d Phosphoric Acid

4.3.3.2.e Ammonia

4.3.3.3 FACT Effluent

4.3.3.3.a Ammonium Nitrate

4.3.3.3.b Free Ammonia

4.3.3.3.c Nitrate

4.3.3.3.d Cyanide

4.3.3.3.e Vanadium

4.3.3.3.f Arsenic

4.3.3.3.g Phosphate

4.3.3.3.h Flouride

4.3.3.3.i Hexavalent Chromium

4.3.3.3 j Chromium

4.3.3.4 FACT Air Emissions

The baby weighs 9.5 kgs while she weighed 2.450 kgs at the time of her birth. For her age she should weigh 12.250kgs, the doctors say. The mother, Jayasri has sever headaches and congestion related health problems. The grandmother has a skin disease for the past 25 years and has severe ear pain too. She has had an operation done on her ear, but that has hardly helped. The whole family seems to be suffering form various health problems.

A9.8.Name: Ameer
Age: 2 .5 years.
Address: Kuttikattukara

The mother, Thankamma says the following. She is a resident of Perumabavoor near Alwaye. She came here when she got married. Her husband has always suffered from breathing problems since his childhood. Their second child was hardly six months old when the first bout of respiratory trouble surfaced. The baby was normal at birth, weighed 3 kgs and was given all the vaccinations on time. He is constantly under medical treatment under Dr. Varma's care for a long time now. He has been in the hospital for fairly long periods. Each visit incurred around 2000 rupees in costs alone. The child gets fever bouts when temperatures shoot over 102 degrees. Sometimes the fever persists beyond the normal time. The child has shown symptoms of asphyxia too. The mother and the child have none of these problems when they are in her home in Perambavoor. The grandmother has something interesting to say. She used a lot of medicinal plants abundantly available in her courtyard during her children's childhood. All these plants are no longer to be found in the area now.

A9.8 Name of child: Keerthi
Age: 2.5 years.
Address: Manjummel

As told by the mother, Namrata. She has been here since her marriage. Her in-laws, husband, and two children comprise her family. Anakha was born in KMK hospital in Alwaye. She weighed 3.800 kgs at the time of birth. The air pollution in this area is primarily the reason for the kind of cough and fever it causes in children like Keerthi. There is a fair amount of breathing difficulty as well. Of late, she has been suffering from severe cough too. The elder son, Antony is comparatively healthier but they have had times when his health costs alone cost them 5000 rupees. She also finds that none of these illnesses raise their heads in her maternal home in Pookattupally. Everybody in the family suffers from some amount of breathing and respiratory troubles.

A9.9 Name of children: Mathew(3) Sarah(1)
Address: Pathalam
As told by the mother, Julie
Both her children keep getting bouts of fever. They are always under treatment of Dr. Somasundaram of JNM hospital. They require medical treatment thrice every month. Each visit demands 300 rupees each. The parents live in a one-room home and both of them too suffer from headaches and breathing difficulty. They have been in Eloor for six

Years now. Before when they were in Coimbatore none of them had any health problems. They are aware that it is the nearby factories and their fumes that are playing havoc with their health.

A9.10 Name of the children: Bidhana.(9); Sanjiva(6); Rama(3)
Address: Majumel.
As per the mother, Kavitha. They have been residents of eloor for the past 45 years. They have all had varied health problems varying from headaches to cough, breathing difficulty, joint pains and cramping of the legs. The eldest daughter, Bidhana has been suffering form Easnophilia for the past five months. She also gets headaches and cold very often. She had a heart valve complication when she was three years old. Now she does not have that. Now 9 years old, she has a gland growing under her ears near the neck. The second daughter, Sanjiva complains of leg pains and cramps very often. The youngest one suffers from cold and fever very often that requires hospitalization too. The oldest member in the family , Sicily has rashes in her leg and Kavitha herself has severe headache and other discomforts as well.

A9.11 Name of twins: Archana and Kiran
Age:15 years
Address:Eloor North.
Aditi the mother gives this account. She is a native of the neighboring Cheranalloor. Ever since her marriage 16 years ago she has been living in Eloor. Her husband is a daily wages laborer and they find it very difficult to meet their daily ends with the work he gets. They live in a three-room house provided by the Panchayat. They have twins, Archana and Kiran both of whom are paralyzed down the hips. Their delivery was before the eighth month. They have gone to the school upto the third standard. Archana likes to write and read but they could no longer afford their studies. In the evenings the fumes from the factories fill the whole surrounding region. They often lead to skin irritations and breathing difficulty. They incur an expenditure of 1400 rupees every month on medicines alone. The children have been shown to an Aired doctor in Coimbatore. The charges there have come to 30,000 rupees. The daughter is slightly better than the son. They believe that their disability should be overcome by good medical treatment.

4.3.3.4.a Ammonia
4.3.3.4.b Sulphur Dioxide
4.3.3.4.c Carbon Monoxide

4.4 Indian Rare Earths,Udyogamandal Industrial Estate,Kerala.

4.4.1 IRE Raw Materials/Intermediates'
4.4.1.a Monazite
4.4.1.b Caustic Soda Lye
4.4.1.c Hydrochloric Acid
4.4.1.d Sulphuric Acid
4.4.1.e Nitric Acid
4.4.1.e Sodium Chloride
4.4.1.f Sodium Sulphate
4.4.1.g Sodium Sulphide
4.4.1.h Soda Ash
4.4.1.i Sodium Silicoflouride
4.4.1.j Sodium Hypochlorite
4.4.1.k Oxalic Acid
4.4.1.l Magnesium Sulphate
4.4.1.m Hydrogen Peroxide

4.4.2 IRE Products
4.4.2.a Trisodium Phosphate
4.4.2.b Rare Earths Chloride
4.4.3.c Rare Earths Flouride
4.4.3.d Cerium oxide
4.4.3.e Thorium hydroxide
4.4.3 f Cerium Nitrate and other Rare Earths

4.4.3 IRE Effluent
4.4.3.aFlourides
4.4.3.b Ammonium Nitrate
4.4.3.c Phosphates
4.4.3.d Lead
4.4.3.e Zinc
4.4.3.f Sulphide

4.4.4 IRE Air Emissions
4.4.4.a Chlorine
4.4.4.b Hydrogen Sulphide
4.4.4.c Sulphur Dioxide

4.5 Binani Zinc,Binanipuram, Edayar,Kerala.

4.5.1 BZ Raw Materials/Intermediates'
4.5.1.a Zinc Concentrate
4.5.1.b Trisodium Phosphate
4.5.1.c Sodium Sulphate
4.5.1.d Sodium Silicate
4.5.1.e Ammonium Chloride
4.5.1.f Manganese Dioxide

4.5.2 BZ Products
4.5.2.a Zinc
4.5.2.b Cadmium
4.5.2.c Sulphuric Acid

4.5.3 BZ Effluent
4.5.3.a Cadmium
4.5.3.b Zinc
4.5.3.c Sulphuric Acid
4.5.3.d Mercury
4.5.3.e Copper
4.5.3.f Sulphide
4.5.3.g Flouride
4.5.3.h Sulphate

4.5.4 BZ Air Emissions
4..5.4.a Acid Mist
4.5.4.b Sulphur Dioxide

4.6 Travancore Cochin Chemicals Ltd,Udyogamandal Industrial Estate,Kerala.

4.6.1 TCCL Raw Materials/Intermediates'
4.6.1.a Barium Carbonate
4.6.1.b Soda Ash
4.6.1.c Common Salt
4.6.1.d Sulphuric Acid
4.6.1.e Lime
4.6.2 TCCLProducts
4.6.2.a Caustic Soda
4.6.2.b Liquid Chlorine
4.6.2.c Hydrochloric Acid
4.6.2.d Soda bleach
4.6.3 TCCL Effluent
4.6.3.a Sulphide
4.6.3.b Mercury
4.6.3.c Chlorine
4.6.4 TCCL Air Emissions
4.6.4.a Hydrochloric acid fumes
4.6.4.b Chlorine
4.6.4.c Mercury

4.7 Cochin Minerals and Rutiles Ltd.,IDA, Edayar.

4.7.1 CMRL Raw Materials/Intermediates' \
4.7.1.a Ilmenite
4.7.1.b Hydrogen chloride
4.7.1.c Chlorine
4.7.2 CMRLProducts
4.7.2.a Synthetic Rutile
4.7.2b Ferric Chloride
4.7.3 CMRL Effluent
4.7.3.a Hexavalent Chromium
4.7.3.bChromium
4.7.3.c Manganese
4.7.3.d Nickel
4.7.3.e Copper
4.7.3.f Zinc
4.7.3.g Cadmium
4.7.3.h Mercury
4.7.3.i Lead
4.7.3.j Cyanide
4.7.3.k Titanium
4.7.4 CMRL Emissions
4.7.4.aSulphur Dioxide
4.7.4.b Carbon Dioxide
4.7.4.c Chlorine
4.7.4.d Hydrochloric acid vapour and mist.

APPENDIX 10: STUDY ABSTRACTS OF THE WATER SYSTEM OF COCHIN AND PERIYAR

10.1 Determination and distribution of Endosulfan and Malathion in an Indian estuary.

Authors:
SUJATHA CH
NAIR SM
CHACKO J
Author Address: Dep. Chem. Oceanography, Cochin Univ. Sci. Technol., Cochin-682 016, India.

Source: WATER RESEARCH; 33 (1). 1999. 109-114.
Abstract:
BIOSIS COPYRIGHT: BIOL ABS. A field survey was conducted to determine the spatial and seasonal distribution of two very common pesticides, Endosulfan and Malathion, in Cochin estuary, India. Six sampling stations along the estuary were identified and analyses were carried out during premonsoon, monsoon and postmonsoon seasons. Pesticide levels were higher during the premonsoon period than during the postmonsoon season. Throughout the monsoon season, the estuary remained largely free of the pesticides except at the mid- estuarine region which was characterized by prominent agricultural runoff. One of the sampling sites located in the riverine area was designated as "pesticide-loading site" in view of its proximity to the pesticide-manufacturing unit.
Medical Subject Headings (MeSH):
CONSERVATION OF NATURAL RESOURCES
ECOLOGY
MARINE BIOLOGY
AIR POLLUTION
SOIL POLLUTANTS
WATER POLLUTION
Keywords:
Ecology
Public Health: Environmental Health-Air
CAS Registry Numbers:
121-75-5
121-75-5
115-29-7
Language: English
Coden:
WATRA
Entry Month: April, 1999
Year of Publication: 1999
Secondary Source ID: BIOSIS/99/04291

10.2 Dissolved and particulate trace metals in the Cochin estuary.

Authors: OUSEPH PP

Author Address: Cent. Earth Sci. Studies, Trivandrum-31, India.

Source: MAR POLLUT BULL; 24 (4). 1992. 186-192.

Abstract:

BIOSIS COPYRIGHT: BIOL ABS. The Cochin estuary located at 9ê58'N latitude and 76ê15'E longitude is subjected to various types of effluents discharged from the Eloor and Chitrapuzha industrial belts. The present study reports the concentrations of dissolved and particulate copper, zinc, cadmium, lead, nickel, and iron based on three consecutive surveys conducted during July (monsoon), November (post-monsoon) 1985 and April (premonsoon) 1986. The concentrations of dissolved and particulate copper, zinc and cadmium showed high seasonal variation. Seasonal variation in the concentrations of nickel and lead was negligible. Iron was found to be removed from the disolved state. Surface water samples contained higher concentrations as compared to the bottom. The study revealed that salinity plays an important role in the precipitation of particulate manner and heavy metals with respect to estuarine mixing.

Medical Subject Headings (MeSH):

CLIMATE
ECOLOGY
METEOROLOGICAL FACTORS
ECOLOGY
OCEANOGRAPHY
FRESH WATER
MINERALS

Keywords:

Ecology
Ecology
Biochemical Studies-Minerals
Movement (1971-)

CAS Registry Numbers:

7440-66-6
7440-66-6
7440-50-8
7440-43-9
7440-02-0
7439-92-1
7439-89-6

Language: English

Coden:

MPNBA

Entry Month: September, 1992

Year of Publication: 1992

Secondary Source ID: BIOSIS/92/20320

10.3 Heavy metals in fishes from coastal waters of Cochin, southwest coast of India.

Authors:
NAIR M
BALACHANDRAN KK
SANKARANARAYANAN V
JOSEPH T
Author Address: Natl. Inst. Oceanography, Regional Centre, PB No 1913, Cochin 682 018, India.
Source: INDIAN JOURNAL OF MARINE SCIENCES; 26 (1). 1997. 98-100.
Abstract:
BIOSIS COPYRIGHT: BIOL ABS. The concentration levels of copper, zinc, manganese and iron have been determined in marine fishes from Cochin area which is one of the major fishing zones along the west coast of India. The concentration of heavy metals varied from species to species. Copper, Zn, Fe and Mn showed increased levels in the gills and alimentary canal compared to the muscle. Difference in heavy metal concentration in various species studied is attributed to the varying feeding habits. The observed levels were below the toxic limit.

Medical Subject Headings (MeSH):
ANIMALS
ECOLOGY
ECOLOGY
OCEANOGRAPHY
NUTRITION
NUTRITIONAL STATUS
DIGESTIVE SYSTEM/PHYSIOLOGY
DIGESTIVE SYSTEM/METABOLISM
RESPIRATORY FUNCTION TESTS
RESPIRATORY SYSTEM/PHYSIOLOGY
RESPIRATORY SYSTEM/METABOLISM
MUSCLES/PHYSIOLOGY
MUSCLES/METABOLISM
ENVIRONMENTAL POLLUTANTS/POISONING
OCCUPATIONAL DISEASES
Keywords:
Ecology
Ecology
Nutrition-General Studies
Digestive System-Physiology and Biochemistry
Respiratory System-Physiology and Biochemistry
Muscle-Physiology and Biochemistry
Toxicology-Environmental and Industrial Toxicology
CAS Registry Numbers:
7440-66-6
7440-66-6
7440-50-8
7439-96-5
7439-89-6
Language: English
Coden:
IJMNB
Entry Month: November, 1997
Year of Publication: 1997
Secondary Source ID: BIOSIS/97/27595

10.4 Effect of waste disposal on water quality in parts of Cochin, Kerala.

Authors:

KHURSHID S
BASHEER A
ZAHEERUDDIN
SHABEER MU

Author Address: Dep. Geology, Aligarh Muslim University, Aligarh, India.

Source: INDIAN JOURNAL OF ENVIRONMENTAL HEALTH; 40 (1). 1998. 45-50.

Abstract:

BIOSIS COPYRIGHT: BIOL ABS. The successively increasing amount of chemicals in rivers and other water bodies, resulting from the enhanced discharge of industrial effluents and municipal waste water, has become the major problem affecting water quality. Study area covers an estuary at south-western part of Kerala which is bound by three important rivers namely Periyar in the north, Pumba in south and Muvattu puzha in the east. In the present study, an attempt has been made to evaluate the water pollution caused by existing industries in parts or Cochin. A systematic study of the chemical nature of the surface water bodies from Eloor to Cochin harbour has been made with a view to assess the extent of pollution of various trace elements. The study revealed that the concentration of trace elements around Eloor industrial belt is higher than the vembanad lake, which may be attributed to steady discharge of effluents in Eloor region. In most of the samples, concentration or trace elements exceed the max

Medical Subject Headings (MeSH):

ECOLOGY
AIR POLLUTION
SOIL POLLUTANTS
WATER POLLUTION

Keywords:

Ecology

Public Health: Environmental Health-Air

Language: English **Coden:** IJEHB **Entry Month:** May, 1999 **Year of Publication:** 1998 **Secondary Source ID:** BIOSIS/99/04916

10.5 Trace elements in the surface waters of Cochin harbour.

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Author Address: Central Inst. Fish. Toxicol., Cochin 682 029, India.
Source: JOURNAL OF ENVIRONMENTAL BIOLOGY; 17 (1). 1996. 33-37.
Abstract:
BIOSIS COPYRIGHT: BIOL ABS. The concentration of Cu, Fe Mn, Zn, Co, Ni, Cd and Pb present in the Cochin Harbour waters was studied at monthly intervals during the period 1982- 83. The concentration in mug l-1 varied from 2.1-25 for Zn, 0.75-5.4 for Ni, 11.0-31 for Mn and 7.2-113.0 for Fe with an average value of 11.88, 2.50, 20.23 and 23.74 respectively. The values for toxic elements ranged from 0-1.5 for Pb, 0.2-13 for Cu, 0-25-28 for Cd and 0-3 for Co with respective means of 0.48, 4.64, 8-37 and 1.1 mug l-1. The average concentration of all the elements except Zn and Cd were highest in the monsoon period. The mean values for Zn increased from premonsoon to post-monsoon period, but the reverse was found for Cd. No interdependancy could be noticed for the presence of trace elements for the period studied.
Medical Subject Headings (MeSH):
ECOLOGY
OCEANOGRAPHY
FRESH WATER
MINERALS
AIR POLLUTION
SOIL POLLUTANTS
WATER POLLUTION
Keywords:

Ecology
Biochemical Studies-Minerals
Public Health: Environmental Health-Air

Language: English
Coden:
JEBID
Entry Month: June, 1996
Year of Publication: 1996
Secondary Source ID: BIOSIS/96/12683