ASBESTOSIS AND GENERAL HEALTH AMONG MIGRANT SHIPBREAKERS FROM NORTHERN BANGLADESH

by

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Abstract

In Bangladesh, shipbreaking is often carried out by internal migrant workers from the impoverished northern regions. Ships can contain hazardous substances such as polychlorinated biphenyls, heavy metals and asbestos, which are all recognized carcinogens. Work is done by hand, without heavy equipment, adequate training or protection, and with high potential for exposures. This pilot study examined asbestosis and non asbestos-related respiratory symptoms among these migrant workers.

Shipbreakers were recruited from their home communities in northern Bangladesh. They were interviewed in Bangla, and received anteroposterior chest x-rays and physical exams. Information was collected on: a) respiratory symptoms using validated questions from the American Thoracic Society, b) work history and past occupational exposures, c) clinical history, d) attitudes around occupational health and safety, e) and knowledge of the potential heath risks and fate of asbestos. Chest x-rays were read by a B-reader for asbestosis diagnosis.

One hundred and four male shipbreakers were recruited with average age 40 years and 2.5 years education. On average they had nine years shipbreaking experience and 17 years since first year of employment on the yards. Radiographic results indicated a six percent prevalence of asbestosis, and results from the interviews indicated a thirteen percent and eight percent prevalence of work-related cough and phlegm, and work-related shortness of breath, respectively.

The prevalence of asbestosis appears lower than seen in previous studies of shipbuilders and ship-repairers. However, beach-based shipbreakers (steel plate loaders and cable-pullers) were overrepresented in comparison to ship-based (cutters and fitters) workers. This, and the small sample size, inclusion criteria, and a possibly exaggerated healthy worker effect, could have resulted in an underestimate of prevalence. Ships typical of those being dismantled contain several tons of asbestos; there is a need for improvements in exposure control, including educating the shipbreakers about asbestos and where it is found. Future research should focus on subjects who have worked closer to the source of exposure, as well as better characterizing the exposure and learning about the fate of the asbestos after it leaves the yards.

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1. Introduction[a]

Shipbreaking[b] is the dismantling and recycling of large obsolete vessels[c], their hulls and superstructures. This study investigates prevalence of asbestosis in a population of shipbreakers in Bangladesh.

1.1 Shipbreaking

Vessels on average have a 25 to 30 year lifespan[d], and while historically they were dismantled on the dry docks of Europe and North America, most are now driven onto the beaches of Bangladesh, India and Pakistan, in part due to less stringent environmental and labour laws in those countries. It costs US$7000 per tonne to properly dispose of asbestos found in old vessels (1); part of the appeal of dismantling ships in developing countries is the circumvention of these costs. Of the 75,000 vessels worldwide, approximately 700 are removed from service each year. The shipbreaking industry of Bangladesh is the largest in the world, its market share moving to 68% (by tonnage) in 2006 from 19% in 2000, and due to a suitable intertidal zone and higher tidal range than other countries, it has the capacity for the largest ships[e] (2,3). Approximately 70 to 200 ships are dismantled annually in Bangladesh, mostly oil tankers and cargo carriers, supplying Bangladesh with 2.4 million of the 3 million tonnes of steel (80%) required for construction annually (see Table 1.1 for a summary of the total world fleet, broken down by vessel type) (4-6). According to the Bangladesh Ship Breakers Association, in Bangladesh, shipbreaking primarily occurs in 69 "shipyards" covering approximately 10 km of beach near the southern port city of Chittagong (7). It directly employs 25,000 workers, the majority of whom come from poverty-stricken[f] northern districts of Bangladesh. A further150,000 people are indirectly employed in industries such as steel re-rolling and reselling salvaged materials (e.g. furniture, electrical parts, generators and boilers) (8,9).

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[a] See Appendix I for a detailed explanation of the literature review strategy. There is a lack of scientific literature on shipbreaking worldwide and of statistical data we have come to expect for other studies. Information from academic journals has been supplemented by anecdotal evidence from grey literature and journalism where necessary.

[b] Synonyms: Ship-Recycling, Ship-Dismantling, Ship-Scrapping

[c] Vessels range from 2000 to 40,000 light displacement tonnes (LDT), or 50,000 to 450,000 dead weight tonnes (DWT). LDT is the net weight of a ship, and used to calculate the scrap value of a ship, although DWT, the weight a vessel can carry, is often reported (83).

[d] As of 2008, the average age of vessels dismantled was 32 years with a range of 18 to 62 years (82).

[e] Fifty-two percent of all vessels greater than 200,000 dwt are dismantled in Bangladesh (62).

[f] According to UNICEF, 50% of the Bangladeshi population lives below the poverty line (<US$1.25/day), and those in the north are more prone to natural disasters such as flooding, and have less stable employment opportunities (refer to Table 4.1 for a more statistics) (121).

Table 1.1: Total world fleet in 2009 by vessel type.

Vessel type	Number at sea
Tankers	12,166
Other bulk	7,066
Liquefied petroleum gas	1,125
Liquefied natural gas	300
Cellular container	4,717
Multi-purpose	2,890
General cargo	15,762
Roll-on, roll-off	3,420
Pure car carrier	695
Reefer	1,860
Passenger	5,159
Offshore	6,498
Dredger	1,922
Tugs	12,262
Total	**75,841**

Source: (Clarkson's 2010) (10)

The benefits and risks of this industry have been widely debated. On the positive side, 97% of the ship is reusable in some form, the industry has created thousands of jobs, and it is worth $100 to $120 million a year in Bangladesh. However, the work is extremely hazardous, putting workers at risk of asphyxiation, falling debris, fires, explosions and electrocution (5,11). Furthermore, the ships contain hazardous materials such as heavy metals, polychlorinated biphenyls (PCBs), and asbestos, causing not only occupational injury and disease but considerable environmental damage (12).

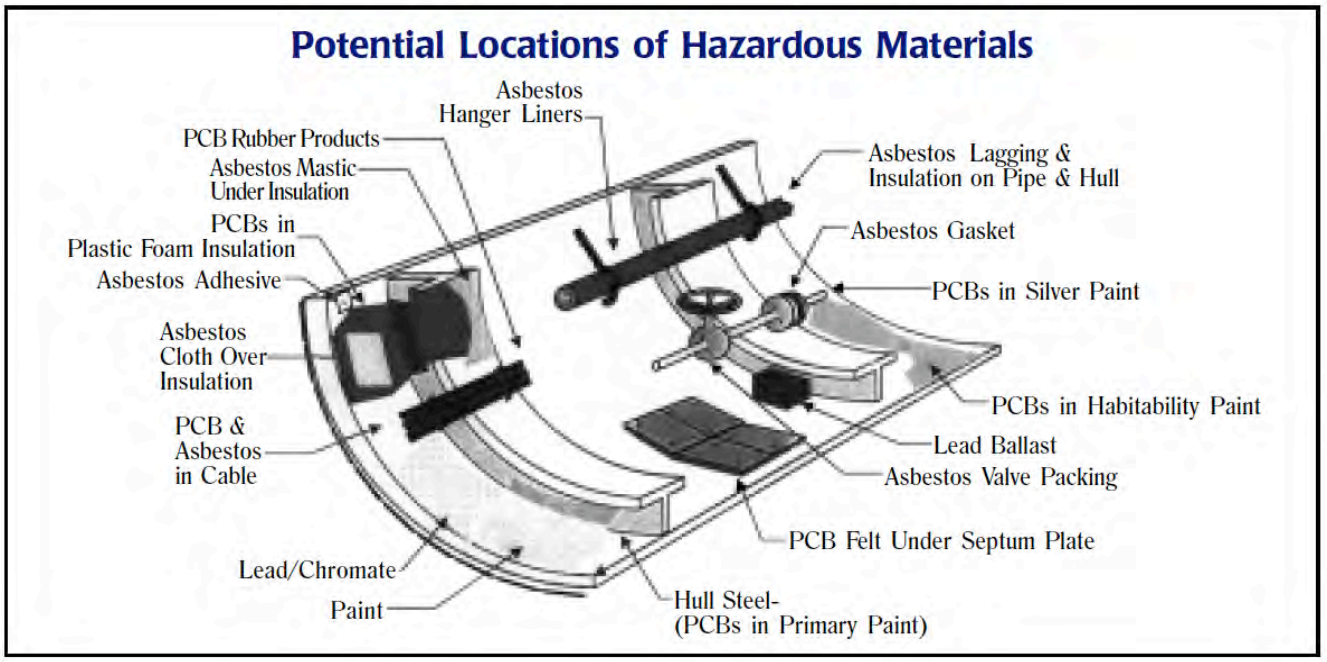

Figure 1.1: Potential locations of hazardous materials in a ship.

In ships, asbestos was used for thermal and acoustic insulation, and to prevent the spread of fires. It is generally found in pipe-hanger liners, insulation on pipes and hulls, cables, lagging, adhesives, gaskets, valve packing, boilers, and inner sides of accommodation envelopes (see Figure 1.1) (13). The asbestos fibres can be encased in hard sheets or boards, part of softer cloth or mattresses, or sprayed-on in friable form. An average 40,000 light displacement tonne vessel built prior to mid-1970 contains 6000 to 8000 kg of asbestos. Approximately 75% could be serpentine asbestos[g] in accommodation areas between steel plates in walls or doors, and 25% could be amphibole asbestos used for lagging and insulation, mainly in the engine rooms, boiler rooms, around pipes, and hulls. These volumes and ratios depend on the type and age of vessel being dismantled. Insulation for engines and pipes in ships built from 1900 to 1950 contained 85% magnesium carbonate (a naturally occurring white mineral also known as magnesia) and 15% amosite; some crocidolite would have been used in mattresses and asbestos board. After 1950, magnesium carbonate was replaced almost entirely by amosite and since 1963, amosite has been replaced by calcium silicate compounds with 12 to15% amosite (14,15). Sprayed asbestos could be a 1" to 2" thick compound of asbestos, usually consisting of crocidolite, and cement on most internal surface of steel, and was covered by a "hard facing" composed of

[g] There are six naturally occurring, regulated minerals known commercially as "asbestos". Chrysotile is of serpentine rock and the other five are from amphibole rock: amosite, crocidolite, tremolite, anthophylite and actinolite.

asbestos plaster and mesh. Decks were covered in cement and asbestos screed to ensure access to lifeboats during a fire. The sprayed-on, friable asbestos and insulation with high percentage of asbestos would be most attractive for reuse (16).

Table 1.2: Airborne asbestos concentrations encountered during removal operations.

Process	**Range (fibres/ml) (Harries et al. 1968)**	**Estimate (fibres/ml) (Holland 2008)**
Removal of amosite insulation (boiler room)	29-1040	10
Removal of sprayed crocidolite	112-1906	1000
Removal of asbestos board	48-683	0.1
Bagging asbestos	106-1815	

Source: (14,16)

Table 1.2 shows estimated fibre concentrations encountered during removal operations. In the first column as estimated by Harries in a 1968 paper entitled, "asbestos hazards in naval dockyards", and in the second column as estimated during a personal communication with an engineer responsible for asbestos removal from the British Columbia (BC) Ferry fleet (14,16). These are estimates from removal operations under controlled conditions in more economically developed countries, where workers would be wearing protective equipment. Concentrations encountered on a shipbreaking yard, where removal is unregulated, could be higher, and workers do not wear equipment to prevent inhalation of fibres. Annual generation from yards worldwide are projected to be 3155 tonnes in 2010 and 1232 tonnes in 2015 (see Table 1.3).

Table 1.3: Projected contaminant volumes in tonnes for hazardous materials associated with shipbreaking.

Hazardous materials, ton	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total
Lead	0.11	0.08	0.08	0.07	0.08	0.08	0.18	0.06	0.06	0.06	0.06	0.07	0.99
Cadmium	32.6	25.0	23.0	22.1	24.3	22.7	54.1	18.9	17.6	18.2	17.9	21.1	298
Pb	38.1	29.1	26.9	25.8	28.4	26.5	63.1	22.0	20.5	21.3	20.9	24.6	347
H_2SO_4	22.1	16.9	15.6	15.0	16.5	15.4	36.7	12.8	11.9	12.4	12.2	14.3	201
Paints	12566	9610	8870	8501	9363	8747	20821	7269	6776	7022	6899	8131	114576
TBT	326	250	230	221	243	227	541	189	176	182	179	211	2976
R22/F12	245	187	173	166	182	170	406	142	132	137	134	158	2232
Asbestos	1904	1456	1344	1288	1419	1325	3155	1101	1027	1064	1045	1232	17360
PVC	2720	2080	1920	1840	2027	1893	4507	1573	1467	1520	1493	1760	24800
PCB	0.004	0.003	0.003	0.003	0.003	0.003	0.006	0.002	0.002	0.002	0.002	0.002	0.03
Hg	0.004	0.003	0.003	0.003	0.003	0.003	0.007	0.002	0.002	0.002	0.002	0.003	0.04
Oils	85775	65593	60547	58024	63911	59706	142118	49615	46251	47933	47092	55502	782068
Oil sludge	792064	605696	559104	535808	590165	551339	1312341	458155	427093	442624	434859	512512	7221760

Source: (European Union 2006)(17)

Until 2009, shipbreaking in Bangladesh was not regulated by environmental law, there was no requirement for ships to be decontaminated before dismantling, and despite being recognized as a legitimate industry for the first time in the new 2006 Labour Laws, rights to protect workers have not been complied with or enforced (18). In March 2009, the Bangladeshi high court ordered the Department of Environment to shut down any yards that had not passed environmental clearance and not permit contaminated ships to be dismantled, as the result of a petition filed by the Bangladesh Environmental Lawyers Association (19). Currently none of the yards in Chittagong have this clearance required by the government. The ruling has been appealed and the court has stayed the order to close the yards, for an indefinite amount of time. This is not surprising as Bangladesh has been struggling to control corruption since liberation in 1971; Transparency International had rated Bangladesh the 10th most corrupt country in the world in 2008, and it had previously been ranked the most corrupt for five consecutive years, 2001-5 (20). Corrupt politicians work with shipyard owners; far from promoting the court ruling, some members of parliament in the region were accused in June 2009 with illegally cutting down rainforests to create more shipbreaking yards (see Appendix II for a summary of recent events to do with shipbreaking in Bangladesh) (21).

In 2009, 65 countries became signatories to the new International Maritime Organization's (IMO) convention for the safe and environmentally sound recycling of ships (22). This convention requires ship owners to provide an inventory of hazardous materials when the ship is to be demolished and requires shipyard owners to protect their workers. While apparently beneficial, the convention further legitimizes the industry which is expected to experience growth as a result.

1.2 Asbestosis

According to the American Thoracic Society (ATS), asbestos has been the largest cause of occupational cancer in the United States and a significant cause of disease and disability from nonmalignant disease. Asbestos is known to cause lung cancer and mesothelioma, a cancer of the pleura. However, it also leads to nonmalignant asbestos-related diseases including asbestosis (a parenchymal disease) and pleural abnormalities (see Appendix III for more detailed clinical definitions) (23,24).

Asbestosis is a form of pneumoconiosis, or scarring of the lung tissue. The ATS describes asbestosis as a "parenchymal abnormality where the initial radiographic presentation is typically that of small, irregular opacities in the lower lobes bilaterally. Over time, the distribution and density, or "profusion" of opacities may spread through the middle and upper lung zones". Although irregular opacities are most common from asbestos exposure, mixed irregular and rounded opacities are often present. This scarring of the tissue can lead to reduced lung volumes, restriction, and decreased diffusion capacity, but it is not so obvious in mild cases.

Death rates from asbestosis increase with severity of disease. Level of disablement has been seen to be predictive of survival; among 665 former asbestosis patients in the UK who had died, for those having mild disability (indicated by a disablement benefit increase of 10%), life expectancy at age 55 decreased three years, while for those with higher disability (50% disablement benefit increase) life expectancy at age 55 decreased 12 years (25). In Canadian men receiving compensation for asbestosis, the survival rate for men at five years since receiving compensation was 69% of that expected for men the same age, and 53% for men at 10 years since receiving compensation (26).

There is no cure for asbestosis, but treatment is aimed at preventing disease progression, prevention and treatment of colds or other respiratory illness, and helping patients breathe more easily. Asbestosis will not progress if exposure ceases, and removal from exposure is the best method of stopping progression. Most asbestosis deaths are due to concurrent respiratory infections, rather than to progressive pneumoconiosis (27). Treatment of discomfort includes postural drainage, chest percussion, oxygen therapy, use of an ultrasonic chest humidifier, and for very serious cases, a lung transplantation. Symptoms can be relieved with corticosteroids and immunosuppressive drugs (28,29). In Bangladesh, pneumoconioses are treated symptomatically. Bronchodialation is used when patients experience dyspnoea, or shortness of breath, along with antibiotics if an infection is discovered. For prevention of disease progression, steroids, disease modifying agents like Methotrexate and occasionally colchicine is used (30).

Given a history of asbestos exposure, there seems to be a threshold dose for asbestosis, of 25 to 100 fibres/ml/year and a fibre length of at least 2 μm, with an exposure-response relationship; the higher the exposure, the less time it takes to detect the early signs (31-34). Asbestosis is generally considered to require a period of at least 15 to 20 years since first exposure (YSFE)

before early signs appear, but can be detected as early as five to 10 YSFE after a very high exposure of short duration where exposure levels reach hundreds of fibers/ml. In one study of 1117 asbestos insulation workers 10% of those with less than 10 YSFE showed radiological abnormalities, while 56% of those with 10 to 19 YSFE and 94% of workers with more than 40 YSFE showed radiological abnormalities (27,35). Therefore, asbestosis is usually associated with labourers with the potential for high exposures such as asbestos miners, asbestos textile workers, insulators, brake-liners, and ship-builders and repairers.

Pleural abnormalities are considered markers for asbestos exposure, but are not necessarily found with parenchymal abnormalities, which indicate pneumoconiosis (24,36). The pleura are more sensitive to asbestos than the lung parenchyma, so the effects of asbestos exposure can show here first and occur at much lower doses than the fibrotic changes in the lung parenchyma (37,38). Pleural plaques are the most common manifestations of asbestos exposure, and by themselves are not usually associated with physiologic decrement or indicate a greatly increased risk for asbestos-related disease compared to workers with equal exposure and no visible plaques (39). The presence of pleural plaques in the general environmentally exposed population in more economically developed countries is in the range of 0.5% to 8.0% (40).

1.2.1 Asbestosis in southern Asia

A literature review found no prior asbestosis prevalence studies from Bangladesh; such studies are difficult as there are no systems in place such as public health registries or death registries to systematically collect illness or cause of death information. In order to diagnose asbestosis, a history of working with asbestos is required and work history has not been consistently collected in Bangladeshi hospitals. Access to healthcare is not available to everyone, and even if the patient was admitted and work history was collected, hospital staff, unfamiliar with asbestosis, could misreport it as another form of pneumoconiosis or respiratory illness such as tuberculosis.

Asbestosis prevalence studies in Indian industries, where occupational health and safety standards and access to health care can be considered similar to the Bangladeshi experience, were reviewed. Poor people with asbestos-related diseases are slightly better off in urban areas where they can obtain access to public medical care; however, with a poor understanding of asbestos-related diseases, the quality of care is variable, and private patients can afford a higher

standard of care. Asbestosis in India has been misreported as tuberculosis in the past (41). This reflects my knowledge of the situation in Bangladesh. Additionally, both India and Bangladesh have no policy restricting asbestos; factories in both countries still process the mineral (42,43). However, in India, where asbestos is mined, information about asbestos processing is apparently more transparent and readily available than it is in Bangladesh.

There are three studies on the prevalence of asbestosis in Indian asbestos mill workers. In a study of 181 composite mill workers, subjects were interviewed and received chest x-rays, physical exams, and lung function tests. Subjects were over 40 years old, with a mean age of 52 years. Diagnostic criteria for asbestosis were duration of at least 15 years exposure and an International Labour Organization (ILO) profusion score of 1/1 or greater (see Appendix III for the ILO Guidelines for Classification of Radiographs of Pneumoconioses). Physical examinations and lung function tests were used as prognostic indicators for treatment. All workers had at least 20 years of exposure and 50% had over 30 years. Parenchymal disease was seen in 18.8%, pleural abnormalities in 1.7%, and the two abnormalities together in 2.2% (44).

An exposure assessment and health outcome study was carried out on 633 Indian miners and millers in 1994. Radiological changes were more common in millers (17%) than in miners (10%). Parenchymal abnormalities were more common (26.2%) than pleural abnormalities (4.3%) (45). The same authors conducted a similar study on 355 asbestos cement workers the following year. 148 personal samples were collected and airborne asbestos levels were two to three times higher than the TLV in half of the samples. Profusions with irregular opacities were seen in 2.8%, profusions with irregular and regular opacities in 6.5%, and pleural abnormalities in 3.0% (46)[h].

A report by Indian asbestos experts states that in chest radiographs of more than 800 asbestos cement workers in the early 1980's, 28% had asbestosis and eight percent showed early lung changes. Similar numbers were found in two brake-lining facilities. In 2004, radiographs were taken of workers of cement plants and asbestos mines, where sometimes exposures were so high, lung fibrosis was documented even after one year of exposure (41).

[h] Results from these three studies are summarized along with other studies in Table 1.4, and see Appendix IV for more details about the exposure assessment from Dave 1997.

The ILO believes that more than 100,000 workers die from asbestos-related diseases every year and this is likely to peak around 2020 with anywhere between 0.5 to 1 million deaths (47). Deaths from asbestosis in the US, where most forms of asbestos have been restricted since the early 1970's, are not expected to slow down for another 10 to 15 years (48), but most of the peak will be seen in less/mid-economically developed countries such as China, India, and Bangladesh, where asbestos use is still growing.

1.2.2 Asbestos use in Bangladesh

It is important to characterize asbestos use in Bangladesh in order to understand who and how many are affected downstream from asbestos retrieved in shipbreaking yards, and worldwide imports, yet it has been challenging to do so. Bangladesh is one of the top five worldwide markets for Canadian asbestos imports. Information about asbestos use in Bangladesh is not as transparent as it is in India, but with similar standards of occupational health and safety, and unrestricted use of asbestos, information about Bangladesh can be inferred from India. India is the largest regional importer, importing 25 times more than Bangladesh in 2007, which accounted for a 70% increase in imports for Bangladesh from the same period in 2006 (43). In India, 100,000 tonnes of asbestos is consumed annually and 21,000 tonnes is mined, so 79% of India's asbestos needs are met through imports, mostly from Canada. This equates to an estimated 3000 tonnes imported annually in Bangladesh, and the rest coming from other means such as shipbreaking (49-51). In India, asbestos is encountered during asbestos mining, in asbestos cement industries, asbestos processing units, and during renovation and demolition of old asbestos cemented roofs, and some electrical or mechanical appliances in which asbestos is still found (52). Although mining cannot exist in Bangladesh due to geological conditions, it is likely to be encountered in cement industries as it is in India. Local Bangladeshi newspapers reported two to three percent of Dhaka Water and Sewerage Authority water lines are composed of asbestos cement, and during recent repairs, 149 km of asbestos water pipes were used (53,54). Interestingly, in 1984, 790 metric tonnes of asbestos was donated by Canada in a campaign to promote asbestos use in less economically developed countries (42).

1.3 Shipbreaking in Chittagong

Almost 70% of the shipbreakers in the Chittagong yards are migrant workers who have come from northern areas of Bangladesh, such as Rangpur, Dinajpur, Rajshahi, Bogra, and Mymensingh, 600 km away from where the shipbreaking occurs (see Figure 1.2). These districts are the hardest hit by annual floods and regular work is difficult to find. The main source of income is agricultural work, which is irregular and less profitable than shipbreaking. Workers are recruited in their home village by a shipyard foreman, often a local, who assembles a team who will work for him on a contract he negotiates with a yard. Teams are usually comprised of all one job type. Recruits are offered an advance which is later worked off on the shipbreaking yard and the migrant workers start sending a remittance home. They will also travel back for the rice harvest, and depending on the shipyard, a portion of their pay may be withheld to ensure they return (55).

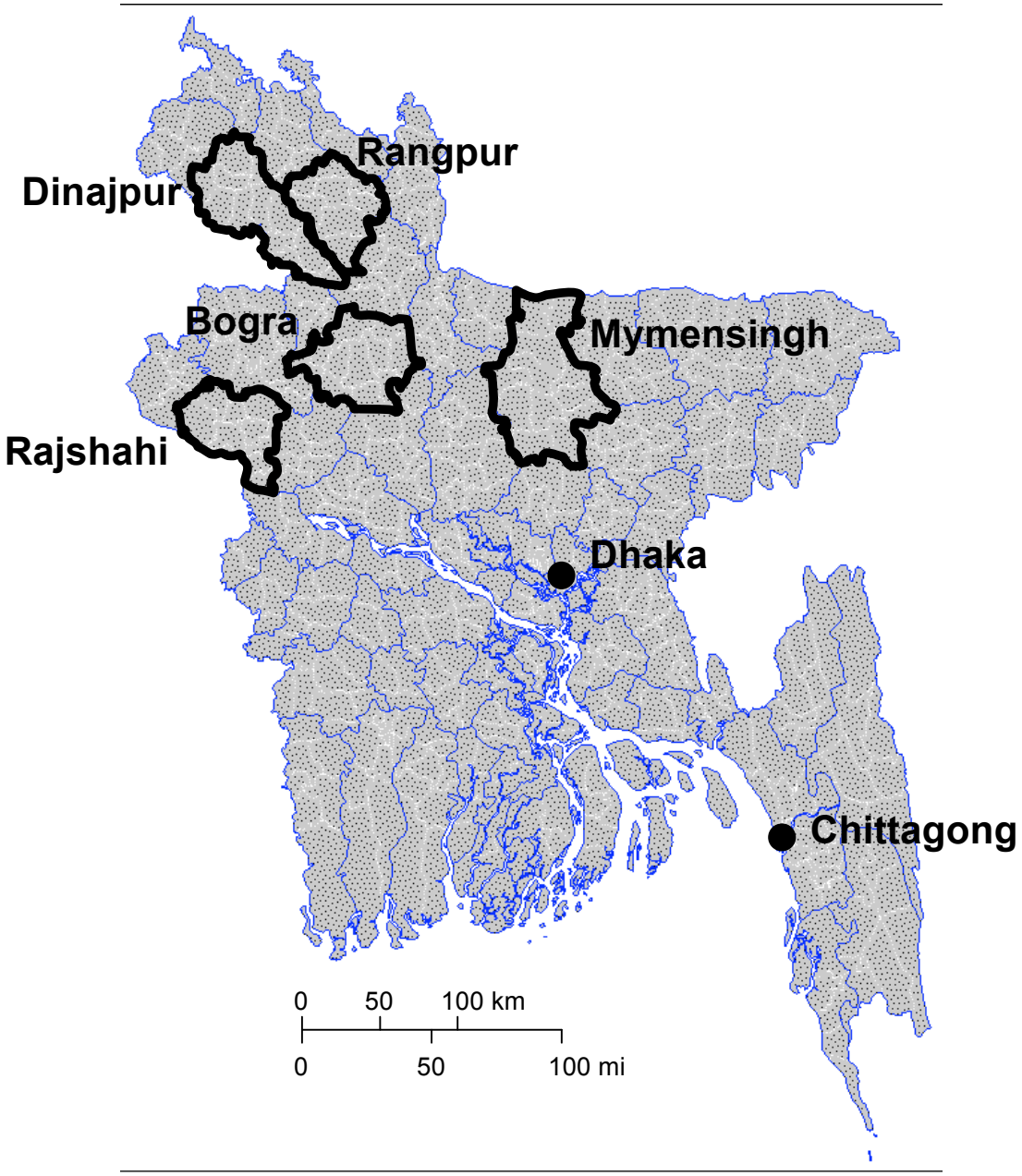

Figure 1.2: Northern districts most shipbreakers migrate from, shown in relation to location of Dhaka and Chittagong.

There are six job types on the yards (see Figure 1.3):

1) Loaders are the largest and most inexperienced group of workers. Primarily involved in heavy manual lifting, they work outdoors in large groups necessary to lift steel sheets (often weighing over one metric tonne). Loads are carried on their shoulders using shoulder padding[i] for protection. This group carries loads in synchrony from within the yards, onto vehicles.
Potential for asbestos exposure: This group mostly works outside and deals with steel sheets, although some have provided accounts of helping cut up white boards for storage, stripping pipes of insulation before loading onto trucks, or throwing insulation into the ocean.

2) Cable-Pullers or wiremen, drag large pieces of the ship up the beach using winches. Cable-pullers are responsible for dragging cables up to several hundred meters down the beach, and attaching them to steel pieces to pull onto higher beach. Most recruits will start off as a loader or cable-puller, and will frequently work both jobs simultaneously. Working barefoot is often considered safer in deep mud where boots can be sucked off.
Potential for asbestos exposure: Like the loaders, this group works on the beach, away from the ship, but can be expected to do other jobs such as stripping pipes and other valued metal of insulation, or discarding objects considered useless, including insulation into the ocean.

3) The oil Group[j] empties the fuel tanks and separates the reusable oil for resale from the residual sludge of no commercial value onto dry ground, where it is burned (56).
Potential for asbestos exposure: This group will traverse back and forth from the ship to the beach; there is the potential for asbestos exposure while in the holds of the ship, but they would not be directly involved in disturbing or removing solid materials from the ship.

4) The hammer group prepares steel sheets by hammering out rivets and other protrusions, and uses a hammer and chisel to break down cast parts.
Potential for asbestos exposure: This group would be out in the open on the beach, and not have many opportunities to enter the ship, or come into contact with asbestos-containing materials.

[i] Locally known as "allergy", this shoulder protector is usually composed of thick cloth, but sometimes composed of foam, rubber sandals, or plastic bags.
[j] Locally known as "foot" group.

5) Cutters are the most experienced and best paid workers, who cut the ship apart with acetylene gas torches. They are considered to have the most dangerous job in terms of chemical exposure, explosions, risk of being crushed, and working in confined spaces. This group is more likely than the above four groups to have access to personal protective equipment (PPE) such as gloves, rubber boots, hard hats and/or goggles, but would probably not receive training.
Potential for asbestos exposure: Cutters spend most of their time inside and around the vicinity of the ship. They may be exposed anytime they cut through asbestos that has been sprayed onto surfaces or while removing insulation to reach structures beyond.

6) Fitters manually remove furnishings and mechanical parts from within the ship, including insulation, before cutting can commence. Like cutters, this group is more likely to have access to PPE, but without appropriate training.
Potential for asbestos exposure: Fitters spend the majority of their time inside the ship and would have the greatest potential for exposure to asbestos while removing insulation and other parts of the ship associated with asbestos such as pipes with lagging, boilers, gaskets, and engines.

The first four groups are mostly based on the beaches, while the last two are found closer to and inside the ships. Other labourers include those who pick debris off the yards[k], often children. Management includes foremen, contractors and the yard owners. Foremen are leaders of each of the labour groups who have worked their way up to that position. They are responsible for recruitment for their job type in their home regions; for example, a loader foreman will recruit loaders in his village and surrounding villages. Contractors are usually local men from Chittagong, in some cases whose villages used to be located where the yards are now (57). They are the middlemen between foremen and the yard owners, responsible for overseeing all yard works and payments.

[k] Locally known as "scrub group"

Figure 1.3: The six main job types on the shipbreaking yards. Clockwise from top left: Loaders (photo: Mark Lewis), cable-pullers (photo: Greenpeace)(58), oil group (photo: Greenpeace) (58), hammer group (photo: Midori Courtice), cutter (photo: YPSA)(59), items on Dhaka-Chittagong highway removed by fitters (photo: Hugh Davies).

1.4 Shipbreaking and asbestos exposure in Bangladesh[1]

According to the ILO, shipbreaking is one of the world's most dangerous occupations (11). On average, worldwide, one worker dies every week and thousands are injured; the long-term consequences of mortality due to occupational diseases such as cancer, and/or asbestos-related diseases are unknown.

For shipbreakers and those working downstream in the resale industry, risks for asbestos-related diseases are compounded by working and living conditions. They lack PPE and adequate training to work safely. The workers often live in squalor, squeezed together in miles of slums surrounding the yards, with no running water, electricity, or sewage system, and other basic hygiene is compromised by large numbers of people living in single rooms. Asbestos is likely a hazard in the community from fibres introduced from contaminated construction materials, but also from contaminated clothing. Ventilation is poor as the dwellings can be windowless, increasing potential indoor exposure levels. In a study by Kilburn et al., radiologic signs of pulmonary asbestos diseases were found in 11.3% of 274 wives of shipyard workers and mesothelioma can result from household exposure (60,61). Exact levels of airborne asbestos transferred in this manner are not known, but this could imply that asbestos brought into the homes and communities of workers in shipbreaking yards could have great implications on the health of community members in their vicinity.

The only exposure assessment undertaken for asbestos in a Bangladeshi shipbreaking yard was by the Norwegian classification society, Det Norske Veritas; they took air, sediment and soil samples, which were analyzed for asbestos, heavy metals, and poly-chlorinated biphenyls. All sampling for asbestos took place in one day. Two air samples were taken, one from near welding/cutting stations, and one was a personal sample along the roadside where workers were seen crushing asbestos with wooden clubs; they were found to be amosite and have concentrations less than 0.01 fibres/ml. White particles were reported to be distributed in two locations on the yards; four bulk samples were collected: two were taken from the yards, one

[1] Studies on shipbreaking yards that did not address asbestos exposure, asbestosis or general worker health are not related to my objectives and are not included in the literature review of the main thesis, but there are so few, I have summarized exposure assessments of other chemicals in Appendix IV to provide the whole picture of other compounds studied to date.

from a sack on the roadside, and one from a roadside crushing shop. They were later confirmed to be amosite (62).

General health problems experienced by Bangladeshi shipbreakers were documented in a 2003 Master of Public Health dissertation. Two-hundred and sixteen shipbreakers were interviewed for self-reported health, 25% from each of four main job groups: cutters, fitters, loaders, cable-pullers. Mean age was 28 years with a range of 15 to greater than 41 years, and 48% had no formal education. Mean duration of employment was 8.8 years with a range of three to greater than 19 years. Workers reported suffering from musculoskeletal disorders (88%), gastric problems (81%), eye problems (72%), skin problems (56%), respiratory tract illnesses (52%), and current injuries (28%). Of those with respiratory tract illnesses, 86% complained of cough and 53% of breathlessness (63).

In a different study, 216 workers participated in a free three-day health care program, during which they were interviewed about occupational health hazards and diseases on the yards. Sixty-six percent were between 20 and 39 years of age and they reported no evidence of child labour. Duration of employment was as follows: less than two years (32%), two to 10 years (57%) and more than 10 years (11%). A geographic information system was used to analyze location and extent of the shipbreaking zone, human settlements and health care services. Asbestos crushing facilities were identified along with eight hospitals, private clinics, and doctor's chambers; the significance of these findings was not discussed (3).

Young Power in Social Action (YPSA), an advocacy group in Chittagong, has published two survey reports on the general demographics and labour condition of Bangladeshi shipbreakers, occupational hazards, and the environmental impact on the coastal zone of Chittagong. A report from 2005 provided a profile of 500 shipbreakers and workers related to industries downstream such as such as steel re-rolling mills, furniture shops, and other shops involved in the resale of salvaged items from the ships. Interviews were conducted from September to November 2003 during breaks outside the shipyards and in the evenings. Fifty-three percent worked on the shipyards, 70% of whom came from northern Bangladesh, specifically 25% from Bogra District. Of the shipbreakers, 40% were cutters, 41% were loaders, 13% were cable-pullers, and 6% were other labourers on the beach. Forty-one percent were 18 to 22 years of age and 11% were child labourers, defined as being less than 18 years of age. Twenty-four percent worked in the

industries downstream from the yards. Thirty-three percent of these workers were from Chittagong and surrounding areas; very few were from northern Bangladesh (64).

A 2006 YPSA survey lead by researchers at the University of Chittagong focused on the impacts of the shipbreaking industry on marine biodiversity. Presence of asbestos on the yards is mentioned and said to be removed from the ship without the use of PPE and dried in the sun before being processed into powder form for resale (12).

While it has been difficult find examples in the literature, other industries in Bangladesh are likely to also have the potential for asbestos exposure. Det Norske Veritas states that asbestos is pulled out of the ships in large bundles, broken down and re-sold in Chittagong and to boiler factories in Dhaka (9,62). Locations of asbestos crushing facilities were included in a map of Chittagong by Hossain et al., although no mention of these facilities was made in the text of the paper, and the locations are believed to move around to avoid detection (3,65).

Initially, this study was intended to be an exposure assessment not only to characterize asbestos exposures on the shipbreaking yards, but also downwind of the yards in the surrounding communities. At an early stage, we consulted with researchers at the University of Chittagong, YPSA, and health officials of the Sitakunda upazila[m] health complex. The general reaction of the former two organizations was positive and helpful, but the response from the local health authorities was discouraging. The reaction to our inquiries closer to the shipbreaking yards and in the surrounding communities was very negative as shipyard owners were suspicious of our motives in light of recent bad press due to interest from environmental activists and journalists.

1.5 Shipbreaking and asbestos exposure in India

Occupational health and safety standards and access to health care in India can be considered similar to the situation in Bangladesh. Comparing shipbreaking in India to Bangladesh, similarities include both beaching and dismantling methods. Where shipbreaking differs in India is that it is governed by the Gujarat Maritime Board, an autonomous state board established in 1982, who describe publicly their shipbreaking practices and information about each yard. Due

[m] Bangladesh is divided into 482 upazilas, the lowest level of administrative government. Sitakunda is the upazila within the Chittagong region where most shipbreaking in Bangladesh takes place.

to more public scrutiny in India, Indian shipbreakers are required to wear PPE and take part in a three day health and safety training session. Whether this occurs in reality has been disputed (8). While the health and safety situation in Indian shipbreaking yards may be a little more advanced in comparison to Bangladesh, just as many fatalities appear in the news, and with dismantling methods similar to Bangladesh, it may be useful to review studies on the shipbreaking situation of this country to inform the probable situation in Bangladesh.

A National Institute of Occupational Health in India (NIOH) report on asbestosis in Indian shipbreakers, commissioned by the European Union in 2006 found 16% (15 out of 94 subjects) asbestosis prevalence in Gujarati shipbreakers exposed to asbestos. The asbestosis cases were diagnosed as having "linear shadows" on radiographs, which were consistent with asbestosis but "could have been caused by other lung conditions". Most had worked for less than 10 years, and all cases were considered early asbestosis, not associated with pulmonary function abnormalities. This study was conducted by a committee of technical experts, headed by Prodipto Ghosh, Indian Secretary of Ministry of Environment and Forests, and no original documents could be located. The methods summarized above were sourced from a Ban Asbestos Network press release from the same year (17,66).

In 2001 Greenpeace published the results of an exposure assessment they performed on the intertidal range of the shipbreaking beach in Alang. Sediment, seawater, dust, and soil samples were collected over two days and analyzed for asbestos, organotins, heavy metals, polyaromatic hydrocarbons (PAH), dioxins, and furans. Six samples were collected for asbestos identification: One bulk sample of insulation from a shipbreaking plot, one dust sample from outside and two from inside living quarters, one dust sample from inside a temple near some of the oldest shipbreaking plots, and one dust sample from a refuse dump 200 metres from the eastern edge of the shipyards. Samples were sent to GALAB laboratories in Germany for identification. Five out of six samples tested positive: chrysotile was found in the insulation on the shipbreaking yard, from outside the living quarters, and in the refuse dump, and both chrysotile and amphibole asbestos were identified inside living quarters. Scanning electron microscopy was the method employed by GALAB laboratories to identify asbestos, but the report does not go into details on sampling methodology or quantification of asbestos found (67).

1.6 Asbestos exposure in shipbuilding and repair

There is a clear analogy of shipbreaking to shipbuilding and repair, and asbestos-related lung diseases due to shipbuilding and repair were reviewed to better understand the health implications of shipbreaking. Early seminal studies were selected for review (out of the large volume of studies available), along with more recent publications reviewing prevalence of asbestosis or mortality due to asbestosis.

Asbestosis was first reported in textile workers at the beginning of the 20th century (68) and since then studies in various industries associated with high asbestos exposures have demonstrated the link between asbestos exposures and asbestosis, lung cancer and mesothelioma (68-72).

In Tyneside, England, Ashcroft was one of the first to describe connections between asbestos exposures of the shipbuilding industry and asbestos-related diseases. Lung smears were examined for asbestos bodies (structures found in the lungs consisting of an asbestos fiber engulfed by a macrophage, or coated with calcium, iron salts, or other substances) from 311 cases in the necropsy department of Tyneside hospital and histological sections were then examined from those with positive smears. Families of subjects positive for asbestos bodies were contacted to establish source of exposure. Asbestos bodies were found in 20.3% of smears and 46.7% of those with positive smears showed asbestos bodies in the histological examination. Asbestos bodies were found in 27.3% of lung cancer cases, and in the one case of mesothelioma reported. Incidence was higher in those living in urban areas where the predominant industry was shipbuilding; 25.6% of urban subjects had positive smears, while only 3.5% of rural subjects did. Based on feedback from families of cases, more than half of those with asbestos bodies in the smear worked on shipyards (73). Percentage prevalence of asbestos-related abnormalities from this and following studies are summarized in Table 1.4.

Table 1.4: Percent prevalence of asbestos-related abnormalities from reviewed studies (Indian studies are shaded).

Paper	n	Parenchymal abnormalities only (profusion score)	Pleural abnormalit-ies only	Parenchy-mal and pleural	All asbestos-related abnormalities
Ashcroft 1968	311				20.3
Sheers 1968	1414	0.3	4.2		4.5
Sheers 1979	971	0.7	9.2		9.9
Harries 1972	1017	0.3	2.9	(1 case)	3.1
	765	0.3	3.1	(1 case)	3.3
	660	0.5	1.5	(1 case)	1.8
Harries 1976	10,849				8.0
Ferris 1971	63	15.8 (>2/1)			
	63	19.0 (1/0-2/1)			
Selikoff 1978	1000	16.7	13.2		50
Selikoff 1979	389	17.8 (percent mortality)			
Selikoff 1980	284	31.7	7.4	47.0	86.3
Jones 1984	1079	1.2	19.6		
	5041		10.3		
Kilburn 1985	288	18.0			64.0
Barnhart 1997	4000	18	27	21	
Murlidhar 2005	181	18.8	1.7	2.2	22.7
Dave 1996	633	26.2	4.3		
Dave 1997	355	6.5	3.0		

The prevalence of pleural and pulmonary abnormalities attributed to asbestos was studied in a radiographic survey of the Devenport British Naval dockyard from 1966. Radiographs and work history were collected from a 10% sample of all employees and two B-readers examined the x-rays for those with abnomalities attributable to asbestos. Exposure was estimated by job type and split into four groups. Prevalence of pulmonary fibrosis ranged from two percent in least exposed to seven percent in the most exposed, with an overall prevalence of 0.3%. Prevalence of pleural fibrosis ranged from two percent in the least exposed to 28 percent in the most exposed, with an overall prevalence of 4.2%. Overall, prevalence of all disorders attributable to asbestos was 4.5%. There was one new case of mesothelioma, in addition to 11 that had been documented before 1966 (38). This study was extended to three more naval shipyards in 1971, using the same methodology and results are summarized in Table 1.4 (37).

Complete surveys of the dockyards in the above pilot studies showed that 893 of 10,849 dockyard workers showed radiological signs of asbestos-related abnormalities. The significance of plaques was discussed as not clinically harmful, but as a marker of asbestos exposure, although some studies at the time had shown reduced lung function in people with pleural changes compared to those without (74). In a follow-up study at the Devenport dockyard 10 years later, 971 subjects from 1966 that had normal radiographs and had survived were re-examined. Ninety-six had nonmalignant asbestos-related abnormalities: 79 were pleural plaques, 11 were pleural fibrosis, and there were six new cases of pulmonary fibrosis. There were 38 new deaths due to mesothelioma, all of whom had greater than 20 YSFE (75).

Sixty-three pipe-coverers listed in personnel files of a shipyard in Boston were matched with welders and pipe-fitters of the same age and duration of employment, as controls. Respiratory symptoms, work history and anteroposterior chest x-rays were obtained. Three B-readers examined the x-rays and classified them according to the ILO classification system (see Appendix III). There were no “positive” readings, indicated by a profusion score of 2/2 or more, in pipe-fitters or welders, but were present in 10 pipe-coverers. “Questionable” readings, indicated by a profusion score between 1/0 and 2/1, were seen in five pipe-fitters, six welders, and 12 pipe-coverers (76).

Chest x-rays of 1000 Grotton shipyard workers with 15 or more YSFE were examined and categorized according to ILO classification. Half had radiologic abnomalities attributable to

asbestos, 33.3% parenchymal (or 16.7% of all subjects) and 26.4% pleural (or 13.2% of all subjects) (27). A 1976 study of 12,051 insulators in Canada and the US with over 20 YSFE, being followed since 1967 compared the mortality experience of shipyard insulators to non-shipyard insulators. Asbestosis was the cause of death in 17.8% of shipyard insulators, while being the cause of death in 7.8% of other insulators (77).

In ship-repair workers, 86.3% of 284 subjects for whom 20 years had passed since onset of employment were found to have "radiological evidence of asbestosis". They were interviewed for lifetime occupational and clinical history, smoking habits, and recieved physical examinations, chest x-rays, and pulmonary function tests. Five B-readers examined the x-rays. Parenchymal fibrosis was evident in 31.7%, pleural abnormalities in 7.4%, and together in 47.2%. Profusion scores of 0/1 were considered negative for pnuemoconiosis. The proportion of individuals with abnormal x-rays increased with longer duration from onset of shipyard employment and ranged from 20 to over 40 years (78).

In a cross-sectional survey of 5041 marine engineers, two B-readers examined chest x-rays after annual checks showed unusual prevalence of calcified plaques on asymptomatic men. Pleural abnormality was defined as presence of chest wall pleural thickening, diaphragmatic pleural plaque, or pleural calcification. In an earlier pilot survey of 1079 engineers, 19.6% of x-rays showed pleural abnormalities while 1.2% showed parenchymal abnormalities. In the subsequent survey of 5041 engineers, 10.3% were found to have pleural abnormalities and prevalence of "pneumoconiotic opacities", or profusion, was said to be negligible (79).

Anteroposterior chest x-rays of 288 shipyard workers with at least 20 years duration of employment were examined by three B-readers. The case definition of asbestosis was at least two readings of 1/0 or greater, or definite pleural abnormalities, thickening, plaques and calcification consistent with asbestos induced disease. Radiographic signs of asbestosis, both pleural and parenchymal were found in 64%; 18% had parenchymal abnormalities alone (80).

The prevalence of asbestosis was examined in CARET (Carotene and Retinol Efficacy Trial) subjects. CARET was a controlled experiment of daily administration of certain vitamins and the effect on prevention of cancer. Twenty-two percent of the participants, or 4000 people were potentially asbestos-exposed shipyard workers. Mean age of this group was 57 years, mean

YSFE was 35 years and mean duration of asbestos exposure was 19 years. Standard anteroposterior chest x-rays were obtained for each subject and they were interpreted according to the ILO classification system by one B-reader. Parenchymal opacities (profusion score greater than 1/0) were see in 18%, pleural thickening in 27% and both occurred together in 21% of participants (81).

1.7 Rationale

Despite the fact that there is evidence of asbestos on the shipbreaking yards, and the potential for exposures to be high, there is almost no literature on the topic of occupational exposures and health outcomes related to shipbreaking in Bangladesh. Bangladesh dismantles 70 to 200 ships a year, and with the average ship being 34 years old, and the oldest ones being over 60 years old, just less than half could contain 6000 to 8000 kg asbestos. Whether the asbestos gets sold or thrown into the sea, removal from the ship is certain, with no effective use of PPE, and those downstream may be exposed depending on disposal practice. While exposure to asbestos on the yards may start to slow down, it will continue on for many years and asbestos-related diseases will continue to rise as a result of past and current exposures due to the latency of several years seen between initial exposure and onset of disease (82,83).

Although we initially intended to perform an asbestos exposure assessment study of the yards and/or communities adjacent to the yards, we experienced too much resistance from yard owners and not enough support from the local health authorities to continue. We shifted our focus to Northern Bangladesh where we conducted a small scale study designed to test methodology and gather information to examine the prevalence of asbestosis and other respiratory symptoms among an internal migrant shipbreaker population in their home communities. Little occupational health work has been done in Bangladesh, and so the study also aided the development of collaborative occupational and environmental health research infrastructure between UBC and institutions in Bangladesh.

The findings from this pilot study were intended to be used to guide future larger scale studies, and to benefit the shipbreakers by raising their awareness about such issues, identifying health concerns, providing information to local organizations that they can use to advocate for change in shipbreaking conditions, and for international organizations such as ILO and the World Health

Organization (WHO) to gain a better understanding about the current situation of this poorly described and very hazardous industry.

1.8 Objectives and research questions

This study characterizes asbestosis and non asbestos-related lung disease among a migrant shipbreaker population who have returned home to northern communities in Bangladesh.

This study had the following research questions:

Primary:

- What is the prevalence of asbestosis among shipbreakers who have returned to their home communities in northern Bangladesh?
- What is the prevalence of other occupationally related respiratory symptoms?

Secondary:

- What are the workers' knowledge of asbestos and the fate of it after leaving the yards?
- What are the workers' attitudes towards health and safety at work?

2. Methodology

This study was performed in Bangladesh, in Bogra District, a floodplain in the northwest of the country, where many of the shipbreakers migrate from, largely due to scarce, irregular employment opportunities in their home region (see Figures 1.2 and 2.1).

2.1 Study locations

Recruitment took place in 16 villages within Sariakandi Upazila of Bogra District[n], 15 to 20 km east from Bogra city (see Figure 2.2). During consultations with local researchers and non-governmental organizations on a fact-finding visit prior to commencement of the study, the locations of the villagers were identified and the trip included a visit to these regions to validate the information. The anteroposterior chest x-rays, physical examinations, and interviews occurred at the Bogra District (Mohammed Ali) hospital, in Bogra city.

[n] Bangladesh, a 147,570 km^2 country of 150 million people, is divided into 64 districts, which are broken into 482 upazilas, the lowest level of administrative government in Bangladesh.

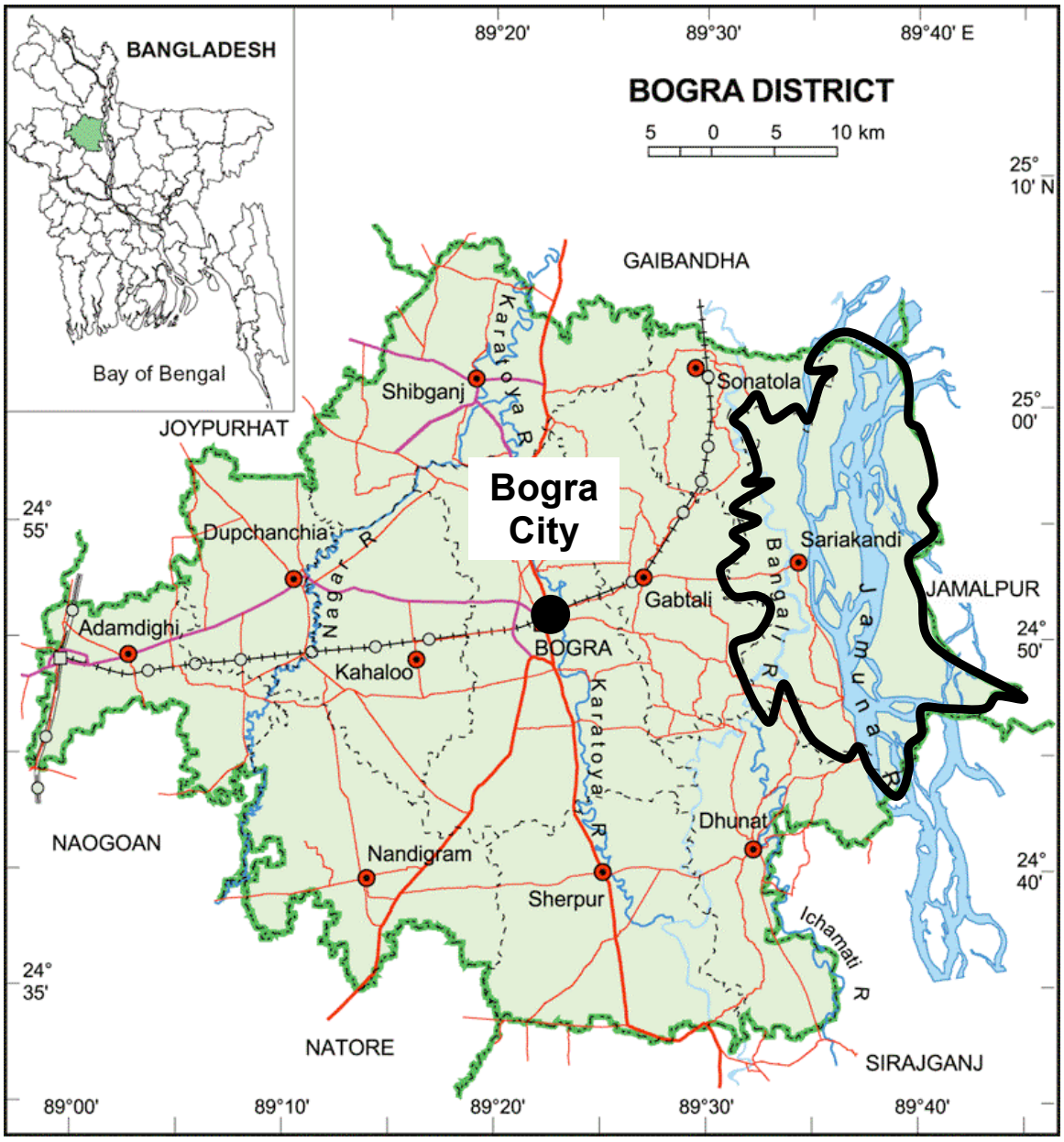

Figure 2.1: Map of Bogra District showing Bogra city and Sariakandi Upazila.

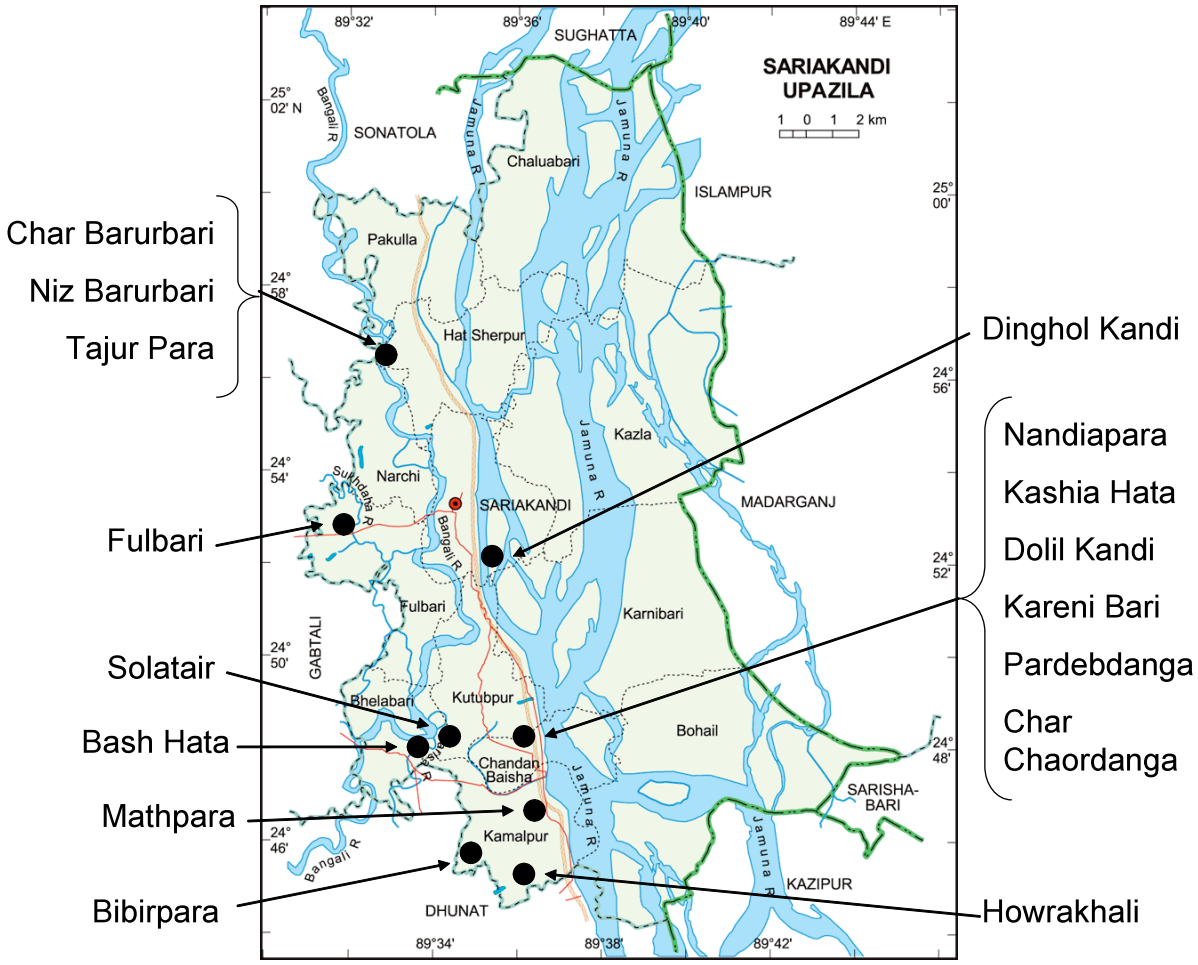

Figure 2.2: Sariakandi Upazila and the 16 villages where recruitment took place.

2.2 Study population

The participants consisted of male shipbreakers living in villages in Sariakandi Upazila (population 229,563), Bogra District. In this pilot study, the target study size (n=100) was determined by time and budget constraints. Male shipbreaking workers of all ages were eligible for the study. They must have worked on the shipbreaking yards for at least one year to ensure time for exposure, and first year of work had to be at least 10 years prior to enrollment to ensure a sufficient number of years had passed since first exposure due to the latent nature of the disease. Asbestosis is commonly seen with exposure durations of over 10 to 20 years, however,

short, intense exposures to asbestos, lasting from several months to one year or more, has been seen to lead to asbestosis in shipyard workers who worked with insulation in confined spaces (24). Various pathologies related to asbestos exposure have different latencies, but asbestosis will start to show first signs after approximately 15 to 20 YSFE, or as early as five to 10 YSFE with sufficiently high exposure (35,78,84).

Initial contact was made in June 2008 by an assistant health inspector for the district health authority, during his routine visits to villages in Sariakandi. The assistant health inspector works under the Civil Surgeon, the district's highest health official, and supervises preventive health care services in the villages. The study was described to villagers and contact information for individuals who were interested in participating was collected; initially, there was no mention of compensation as an incentive.

Enrollment of participants was conducted from October to December 2008 by me, the assistant health inspector and a research assistant from the National Institute of Preventive and Social Medicine (NIPSOM), who was fluent in English and Bangla. Recruitment occurred over several weeks. A village where shipbreakers lived was visited at the beginning of each week, and the consent process was explained orally by the assistant health inspector in Bangla as many individuals were illiterate. Consent forms, in Bangla were signed by participants. The assistant health inspector provided the subjects with clear instructions on how to get to the hospital where data gathering (interviews, physical examinations, and x-rays) was carried out for the rest of the week. Travel costs were provided for the approximate one-hour auto-rickshaw ride to Bogra city, and the subjects were compensated with reimbursement equivalent to one day's wages once they arrived at the appointment. These costs amounted to approximately 210 Bangladeshi Takas or five Canadian Dollars per person.

2.3 Questionnaire and consent form development

All documents were initially created in English, translated into Bangla by researchers at NIPSOM in Dhaka, then "back-translated" by a Bangladeshi-Canadian at UBC to assure quality control. Questions that lost their original meaning or intent were rephrased in a manner that transcended the back and forth translation. This method has been validated and used in translations of over 20 languages for the WHO Quality of Life (WHOQOL) surveys (85-87).

The questionnaire and consent form met requirements of the UBC and Bangladesh Medical Research Council ethical review boards, and in particular the boards' requirements for low-literacy subjects (see Appendices VIII to XIII for certificates from ethical review boards of UBC and the Bangladesh Medical Research Council, both translations of the consent form, and both translations of the questionnaire).

The questionnaire was pilot tested in Dhaka with two Bangladeshi-speaking people of a similar socioeconomic status to the shipbreakers (a rickshaw wallah and a construction worker). It was reviewed by a Bangladeshi respiratory physician who had used the ATS portion of the questionnaire previously in a study of asthma prevalence in Bangladesh (88). Pilot testing was essential because while certain medical and other technical terms worked in both English and Bangla, lay people would not necessarily have understood them. The questionnaire was adjusted according to their responses and comments. The respiratory physician advised on terminology adjustments for the ATS portion of the questionnaire for a lay Bangladeshi audience.

2.4 Data collection

Interviews and physical examinations were conducted in a private consultation room at the Bogra District Hospital. The questionnaire was administered orally in Bangla by the research assistant and responses were simultaneously translated to English for me to record. The research assistant, a physician, performed a physical examination for each subject which assessed:

a) Degree of chest expansion,
b) percussion,
c) auscultation with focus on inspiratory crackles
d) pleural rubs,
e) vital signs,
f) clubbing of the fingers,
g) cyanosis,
h) signs of congestive right heart failure (such as heart sounds, "S_3" or "gallop"),
i) high jugular venous pressure,
j) peripheral edema, and
k) signs of chest surgery.

The anteroposterior chest x-rays were taken by a hospital technician using a 250 kVp x-ray unit, type-TuR DR154® (Transformatoren und Röntgenwerk, VEB Hermann Matern, Dresden, GDR). Technicians were instructed to ensure subjects had shoulders rolled forward and scapulae moved apart for a clear image of the lungs.

The questionnaire collected information on the following:

a) Respiratory symptoms using validated questions from the ATS (89),
b) clinical and work history,
c) general awareness about occupational health and safety (including photos of PPE to determine which kinds they recognized),
d) asbestos and its potential heath risks (including photos of different forms of insulation or other potential asbestos containing materials that can be found on ships) (see Figure 2.3).

Figure 2.3: Photographs of asbestos containing materials potentially encountered on ships or on the shipbreaking yard, used during interviews. Clockwise from top right: lagging on pipe, sprayed insulation, cloth lagging, person sifting asbsetos on Indian shipbreaking yard, ceiling tiles, cloth lagging, and a gasket.

In addition to questions regarding asbestos exposure on the shipyards, the work history questions gathered information about every job ever held including those with potential for asbestos exposure, or exposure to materials such as silica that could lead to other forms of lung fibroses. From work history responses, the variable "former dusty job other than shipbreaking" was created and broken down further into previous occupations with potential for silica exposure. Clinical history questions included injuries, treatments, time-off, and general health.

Subjects were shown photographs of PPE in case they recognized them but did not know what they were called:

1) Respirator (half-face)
2) Dust mask
3) Hard hat
4) Gloves
5) Boots

However, the question about PPE was left open-ended to gain a more comprehensive understanding about other equipment they used and might have considered PPE.

Since the fate of the asbestos after leaving the yards is unknown, subjects were asked how asbestos was collected, processed and removed from the yards. If subjects did not know what asbestos was, they were shown photographs of asbestos in various forms within a ship and asked if they recognized, and had ever handled these materials (see Figure 2.3). Any information obtained on how asbestos was collected, processed and removed from the yards, has been added as a descriptive component of this study.

2.5 Data analysis

All data were coded and entered into Stata/SE version 10.1 for Windows (StataCorp LP College Station, Texas). Twenty percent were double entered and compared to original entries for quality control purposes. Any missing variables were replaced by the mean value for continuous variables, and there were no missing categorical variable values. Histograms were obtained for continuous variables and scatter-plots were used to explore the relationships between them. Contingency tables were used to examine correlation between categorical variables. Due to the small sample size (n=104) a Fisher's exact test was performed to determine p-values. A one-

way analysis of variance was used to examine the relationship between smoking pack-years and outcome variables.

Logistic regression was used to determine odds ratios and 95% confidence intervals for asbestosis, all respiratory symptoms, and work-related respiratory symptoms after being adjusted for age and smoking. Respiratory symptoms were additionally adjusted for possible confounding from former jobs other than shipbreaking with dust exposure. Some correlation was found between covariates but no variables were removed due to the small number of variables used in the models.

A B-reader (certified by NIOSH for proficiency in classifying radiographs of pneumoconioses including asbestosis) from the University of Washington scored all radiographs using the ILO Guidelines for Classification of Radiographs of Pneumoconioses (described in Appendix III) (24,90). Patients were grouped into three categories (see Table 2.1):

1) Probable asbestosis: ILO profusion scores ≥1/1 with irregular opacities consistent with asbestosis.

2) Possible asbestosis: ILO profusion scores ≥1/1 with round opacities, or profusion scores of 0/1 or 1/0 with irregular opacities consistent with asbestosis.

3) Unlikely asbestosis: No visible radiographic abnormalities present, including ILO profusion scores of 0/1 or 1/0 with round opacities.

Table 2.1: Criteria for diagnosis of asbestosis*.

	Profusion score	**Scar shape**
Probable	**≥1/1**	**Irregular (s, t, u)**
Possible	**≥1/1**	**Round (p, q, r)**
Possible	**0/1 or 1/0**	**Irregular (s, t, u)**

* Asbestos exposure assumed for all

Any pleural abnormalities or other radiographic changes of interest were noted. Possible and probable cases are described on a case by case basis in Appendix V.

The ATS questions are designed to obtain information about current respiratory symptoms, and they were determined to be work-related if the subject was positive for the symptom and reported:

a) Improvement on days off and/or
b) Improvement on long holidays and/or
c) Work-related situations or environments (i.e. general work-related environments, mask, dust, humidity, engine fumes, smokes and fogs) making the symptom worse

If the symptom started before the age of starting work in the industry, then subject was considered not to have a work-related problem (see Appendix VII for a more detailed symptom definitions) (91). Current and work-related respiratory symptoms are described separately.

Prevalence of asbestosis and other respiratory symptoms were determined for association with explanatory variables:

a) Job type,
b) duration of employment,
c) years since first employment on the shipbreaking yards, and
d) whether subjects had held a former job known to have "considerable dust exposure".

Duration of employment and years since first employment are surrogates for exposure, and will be known from here on as duration of exposure and years since first exposure (YSFE), respectively. Duration of exposure and YSFE were broken down further into four and three classes respectively based on how subjects were distributed over the range and prior knowledge of asbestosis development and characteristics. This is explained when the characteristics of explanatory variables are presented in Table 3.2 of the results section. Due to an overrepresentation of beach-based rather than ship-based job types, and the small number of cases, the results were not stratified by these differences and job type is reported for each case. Jobs with "considerable dust exposure" were determined through discussions with occupational health researchers at NIPSOM. These jobs were further categorized into those with potential for silica exposure.

To assess the effects of cigarette smoking on the development of lung disorders, the population was divided into current, former, and never smokers, and pack-years were calculated (see Appendix VI for calculation). Former smokers were defined as having quit for at least one month, excluding the month of Ramadan[o] when most smokers will try to stop smoking for one month.

[o] Islamic month of fasting based on the lunar calendar

3. Results

During the feasibility survey conducted in June 2008, 223 eligible shipbreakers expressed their interest in participating in a future study of prevalence of asbestosis.

3.1 Study population

Of the 223 eligible shipbreakers, 118 people were available for enrollment in October to December, 2008 when the study was undertaken; the other 105 people were not available either because they were away at work locally, or they had returned to the shipbreaking yards in Chittagong. The participation rate was 88% (104/118 available subjects). Reasons for not participating included ten subjects who refused after hearing a rumour that subjects would receive vasectomies instead of the x-rays, one from illness, and three from unspecified reason. Some subjects had permanently retired from the shipbreaking yards, but others were planning to return to Chittagong. Due to the difficulty in reaching the villages, only one attempt could be made to visit each village, and it was unsafe and difficult to recruit at night when more people would have been at home. Most participants had no telephone or means of contacting other than to visit their villages in person.

Table 3.1: Age and level of education of the study population (n=104 males).

	n	**%**
Age (years)		
<35	27	26
35-39	22	21
40-44	23	22
>44	32	31
Education (years)		
None	65	63
Primary	15	14
Secondary	24	23

Age and education of the study population are shown in Table 3.1. Mean age was 40 years with a range of 25 to 70 years and a standard deviation of 8.7 years. Mean years of education was 2.5 years with a range of zero to 12 years and a standard deviation of 3.6 years; 63% had no formal education. There were 80 current smokers, 11 former smokers, and 13 nonsmokers. Mean pack-years for current smokers were 6.4 years with a range of less than one to 60 years and a standard deviation of 8.9 years. Mean pack-years for former smokers were 0.4 years with a range of less than one to 11 years and a standard deviation of 1.4 years. Average weight was 50 kg with a range of 39 to 70 kg and a standard deviation of 6.0 kg, and average height was 162 cm with a range of 139 to 179 cm and standard deviation of 6.6 cm.

Table 3.2 displays descriptive statistics for four explanatory variables we investigated: Job type, duration of exposure, years since first exposure (YSFE), and "former dusty job other than shipbreaking". Job type was grouped into beach-based (94%) and ship-based (6%) for further analysis. Loaders, cable-pullers, the oil group and a manager (an accountant) were beach-based, while cutters and fitters were ship-based. The only major job group not captured was the hammer group. Mean duration of exposure was 8.7 years with a range of one to 30 years and standard deviation of 6.8 years. With no prior hypothesis to separate this variable into different classes, it was divided into quartiles which were roughly equal in size. Mean YSFE was 17.3 years with a range of 10 to 30 and a standard deviation of 5.2 years. This variable was divided into three classes based on prior knowledge of asbestosis pathology and development; early signs of asbestosis commonly appear around 15 to 20 years after first exposure (as already discussed in sections 1.2 and 2.2). However, if exposures are sufficiently high, radiographic signs can be seen as early as five to 10 years from onset of exposure. YSFE was divided into 10 to 14 years, indicating possible high exposure, 15 to 19 years, and greater than 19 years. Duration of exposure, YSFE and "former dusty job other than shipbreaking" are displayed against beach-based and ship-based job types.

Table 3.2 Characteristics of explanatory variables (n=104 males).

	Beach-based (n)	Ship-based (n)	Total (n)	Total %
Job Type: Beach-based workers			98	94
Loader			51	50
Cable-puller			21	20
Loader/Cable-puller			20	19
Oil group			4	4
Manager			1	1
Job Type: Ship-based workers			6	6
Cutter			3	3
Fitter			3	3
Duration of exposure in years				
<3	26	0	26	25
3-7	28	1	29	28
8-14	25	1	26	25
>14	19	4	23	22
Years since first exposure				
10-14	35	0	35	33
15-19	29	2	31	30
>19	34	4	38	37
Dusty job other than shipbreaking				
No	67	4	71	68
Yes	32	1	33	32

Because all subjects were potentially exposed, the comparison groups in analyses were those with the lowest exposure class, i.e. beach-based job group, subjects with less than three years for duration of exposure, 10 to14 YSFE, and no "former dusty job other than shipbreaking", respectively. Quantitative exposure data was not available, and no new measurements could be taken, so YSFE was estimated assuming that ships with asbestos are dismantled on the beaches and first exposure would have occurred at first employment.

3.2 Radiographic findings

Profusion scores as determined by the B-reader are displayed in Table 3.3. X-rays were considered "good" in 12%, "acceptable" in 74%, "poor" in 14%, and none were unreadable. According to the diagnostic criteria (see Table 2.1) there was one probable and five possible cases of asbestosis (see Appendix V for details on how this was determined). Because of the low numbers, these were grouped together as six cases, for a prevalence of six percent.

Table 3.3: Radiologic signs of asbestosis (n=104).

	Profusion of irregular opacities		**Profusion of round opacities**		**Asbestosis**
Group	**0/1**	**1/1**	**0/1**	**1/1**	**Total (%)**
	3	**1**	**1***	**2**	**6 (6)**

* Not included according to diagnosis criteria

Six cases of pleural abnormalities were found and none of them were in subjects with parenchymal abnormalities. One was a unilateral pleural plaque five to 10 mm on the left chest wall, four were diaphragmatic pleural plaques of which one showed calcification, and one was a case of diffuse pleural thickening of an obliterated costophrenic angle (refer to Appendix III for clinical definitions of pleural abnormalities). All subjects with pleural abnormalities were in beach-based workers, three of whom had a "former dusty job other than shipbreaking".

Table 3.4 shows distribution of asbestosis cases by exposure category. All cases were beach-based workers with less than 15 years duration of exposure, and had never had a dusty job. Initial exposure was more than 19 years ago for one, 15 to 19 years ago for three, and 10 to 14 years ago for two cases. With respect to original job type, five of the six cases were loaders, and one was a cable-puller.

Table 3.4: Odds ratios and 95% confidence intervals for asbestosis cases by exposure variables, adjusted for age and smoking (n=104).

Exposure variables (n for each category)	Crude count	Odds Ratio	95% Confidence interval
Job type			
Beach-based (98)	6	1	
Ship-based (6)	0	0	
Duration of exposure in years			
<3 (26)	1	1	
3-7 (29)	4	10.0	(0.95-105.2)
8-14 (26)	1	2.8	(0.15-51.3)
>14 (23)	0	0	
Years since first exposure			
10-14 (35)	2	1	
15-19 (31)	3	1.5	(0.21-10.4)
>19 (38)	1	0.36	(0.03-4.4)
Dusty job other than shipbreaking			
No (71)	6	1	
Yes (33)	0	0	

The risk of developing asbestosis for those with three to seven years duration of exposure was ten times that of the reference group and three times for those with eight to 14 years duration of exposure. Those with 15 to 19 YSFE had a higher risk of developing asbestosis compared to the reference group, but those with more than 19 YSFE had a third of the risk. Odds ratios were very stable going from crude to adjusted estimates, but the 95% confidence intervals contained 1.0, indicating the results were not statistically significant.

There were two suspected cases of tuberculosis and one suspected case of lung cancer; see section 4.4.3 for how these were handled.

3.3 Non asbestos-related respiratory symptoms

We examined symptoms based on the ATS questionnaire, looking separately at "any" occurrence of the symptom and those defined as "work-related". The proportion of subjects reporting these symptoms, by beach and ship-based workers, are listed in Table 3.5. Work-related questions for chest tightness were not part of the ATS questionnaire. Due to the low prevalence of work-related symptoms, for further analysis "cough and phlegm" were grouped together, and wheeze and breathlessness were grouped together as "shortness of breath", also known as dyspnoea symptoms. We also groped "any" "cough and phlegm" and "shortness of breath" including chest tightness to investigate further. Variables entered into the statistical model were age, smoking pack-years for current and former smokers, and whether or not they had a former dusty job, except when this last variable was being examined as the explanatory variable.

Table 3.5: Proportions of subjects with "any" and "work-related" respiratory symptoms based on questions from the ATS questionnaire (n=104).

	Any symptom (%)			Work-related symptom (%)		
	Beach-based	**Ship-based**	**Total**	**Beach-based**	**Ship-based**	**Total**
Cough	**23**	**1**	**24**	**13**	**0**	**13**
Phlegm	**10**	**1**	**11**	**1**	**0**	**1**
Chest tightness	**19**	**2**	**21**	**N/A**	**N/A**	**N/A**
Breathlessness	**11**	**0**	**11**	**6**	**0**	**6**
Wheeze	**3**	**0**	**3**	**2**	**0**	**1**
All respiratory symptoms	**35**	**2**	**37**	**17**	**0**	**17**
Cough and phlegm	**25**	**1**	**26**	**13**	**0**	**13**
Shortness of breath	**27**	**2**	**29**	**8**	**0**	**8**

Questions on respiratory symptoms also included history of bronchitis, pneumonia, chronic obstructive pulmonary disease (COPD), pulmonary fibrosis, tuberculosis and asthma. See Table

3.6 for percentage of subjects who had a confirmed case, and percentage of subjects who did not know what the illness was. All "confirmed cases" had to have been confirmed by a doctor.

Table 3.6: History of other respiratory illnesses (n=104).

Illness	Percent confirmed cases	Percent who did not know what this was
Bronchitis	2	78
Pneumonia	1	29
Chronic obstructive pulmonary disease	0	96
Pulmonary fibrosis	0	96
Tuberculosis	1	0
Asthma	4	11

Table 3.7: Odds ratios and 95% confidence intervals for all cases experiencing respiratory symptoms, by exposure variables, adjusted for age, smoking, and former dusty job*.

Exposure variables (n for each category)	Cases	Odds Ratio	95% Confidence interval
Job type			
Beach-based (98)	36	1	
Ship-based (6)	2	0.53	(0.05-5.4)
Duration of exposure in years			
<3 (26)	12	1	
3-7 (29)	10	0.67	(0.20-2.2)
8-14 (26)	7	0.60	(0.17-2.1)
>14 (23)	9	0.73	(0.21-2.6)
Years since first exposure			
10-14 (35)	13	1	
15-19 (31)	11	0.44	(0.13-1.5)
>19 (38)	14	0.60	(0.18-2.0)
Dusty job other than shipbreaking			
No (71)	25	1	
Yes (33)	13	1.2	(0.45-3.0)

*Except when "former dusty job other than shipbreaking" was being examined as an explanatory variable.

Prevalence of all respiratory symptoms was 37%, of which 95% was in beach-based workers (Table 3.5). Table 3.7 shows relations between selected risk factors and all respiratory symptoms. For all variables except former dusty job, risk factors indicated a "protective effect" with respect to the reference group, i.e. ship-based workers had half the risk of beach-based workers. The odds ratio of all respiratory symptoms for those with a "former dusty job other than shipbreaking" was 1.2; however, the 95% confidence intervals all included 1.0, and were not statistically significant.

Table 3.8: Odds ratios and 95% confidence intervals for "cough and phlegm" cases by exposure variables, adjusted for age, smoking, and former dusty job*.

Exposure variables (n for each category)	Cases	Odds Ratio	95% Confidence interval
Job type			
Beach-based (98)	26	1	
Ship-based (6)	1	0.26	(0.01-5.8)
Duration of exposure in years			
<3 (26)	8	1	
3-7 (29)	8	1.1	(0.30-3.7)
8-14 (26)	5	0.76	(0.20-2.9)
>14 (23)	6	0.89	(0.19-3.5)
Years since first exposure			
10-14 (35)	10	1	
15-19 (31)	8	0.55	(0.16-1.9)
>19 (38)	9	0.73	(0.21-2.6)
Dusty job other than shipbreaking			
No (71)	17	1	
Yes (33)	10	1.4	(0.51-3.7)

*Except when "former dusty job other than shipbreaking" was being examined as an explanatory variable.

Prevalence of cough and phlegm was 26%, of which 96% was in beach-based workers (Table 3.5). Table 3.8 shows odds ratios of cough and phlegm for a variety of risk factors which all primarily indicated a "protective" effect except for other dusty job. Duration of exposure shows a slight increase but for only one of the groups. The odds ratio of those with a "former dusty job other than shipbreaking" showed a 40% increase; however, all 95% confidence intervals included 1.0, and were not statistically significant.

Table 3.9: Odds ratios and 95% confidence intervals for shortness of breath cases by exposure variables, adjusted for age, smoking, and former dusty job*.

Exposure variables (n for each category)	Cases	Odds Ratio	95% Confidence interval
Job type			
Beach-based (98)	28	1	
Ship-based (6)	2	0.81	(0.07-8.6)
Duration of exposure in years			
<3 (26)	10	1	
3-7 (29)	7	0.51	(0.14-1.9)
8-14 (26)	6	0.68	(0.18-2.5)
>14 (23)	7	0.65	(0.17-2.5)
Years since first exposure			
10-14 (35)	10	1	
15-19 (31)	9	0.45	(0.12-1.7)
>19 (38)	11	0.62	(0.18-2.2)
Dusty job other than shipbreaking			
No (71)	20	1	
Yes (33)	10	0.98	(0.36-2.7)

*Except when "former dusty job other than shipbreaking" was being examined as an explanatory variable.

Prevalence of shortness of breath symptoms was 29%, of which 93% was in beach-based workers (Table 3.5). Table 3.9, shows odds ratios of shortness of breath for a variety of risk factors which all indicated a "protective" effect. The odds ratio for duration of exposure and YSFE showed about half the risk when compared to the reference groups; however, all 95% confidence intervals included 1.0, and were not statistically significant.

3.3.1 Work-related respiratory symptoms

Prevalence of work-related cough and phlegm was 13% (Table 3.5), all in beach-based workers. Table 3.10 shows odds ratios of work-related cough and phlegm for a variety of risk factors. A slight negative trend was seen from 1.0 to 0.81 for duration of exposure, and from 1.0 to 0.62 for

YSFE. The odds ratio was nearly the same for having or not having had a "former dusty job other than shipbreaking". All 95% confidence intervals contained 1.0, therefore not statistically significant, and all values were very stable going from crude to adjusted estimates.

Table 3.10: Odds ratios and 95% confidence intervals for work-related cough and phlegm cases by exposure variables, adjusted for age, smoking, and former dusty job*.

Exposure variables (n for each category)	Cases	Odds Ratio	95% Confidence interval
Job type			
Beach-based (98)	14	1	
Ship-based (6)	0	0	
Duration of exposure in years			
<3 (26)	4	1	
3-7 (29)	4	1.0	(0.21-4.8)
8-14 (26)	3	0.84	(0.16-4.5)
>14 (23)	3	0.81	(0.15-4.6)
Years since first exposure			
10-14 (35)	6	1	
15-19 (31)	4	0.78	(0.18-3.3)
>19 (38)	4	0.62	(0.13-3.0)
Dusty job other than shipbreaking			
No (71)	9	1	
Yes (33)	5	1.2	(0.34-3.9)

*Except when "former dusty job other than shipbreaking" was being examined as an explanatory variable.

Prevalence of work-related shortness of breath symptoms was 8% (Table 3.5), all in beach-based workers. Table 3.11 shows odds ratios of work-related shortness of breath for a variety of risk factors, which indicated a "protective" effect for duration of exposure and YSFE. More than double the risk was seen with having had a "former dusty job other than shipbreaking". The 95% confidence intervals were not as wide as some encountered in the other models; however, they all contained 1.0, and were not statistically significant.

Table 3.11: Odds ratios and 95% confidence intervals for work-related shortness of breath cases by exposure variables, adjusted for age, smoking, and former dusty job*.

Exposure variables (n for each category)	Cases	Odds Ratio	95% Confidence interval
Job type			
Beach-based (98)	8	1	
Ship-based (6)	0	0	
Duration of exposure in years			
<3 (26)	5	1	
3-7 (29)	2	0.69	(0.12-4.0)
8-14 (26)	1	0.42	(0.04-4.2)
>14 (23)	0		
Years since first exposure			
10-14 (35)	4	1	
15-19 (31)	2	0.23	(0.03-2.1)
>19 (38)	2	0.19	(0.02-1.4)
Dusty job other than shipbreaking			
No (71)	4	1	
Yes (33)	4	2.4	(0.52-10.7)

*Except when "former dusty job other than shipbreaking" was being examined as an explanatory variable.

Shortness of breath is a symptom of asbestosis, and so its presence was examined along with presence of asbestosis (92). Out of six asbestosis cases, five were found to be experiencing some form of respiratory symptom: two shortness of breath, three cough and phlegm, one work-related shortness of breath, and two work-related cough and phlegm.

3.4 Other health outcomes

Information collected from the remainder of the questionnaire relating to self-reported health, hazard perception and knowledge of asbestos, is reported in the following sections.

3.4.1 Self-reported health

Distribution of self-reported health symptoms for all subjects was as follows: excellent (11%), good (33%), fair (37%), poor (10%), and bad (9%). In Table 3.12, job type, duration of exposure, YSFE and former dusty jobs other than shipbreaking, are displayed according to self-reported health. There was no discernable pattern between exposure variables and self-reported health, and p-values indicated relationships were not significant.

Table 3.12: Self-reported health against exposure variables. P-values indicate correlation from Fisher's exact tests (n=104).

Exposure variables (p-value for each category)	**Self-reported health**					
	Excellent	Good	Fair	Poor	Bad	**Total**
Job type (0.627)						
Beach-based	12	30	37	10	9	**98**
Ship-based	0	4	2	0	0	**6**
Duration of exposure in years (0.319)						
<3	3	7	10	4	2	**26**
3-7	6	10	8	1	4	**29**
8-14	1	12	11	2	0	**26**
>14	2	5	10	3	3	**23**
Years since first exposure (0.417)						
10-14	6	14	11	2	2	**35**
15-19	4	9	10	3	5	**31**
>19	2	11	18	5	2	**38**
Dusty job other than shipbreaking (0.574)						
No	8	26	24	8	5	**71**
Yes	4	8	15	2	4	**33**
Total self-reported health symptoms	**12**	**34**	**39**	**10**	**9**	**104**

In Table 3.13, cases of asbestosis, all respiratory symptoms, work-related cough and phlegm, work-related shortness of breath, and those without respiratory symptoms, are displayed

according to self-reported health. Proportions of respiratory symptoms indicated in parentheses, increase as self-reported health goes from excellent to bad, with the greatest frequency reporting fair health. P-values were less than 0.05 for respiratory symptoms and subjects without respiratory symptoms, indicating a small chance of observing these differences even if there was no true difference between the two populations, but a higher p-value (0.217) was found when examining self-reported health as an indicator for asbestosis.

Table 3.13 Self-reported health against health outcome, including no symptoms, with p-values indicating correlation from Fisher's exact tests.

Health outcome variables (p-value for each category)	**Cases according to self-reported health (proportion of cases in each self-reported health category)**					
	Excellent	Good	Fair	Poor	Bad	**Total cases (row totals)**
Asbestosis (0.217)	0	1 (3)	2 (5)	2 (20)	1 (11)	**6**
All respiratory disorder symptoms (0.000)	2 (17)	5 (15)	14 (36)	9 (90)	8 (89)	**38**
Work-related cough and phlegm (0.001)	0	1 (3)	5 (13)	5 (50)	3 (33)	**14**
Work-related shortness of breath (0.030)	0	0	4 (10)	2 (20)	2 (22)	**8**
Subjects without respiratory disorder symptoms (0.000)	10 (83)	29 (85)	25 (64)	1 (10)	1 (11)	**66**
Total self-reported health	12	34	39	10	9	104

3.4.2 Hazard perception and PPE use

When asked whether or not it was important to protect yourself at work, eighty-five percent of subjects reported it was important. Comparing shipbreaking to other jobs in Bangladesh, eighty-

five percent reported shipbreaking is less safe than other jobs in Bangladesh, fifteen percent reported it to be equally safe or equally dangerous as other jobs in Bangladesh, and none reported shipbreaking to be more safe than other jobs in Bangladesh.

Injuries were common; fifty-eight percent of the shipbreakers had been injured severely enough to take time off, at least once while working on the shipbreaking yard. Most injury accounts are of loaders and cable-pullers because the majority of subjects in this study belonged to those two job groups.

Common injury causes for loaders were: slipping in mud and straining muscles while loading steel sheets onto trucks. Common injury causes for cable-pullers were: stepping on debris and coming into contact with frayed metal cables. Other self-reported causes of injury included: falling from heights and objects falling on them from heights. In addition to self-reports, workers reported seeing other cable-pullers standing too close to metal cables snapping under tension, as a cause of injury.

Common injury outcomes were: punctured skin, fractured/broken bones, burns, heat stroke, and there was one account of losing consciousness due to gas leaking from a pipe.

Of all subjects, including those who did not believe it was important to protect oneself at work, seventy-six percent used a method to stay safe on the yard: PPE (69%), bathing, washing hands or changing before leaving the yard (30%), and "being extra careful and vigilant" (4%). Of those 16 subjects who reported protection at work not important, two used PPE to "stay clean", and three were instructed to do so by supervisors.

While sixty-nine percent of subjects reported using some form of PPE, they claimed to have never received any training. PPE they reported included shoulder protectors while loading heavy metal sheets[p] (49%), gloves (38%), rubber boots (12%), sandals (7%), hard hats (6%), cloth to cover face[q] (6%), special (mechanic type) clothing (3%), and baseball caps (2%).

[p] Local term "allergy"
[q] Local term "gamcha"

Reasons for not using PPE included discomfort (24%), not being appropriate for their job/only meant for cutters and fitters (16%), unavailability (15%), would not know how to use if it was available (7%), not necessary because the work is safe/they are careful/God would protect them (6%), PPE is unsafe (2%), and did not have a reason (30%).

When used, PPE was reported to be supplied by foremen or found abandoned in the ships. Two people refused to wear rubber boots because they are considered a hazard especially in deep muddy conditions. At least one person stated wearing a hard hat to protect him from the rain, and another for curiosity because it was found in a ship. The most frequently used PPE was the shoulder protector, usually composed of thick cloth, but sometimes composed of foam, rubber sandals, or plastic bags. Those who had purchased their own rubber sandals as footwear felt it was an important to mention as protective equipment because many of their colleagues work while barefoot.

3.4.3 Knowledge of asbestos

When asked about concern regarding asbestos exposure at work, eighty-seven percent did not know what was meant by the term, "asbestos", eight percent were unconcerned and five percent were concerned. When the latter two groups were asked how they knew about asbestos, one said a foreman had told him it was a, "hard white material which is poisonous if it mixes with air" and was instructed not to touch it, although he had handled loose pipe lagging in the past; two said they heard on a television show that it was a "powder that causes disease"; two said they heard on a television show that it was a disease, and the rest said they first heard about it during recruitment for the study.

The majority of subjects did not understand what was meant by "asbestos", so a series of photographs of asbestos in forms likely to be encountered on a ship were shown to determine if they were recognized (see Figure 2.3). Forty-one percent did not recognize items in the photos. Interestingly some perceptions of the photo's content were far from actuality; responses to photos such as, "pipes looked like 'arms and legs' or 'ulcerated stomachs'", or "something they burned for cooking", were coded as not recognizing the photos.

The other fifty-nine percent who recognized the photos as items from ships, stated the items were either removed and thrown into the sea, stored in a shed until special parties came to purchase it, or it used to be thrown into the sea but was now sold to special parties. Some considered the materials in the photos as trash, while others stated the materials were costly and valuable. Of those who stated the materials were sold, nobody knew its final destination. Half of those who recognized the photos stated they had come into regular contact with these items while carrying out their tasks on the beach. Names used for these items included, "Shung shungi-tula" or "Khaizani" which means "itchy-itchy cotton", and these terms were used interchangeably for asbestos insulation or fiberglass insulation.

4. Discussion

The following sections compare key findings to existing literature and discuss potential biases.

4.1 Asbestosis

We found six percent prevalence of asbestosis. This estimate was derived from one probable and five possible cases grouped together. There have been no studies of asbestosis prevalence in Bangladesh for comparison, but there are Indian studies where occupational health and safety standards on shipbreaking yards and other industries, and access to health care can be considered similar to the situation in Bangladesh.

According to a report of Indian shipbreakers prepared by the National Institute of Occupational Health in India (NIOH), "one in six workers (16% of the workforce that handles asbestos) could be suffering from an early stage of asbestosis and thus at serious risk of mesothelioma". The 16% prevalence of early stage asbestosis is higher than our six percent prevalence, but none of the original reports could be located and the methodology was not provided in the EU report. Reference to the methods was found in an article from the Ban Asbestos Network (BAN) which stated, "diagnosis was made by noting linear shadows on radiographs which were consistent with asbestosis but could have been caused by other lung conditions. Most of the workers had worked for less than 10 years, and all cases were considered early asbestosis, not associated with pulmonary function abnormalities". The conclusive remark regarding mesothelioma was not supported (17,66,93). It is unusual that they would have found such a high prevalence with subjects who had worked less than 10 years on the yards, but we are also not told what other jobs they may have had in the past. Without being able to access the original study it is difficult to make meaningful comparisons to our results.

In Mumbai, India, 181 asbestos composite mill workers were reported to have an asbestosis prevalence of 22%; both pleural and parenchymal disease were seen in ten percent of the cases, but it seems unusual that pleural abnormalities were seen in only 1.7% of subjects (refer to Table 1.4). The higher prevalence of asbestosis found in this study is likely due to a) workers having at least 20 years of exposure (our minimum duration of exposure was one year), and b) working in an enclosed facility provided potential for higher concentrations of asbestos exposure in comparison to the majority of our subjects who were stationed outdoors (44). However, this

study may provide us with an idea of disease prevalence likely to occur to those working mainly inside the ship.

A number of studies exist from countries that have historically been involved in ship-repair and shipbuilding. In the literature review, asbestosis prevalence ranged from 0.3% to 31.7% for parenchymal abnormalities alone, 1.5% to 27% for pleural abnormalities alone, and 1.8% to 86.3% for all asbestos-related abnormalities (see Table 1.4). It was common for cases with parenchymal abnormalities to also have pleural abnormalities. Typically, because the pleura is more sensitive to asbestos than the lung parenchyma and the earliest effects of asbestos exposure can show there first, more pleural abnormalities would be expected than parenchymal, and some subjects expected to display both. The six percent prevalence asbestosis we found is towards the lower end of the range of parenchymal abnormalities seen in the literature, and pleural abnormalities were not found in asbestosis cases, adding to the question of whether the workers in this study were even moderately exposed. However, these patterns may have emerged with a larger sample size, more highly-exposed workers, and other reasons being discussed in section 4.3.5. Interestingly, this expected high prevalence of pleural abnormalities was also not seen in some of the other studies summarized in Table 1.4.

There were no cases of asbestosis seen in the ship-based workers, where we would have expected to see a greater risk of developing disease, due to the presumed higher concentrations of exposure. This is likely due to the small representation of ship-based workers compared to beach-based workers, but could also have to do with over-stating the difference in exposures experienced by beach- and ship-based workers. We found five of the six cases were in loaders, and this highlights the need for a more detailed job analysis after an exposure assessment of the yards.

There was no exposure-response as might have been expected with YSFE or with duration of exposure. Two of the six cases were found to belong to the shortest YSFE class, between 10 and 14 years, and five cases had worked for less than eight years; typically asbestosis cases are not seen with such a short latency or duration of exposure unless exposures were very high (33,94). Subjects whose initial exposure was more recent or who worked fewer years could have been at greater risk if those particular workers happened to work around older ships with asbestos, or

had tasks for short periods of time with high exposure such as loading insulation into storage sites, or stripping insulation off pipes before loading onto trucks.

While the findings reveal a lower prevalence than in shipbreaking yards and mills in India, and shipbuilding/repair yards in other countries, there are a number of possible reasons for this and these will be discussed in sections 4.3 and 4.4.

4.2 Current and work-related, non asbestos-related respiratory symptoms

Results show that there was little association between all respiratory symptoms and job type, duration of exposure or YSFE. Any association seen was "protective", but it was non-significant. Previous dusty jobs other than shipbreaking were associated in a non-significant way with an increased risk of respiratory symptoms. None of these findings changed when we looked at work-related symptoms.

There are two reports with information about respiratory symptoms in Bangladeshi shipbreakers. A published paper from 2008, and a Master of Public Health dissertation from 2003. The 2008 paper reports 80.56%, or twice the prevalence of self-reported "all respiratory problems" in a study of workers on Chittagong shipbreaking yards, who were approximately the same age as our subjects but had worked for a shorter duration of time. We would have expected to see a lower prevalence due to an average shorter duration of employment, but the paper does not state what former jobs the workers had, or what instrument or whether questions from the ATS questionnaire were used. Respiratory symptoms being reported could be a result of a job held before shipbreaking, and because the nature of self-reported information is subjective, it would be important to know how similar their questionnaire was to ours. If questions being asked were different from the questions used in our study, the results would likely be different (3).

The 2003 dissertation by Roy (National Institute of Preventive and Social Medicine, Bangladesh) reports 52% prevalence of self-reported respiratory tract illnesses, which is in closer agreement with our reported 37% prevalence for all respiratory symptoms. Of those with respiratory tract illness, 86% complained of cough and 53% of breathlessness, compared to our reported values of 65% and 30%, respectively. Double the number of subjects were interviewed

in the Roy study, with a lower mean age of 28 compared to our 40 years. Duration of employment was very similar with a mean of 8.8 years (range of three to greater than 19 years), compared to a mean of 8.7 years (range of one to 30 years) for our subjects. While the results are slightly different from ours, Roy's subjects consistently reported more disorders; validated questions from the ATS questionnaire were not used, so this could account for some of the differences observed, especially because the differences were consistently in the same direction (63).

While there are only two studies to report respiratory symptoms in Bangladeshi shipbreakers, there is a study for comparison on general prevalence of respiratory symptoms in Bangladesh. In a cross-sectional study on 5642 people interviewed with the ATS questionnaire, Hassan et al. found a prevalence of wheeze in 6.2% of adults 15 to 44 years old and 11.8% in adults over 45 years old; we also found a greater prevalence of wheeze in subjects over 45 years with no wheeze in the younger group, and three percent prevalence in those over 45 years. Asthma was reported in 5.6% of adults 15 to 44 years old and in 11.8% of adults over 45 years old; prevalence of asthma was seven percent in rural areas. We found a four percent prevalence of asthma, but 11% did not know what asthma was (88). Hassan et al. used the ATS questionnaire, which makes their results more comparable to ours, and while it appears shipbreakers have a lower prevalence of respiratory symptoms than the general Bangladeshi population, this is likely due to our smaller sample size being non-representative, and the healthy worker effect which will be discussed in section 4.3.3.

Self-reported health symptoms in Table 3.12, showed very little association with explanatory variables. This was not unexpected since little association was seen between all respiratory symptoms and duration of exposure or YSFE; respiratory symptoms are determined from responses to self-reported data from the ATS questionnaire, and are highly correlated to self-reported health symptoms.

Shortness of breath, a usual symptom of asbestosis, was found in only two of six asbestosis cases. This may be an indication that the cases are at an early stage and have yet to develop strong symptoms.

4.3 Study bias

While the findings reported may be a true estimate of the risk posed, a number of factors can affect the results. These factors which could lead to an inaccurate estimate are discussed in the following sections, along with their potential impact on the results and interpretation.

4.3.1 Sampling strategy

The goal of our sampling strategy, as for most studies, was for the target number of 100 subjects to be as representative of the whole population of Bangladeshi shipbreakers as possible. A major consequence of our strategy, discussed below, resulted in an overrepresentation of lower-exposed, beach-based workers.

The northern village communities were selected for this study instead of Chittagong, where the shipbreaking yards are located, for two reasons. The first being barriers to conducting a study in Chittagong. During a fact-finding trip prior to the pilot study, shipbreaking yard owners suspected us of being journalists or environmental activists who were interested in disrupting work at the yards. They would not allow us access to the yards, or even the adjacent communities which they had control over. The second reason was locating subjects in their homes allowed us unimpeded access to workers who had returned due to injury or old age, providing us the possibility of detecting a chronic disease after a long latency. Through consultations with local researchers during our fact-finding trip, Bogra district was selected from other possible northern districts because it had a large population of shipbreakers, and the local government authorities were supportive of our work.

Migrant workers from northern areas of Bangladesh are given tasks considered to be the most labour intensive and poorest paid, such as loading and cable-pulling. The more well-paid workers, such as cutters, are mainly local men from Chittagong. The ship-based workers would theoretically have higher potential for exposure to asbestos, thus our approach may have led to an overrepresentation of loaders and cable-pullers, a less-exposed population. In order to understand the most representative scenario and risks for ship-based compared to beach-based workers, we needed more representation of the higher exposed group.

4.3.2 Volunteer bias

A bias caused by more diseased or healthier people participating because of an interest in the study is known as a volunteer bias. Our study could have been susceptible to this because any shipbreaker who fit the eligibility criteria and was willing to participate was selected. To minimize bias and reduce chances of someone falsifying information to get access to the study, only those who had been identified during the feasibility survey were approached for recruitment. No mention of incentives was given during the survey. Because those approached during recruitment had already expressed interest, few of those approached during recruitment were unwilling to participate. Volunteer bias should not have significantly affected the results.

4.3.3 Healthy worker effect

The healthy worker effect describes employment selection factors leading to the lower morbidity and mortality prevalence seen in workers in general, or in workers who survive longer in an industry because of better health. The shipbreaker population in this study demonstrates a healthy worker effect that is more pronounced than classically seen. The background Bangladesh mortality demographics have a high under age five mortality and those who live past their fifth birthday then face annual natural disasters and a high burden of disease (see Table 4.1). Perhaps then the workforce here is more likely to do well in an unhealthy worker environment compared to workforces in more economically developed countries where the healthy worker effect has been previously described. In addition to their extremely physically demanding work, the shipbreaker population must have enough stamina to travel to a distant workplace and live in cramped, unhygienic conditions.

Table 4.1: 2009 Bangladesh profile of morbidity and mortality for selected risk factors.

Population living below poverty line	50%
Under age five mortality	69/1000 live births
Life expectancy	63 years
Malnutrition (% stunting)	47%
Diarrhoea	65,000 deaths/year
DALYs/1000 cap/year for environmental burden of disease	64 (world lowest:16; highest: 289)
Deaths/year from floods	6958
Number of people affected/year from drought	12.5 million

DALY-disability adjusted life year (Source: UNICEF (121))

This phenomenon has been described by others. A study on mortality from injuries in Brazilian steel workers found that the healthy worker effect was greater than that commonly found in studies of occupational groups in more economically developed countries because of a greater socioeconomic gap between employed and unemployed populations in Brazil, and unequal distribution of health care resources (95).

A "healthy migrant effect" has been described as self-selection at the time of immigration which leads to a mortality advantage despite the lower socioeconomic status of immigrants. It has classically been described in reference to people who immigrate from less economically developed countries to more economically developed countries, especially in the context of Hispanics in the United States (96,97). In Croatia, a within-country healthy migrant effect was described, where there were other reasons for migrating in addition to finding work, but it was theorized that people have to be more physically and mentally fit to make the transition (98). In Bangladesh, a healthy migrant effect could account for the lower than expected prevalence of asbestosis seen in shipbreakers.

The healthy worker and healthy migrant effects could in part account for the lower than expected prevalence of disease in our sample of shipbreakers; both in the classic sense when compared to the general Bangladeshi population, and a pronounced effect when compared to shipyard workers from more economically developed countries.

A survivor effect is seen when removal of unhealthy workers from the work force leaves only a pool of healthy workers to select from, leading to a lower than expected prevalence of disease. However, the survivor effect should be reduced in this study compared to others where recruitment takes place at the worksite, because while some very ill workers could have passed away, recruitment took place in the villages with both current and former workers. Because recruitment took place during the day while healthy individuals may have been in the field, recruitment could have included more ill or elderly people, but a normal distribution of subjects' ages did not indicate this was the case.

4.3.4 Exposure misclassification

As discussed in section 4.2.1, our sampling strategy may have led to an overrepresentation of a less-exposed population, but it was not possible to verify levels of exposure on the beach by conducting exposure assessments of the yards or of the villages directly adjacent to the yards. Exposure to asbestos on the yards was therefore assumed, based on the following knowledge:
a) Most ships built before mid-1970 contained asbestos,
b) As of 2008, the average age of ships dismantled in Bangladesh was 34 years with a range of 21 to 64 years (82,83),
c) Bangladesh dismantles 70 to 200 ships a year,
d) Approximately 10% of ships today would have been built prior to mid-1970 and could contain asbestos while the rest contain fiberglass insulation (10).

Therefore, it was reasonable to assume exposure[r]; whatever the fate of the asbestos, there would have been asbestos fibres in the vicinity of the yards as it was removed either discretely, or with components as they were removed from the ships. Environmental exposures would vary depending on number of ships being dismantled, which ones contained asbestos, and what stage of the process they were at. Independent exposures would vary with whether the work was located within the ship or on the beach, and tasks being carried out at each location (refer to job descriptions and potential for asbestos exposure from section 1.1.5).

[r] We know of at least one asbestos-laden ship dismantled even during the field work. The scrapping of the "Laieta" (built 1970 in Astano S.A., Spain), containing 1,200 tonnes of asbestos, was dismantled in Bangladesh in July 2008(122,123)

We know from Table 1.2 that removal and bagging of asbestos can lead to individual asbestos exposures from ten to 2000 fibres/ml. Ship-based workers may experience these levels of exposure for up to 12 hours a day, six days a week, but it is more difficult to estimate the individual exposure for the beach-based workers. Assuming airborne concentrations are much lower and taking into account the dose-dependent timecourse for asbestosis to develop, a higher prevalence of asbestosis than six percent, might not be expected for this less-exposed group (32). Despite the fact that four out of six ship-based workers belonged to the longest exposure duration and YSFE class (refer to Table 3.2), none of them had signs of asbestosis or other work-related lung diseases and reported their health as being fair and good. This was lower than expected, but with a larger sample size, including more ship-based workers, stronger asbestosis prevalence patterns could emerge.

4.3.5 Disease misclassification

When determining which asbestosis disease group (see Table 2.1) a subject belonged to, we considered the ATS six criteria guideline for asbestosis diagnosis, which I discuss here (24):

1) Sufficient history of exposure to asbestos. There was no exposure assessment in this study and an assumption was made that all subjects were exposed based upon knowledge of work practices and the presence of asbestos materials on ships. Eighty-seven percent of workers did not know what "asbestos" was, which affected their ability to know whether they had been historically exposed; however, we knew these workers' tasks were performed on beaches, generally in open air, and without appropriate protective equipment.

2) Appearance of disease after sufficient time interval after initial exposure. Though the inclusion criteria addressed the temporality issue, it may have needed to be longer. While asbestosis is known to show signs 10 to15 years from initial exposure when exposures are high, incidence peaks at 40 to 45 years from onset, so it is possible the subjects had yet to begin showing signs of disease. The time-course of asbestosis is dose-dependent; with higher levels of asbestos, asbestosis will show early signs sooner (32,78). Without exposure measurements and knowing most subjects were beach-based, the minimum inclusion criteria of 10 YSFE may have been too recent to capture a higher prevalence.

3) Clinical picture such as insidious onset of dyspnoea on exertion, bibasilar inspiratory crackles not cleared by coughing. The physical exam and ATS portion of the questionnaire collected information on inspiratory crackles and shortness of breath, or dyspnoea. Two of the six asbestosis cases reported shortness of breath and three demonstrated crackles (see Appendix V); however, dyspnoea or crackles were not included in my case definition as they assess lung function and degree of fibrosis, not the presence of it. There are more detailed questions on dyspnoea by ATS in their "Pulmonary Functional Status and Dyspnoea Questionnaire" but these were not included in this study for reasons of simplicity (41).

4) Pulmonary function tests such as spirometry were not performed because as with crackles and dyspnoea, they are very non-specific and do not contribute to making a diagnosis, only in determining severity of disease.

5) Characteristic x-ray appearance. In some studies, profusion scores of 0/1 and less have been counted as negative findings, while others include scores of 0/1 as positive; one study included 0/1 in a "low profusion score" group along with 1/1, and anything greater than 1/1 in a "high profusion score" group (44,81,84). A score of 0/1 is suggestive but not diagnostic, meaning profusion is probably negative, with a chance that early signs are starting to show. In our study, choosing to include profusion scores of 0/1 as positive could have led to an overestimate of prevalence.

Positive profusion scores indicate the presence of parenchymal abnormalities, or early pneumoconiosis, but exposure is nonspecific; it could be associated with exposure to asbestos, silica, other dusts, or non occupational disease such as rheumatoid arthritis. Irregular opacities are more consistent with asbestos exposure than round ones, and this was taken into consideration in our case definition. Pleural abnormalities are considered a specific indicator of former asbestos exposure; because pleura may be more sensitive to asbestos than the lung parenchyma, the effects of asbestos exposure can show here first and can occur at much lower doses than the fibrotic changes in the lung parenchyma. The majority of radiographic abnormalities in a 1976 survey of dockyard workers were pleural rather than parenchymal, which was "probably a reflection of intermittent rather than heavy and prolonged type of exposure" (74); however, pleural abnormalities were not included in our case definition, and while there were six subjects with pleural abnormalities, none of the six asbestosis cases

displayed them, again raising the possibility of very low exposure in the study population. A more sensitive case definition might have included presence of pleural plaquing, though this could have led to an underestimate of asbestosis because normally fewer people display both parenchymal and pleural abnormalities together, and none of our asbestosis cases displayed pleural abnormalities; other studies reviewed do not include this in their case definition, however, mention presence of plaquing (38,92,99,100). Including pleural abnormalities in the case definition could increase specificity at a cost in sensitivity because one can have significant enough exposure to cause disease, without having pleural plaques. In our study, with likely intermittent exposure on the beach, a greater number of pleural abnormalities than parenchymal might have been expected. Reasons why this was not seen could include:

a) Low exposure
b) profusions were mostly non asbestos-related findings,
c) pleural abnormalities were difficult to discern from x-rays, or
d) before a 2000 update to the ILO classification guidelines, stating plaques had to be at least two mm in width to be counted, many more plaques and pleural thickenings were recorded (101).

The quality of the x-rays could have affected interpretation. Anteroposterior chest radiographs were considered "acceptable" in only 74% of the x-rays (out of four possibilities: good, acceptable, bad, and unreadable), and all cases of asbestosis were diagnosed from these x-rays. The B-reader followed standard ILO procedures to read the radiographs, and a number of factors went into assessing film quality. The most frequent reason for x-rays being labeled "acceptable", and not "good", was because of improper positioning of the scapulae, obscuring a clear view of the lungs periphery where pleural plaques are detected (68%). Other reasons were artifacts (film scratches, other unidentifiable artifacts, and shadows of shirts not removed) (34%), underexposure (11%), and overexposure (2%). X-rays were considered poor (14%) if two or more of these reasons occurred simultaneously. However, scapulae images were able to be ignored and would not have affected the diagnoses (101). X-rays of similar quality were used in another study on silicosis in Petropolis, Brazil, a town in the mountains 65 km from Rio de Janeiro. With a similar level of German x-ray technology, three B-readers interpreted 61% of their films used for diagnosis to be of "acceptable" quality (102). It is not likely that the quality of the x-rays would have led to misdiagnosis of disease.

B-reader variability could have affected interpretation of the x-rays. The single B-reader was blind to exposure history (job type, duration of exposure, and YSFE); however, accuracy could not be assessed as there was not a second reader. There can be significant inter-reader variability in such a subjective method, especially with earlier stages of disease (profusion scores <1/0) and the ILO recommends at least two readers (36,81).

6) Exclusion of other causes of interstitial fibrosis or obstructive disease such as usual interstitial pneumonia, connective tissue disease, drug-related fibrosis. Four out of six cases had irregular opacities more consistent with asbestos exposure, and two had round opacities which could be consistent with exposure to other materials such as silica and other dusts. None of the six cases had a previous dusty job other than shipbreaking. "Former dusty jobs other than shipbreaking" had been further divided into former jobs with the potential for silica exposure such as sandblasting or stone-cutting, and the results here suggest that no cases had significant former exposure to silica. The cases with rounder opacities could be misclassified as having asbestosis while having another form of fibrosis, or they could have asbestosis and the irregular nature of the opacities was difficult to discern.

In a study of older, less-exposed workers in the US, Ohar et al. state that, "asbestos-induced lung disease today is characterized by low ILO scores, long latencies, greater disease magnitude in smokers, and a normal or obstructive pattern of pulmonary function abnormality" (84). Due to the latent nature of asbestos-related diseases, even without further exposures, some of the subjects with other lung abnormalities, or even those with normal radiographs, could develop asbestosis years or decades after they have left the shipyards.

4.3.6 Recall and reporting errors

Classic recall bias is defined as a situation in a case-control study, where a subject interviewed to obtain exposure information after a disease has been diagnosed, generally recalls more information than someone who has not been diagnosed with the disease. There may be another form of recall bias in this study caused in the context of high background injury and illness rates, leading subjects to recall less information In a demographic surveillance study by the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B) on parent's recalling information about their children's diarrhea, 34% of the cases were underreported after

one week. Accuracy was related to the length of time, and the severity of the cases (103). In our study, where nearly every subject had been injured at least once, (58% severe enough to take time off) there could be some underreporting with respect to recalling or reporting minor injuries or past diseases.

Subjects often had trouble recalling their own age as much as ± five years. This could have affected the study during the analysis by grouping cases into the wrong age groups and misreporting trends, but the bias was most likely non-differential, and subjects were grouped into only four classes, which would reduce any impact. This phenomenon has been described before. In a study on Bangladeshi children, random error, age heaping[s] at whole numbers, and preferences for particular ages were found (104). In Bangladesh, this error in age recall happens for several reasons. No great emphasis is placed on achieving another calendar year of age, the Bengali calendar is slightly longer than the Christian one, and recalling calendar years can be confusing when working with their local calendar, an Arabic calendar, and a western calendar. We developed a series of questions to estimate age based on whether or not they remembered certain prominent historical events, how long ago since they were married, had their first child, and other memory triggers. It seemed like most subjects had a fairly accurate estimation of their own age, and if not, the estimation was biased in both directions. In an added level of complexity, the year the study was conducted was the first year voter registration cards were introduced so many villagers had already been visited by a government official, who let them know how old they looked.

Information collected during the interviews was prone to inaccuracies because of the language barrier, and a culture unaccustomed to participating in surveys and questionnaires. The validated, standardized questions from the ATS questionnaire used during the interviews were modified for cultural appropriateness through back-translations, pilot testing, and input from local researchers. This was important because while structure in a questionnaire is important for consistent answers and comparability, altering it slightly ensured collection of data as accurately as possible. Also, an interview style which is adapted to normal every day communication is important in surveys in less economically developed countries, to gain the subjects' trust. The concept of anonymity in survey research is hard for people in less economically developed countries to grasp and adverse effects of suspiciousness could include cautious responses that are not completely

[s] Tendency to over-report ages ending in zero or five.

accurate. These effects on the reliability of data are difficult to predict, and therefore control for (105). For example, information about safety on the yards or tasks involving potential exposure to asbestos might have been left out for fear of retribution from yard owners. An extensive explanation during the consent process by a person from the same region addressed anonymity to the best of our ability and having the interviews conducted by a Bangladeshi, as we did, would have helped the participants feel less suspicious. A data entry system established with the research assistant asking questions in Bangla and me recording information right away, increased precision and reduced bias by removing the number of steps that would have been required if information was translated after the interviews.

A problem encountered during the interview was the way photographs of insulation were perceived, which could have led to inaccuracies in regards to exposure information. For instance, when we showed photographs of insulation around pipes (see Figure 2.3), some identified them correctly, but others had answers such as "flower gardens", "the ocean", or "body parts" such as "arms", "legs" or "an ulcerated stomach". In another photograph of a woman sifting asbestos on an Indian shipbreaking yard (see Figure 2.3), the insulation was sometimes perceived as eggs, or as stones. This phenomenon, when limited to cases where non-human agents are perceived as human-like, has been described as anthropomorphizing, and suggests inaccuracies in perception. It is encountered when people come across something that is foreign to them, and instead of admitting so, or even spontaneously without realizing, the visual stimulus is processed using emotionally and socially relevant information, in a way they can relate to the foreign object. It has been suggested that humans evolved a propensity to anthropomorphize because failures to do so would have been more costly than over-attribution (106-109). In this study, where some subjects have attributed human-like, but also other non-human characteristics such as a garden, to unrecognized items, the phenomenon is akin to anthropomorphizing. A tendency to anthropomorphize may have led to inaccurate responses, such as recognizing asbestos insulation as something they have worked with, when in fact they did not recognize it at all. Subjects understood we were interested in whether or not they had worked with these items in the photographs, so they may have tried, perhaps at times without realizing, to tell us that they had when they had not. Overall, I do not believe this would have impacted the prevalence of disease results, but it could have affected our understanding of how much asbestos-containing material is encountered on the beaches without the ability to carry out exposure measurements.

Inaccuracies in responses arose when subjects were copying responses other villagers had given. There was almost certainly interaction among villagers who had been interviewed and those about to be interviewed. Sometimes subjects would then provide a correct answer for the "wrong" question, such as one that had not yet been asked. For instance, answering questions about PPE while we were showing them photos of insulation, before showing them photos of PPE. This tendency to copy responses would not have affected the asbestosis prevalence results, but it could have affected self-reported responses, leading to an over or underestimation of the true prevalence of other respiratory symptoms, PPE use, or other information collected during the interview.

4.3.7 Potential confounders

A confounder is a variable, aside from the explanatory variable of interest, associated with both the exposure and the outcome being studied that is not part of the causal pathway. Other factors may lead to the background levels of respiratory symptoms in Bangladesh, such as tuberculosis, but if there is no reason to believe they are correlated with asbestos exposure, they would not be a confounder.

Silica, however, was a possible confounder. If workers had been exposed to silica, then the potential for misdiagnosis of silicosis as asbestosis existed. However, upon examining former jobs held by asbestosis cases, none had worked in jobs with other dust, which included silica exposure. Having a former job with dust exposure other than shipbreaking was controlled for all respiratory symptoms by inclusion into the regression models except when examining it as an explanatory variable. Former experience in agricultural work was not considered as having had a "former dusty job", but in hindsight, this should have been included in the analysis because while this "dusty job" would not be a source of silica exposure, it could be a source of significant organic dust exposure. Organic dust is known to lead to a condition called hypersensitivity pneumonitis, which can cause round opacities, similar to the ones seen from silica exposure.

Smoking (including filter-less cigarettes[t]), and age were potential confounders and were controlled for by their inclusion in the regression models for asbestosis and all respiratory symptoms. Crude odds ratios were not significantly affected by these additions in most cases,

[t] Locally known as bidi

suggesting they were not acting as confounders. However, their inclusion decreased odds ratios away from 1.0 for cough and phlegm, and shortness of breath when examining YSFE, and for shortness of breath when examining duration of exposure. Odds ratios increased towards 1.0 for cough and phlegm when examining the three to seven years of exposure group.

Arsenic is widely found in water supplies in Bangladesh. Symptoms of inhaled arsenic (prevalence of cough, shortness of breath, and chest sounds (crepitation and/or rhonchi)) might be similar to symptoms of dyspnoea with asbestosis, but geographic variation of exposure means it is unlikely to be correlated with asbestos exposure, and therefore not a confounder (110).

4.4 Discussion of other findings

The following sections discuss workers' hazard perception, knowledge of asbestos, and how they were informed of their personal results.

4.4.1 Hazard perception and PPE use

Eighty-five percent of the shipbreakers felt shipbreaking was more dangerous than other occupations in Bangladesh: seventy-six percent used some method of staying safe on the job including PPE and methods such as bathing, washing hands, or changing before leaving the yards. With respect to asbestos, these latter methods could have prevented spread of fibres between workers and their clothes, but how much care is taken in executing these methods is questionable; most of the time, hands are washed without soap or running water and bathing is done in a pond without removing clothing. The workers are not educated on why these methods are important in preventing the spread of illnesses, or substances such as asbestos especially in terms of carrying the fibres into the communities beyond the yards. Even if they were trained, proper facilities are not available at most yards.

Sixty-nine percent stated using PPE as a method of staying safe on the job, but they claimed to have never received any training. According to guidelines set by the Worker's Compensation Board of British Columbia, Canada, PPE for working with asbestos would include:

- Protective clothing made of a material that resists penetration by asbestos fibres; covers the head and body; fits snugly at the neck, wrists and ankles; covers the feet (lace-less

rubber boots recommended); and can be immediately replaced or repaired if torn (disposable clothing recommended).

- Air-purifying respirators with high efficiency particulate absorbing (HEPA) filters or air-supplying respirators are necessary depending on the risk level of the work involved. Single-use or disposable respirators are not acceptable. Employers are required to provide fit-testing when a worker is first fitted with a respirator and once a year thereafter (111).

The only full-body type clothing mentioned by the shipbreakers included "special, mechanic style" clothing worn by three percent, but this would not have been appropriate for working around asbestos. Six percent cited use of a cloth to cover their face, and nobody wore respirators.

Other common PPE in more economically developed countries include hard hats, gloves, and steel-toe boots. Of these PPE, our subjects reported using gloves (38%) and hard hats (6%), although one person wore the hard hat for protection from the rain, and another for curiosity. Items of PPE reported that are uncommon or not considered PPE in more economically developed countries included rubber boots, sandals, cloth masks, baseball caps and shoulder protectors composed of cloth, plastic, or sometimes a sandal. The shoulder protector was the most frequently reported item (49%), and apart from those who wore boots (12%) or sandals (7%), the shipbreakers worked barefoot.

Hossain et al. and Roy collected information on percentage of PPE use, and results for gloves and boots were similar to our findings at ten to forty percent, but they do not mention use of items such as cloths for face or shoulders, or sandals (3,63). Perhaps only PPE recognized by western standards were included in their study, but all items self-reported have been documented in this study because these may provide some protection to workers.

Of people who did not wear PPE, Roy states lack of knowledge about usage and feeling PPE was unnecessary. We similarly found these reasons, along with "discomfort", "not appropriate for the particular job type", "not necessary because they were cautious individuals", or that "God would protect them". Two people raised concern about PPE themselves being a hazard, for example wearing boots in deep muddy conditions would hinder ability to walk and stay balanced while carrying heavy loads.

4.4.2 Knowledge of asbestos

Apart from the one worker who was seemingly well informed about asbestos and potential dangers, the term "asbestos" was not familiar to most; however, over half recognized what we were referring to in photographs and had local terminology for it.

The fate of the asbestos once it leaves the yards is unknown. Anecdotal evidence from the shipbreakers indicates that:

1) It is thrown into the sea,
2) stored on the beach until sold, or
3) burned for cooking fuel,

The third point illustrates their inability to distinguish from the photos, asbestos from some other flammable materials found on board.

During their survey of Bangladeshi shipbreakers, Det Norske Veritas found evidence of warehouses located on the roadside with raw and processed asbestos, some with signs advertising it for sale. An interview with a foreman in charge of five to six men who process asbestos revealed that at one time there was no market for used asbestos and it was discarded into the ocean, but now there is a market for it in boiler factories and cotton mills in Dhaka where it is sold for 15 taka/kg. The foreman stated he "generates two to four tonnes of re-processed asbestos a year, none of the workers wear protective equipment, but none of them feel sick" (62). This information about past and present usage of asbestos is supported by responses during interviews with the current study subjects and represents an important area for potential disease prevention opportunities.

4.4.3 Reporting findings

All subjects were informed of their personal results through a letter delivered by the assistant health inspector, who read the letter to illiterate subjects. For eleven subjects we arranged free referral to a respiratory physician, and the letter contained contact details and directions for Bogra medical college. Two subjects with suspected cases of tuberculosis were referred by the assistant health inspector to the Sariakandi Upazila health complex, where physicians treat local patients. Local physician knowledge of asbestosis and pneumoconioses is almost non-existent, but with only one probable and five possible cases, a case-management strategy was not deemed

necessary to prepare. The respiratory physician at the Bogra medical college was provided with the x-rays and B-reader's reports and has consulted subjects at the health complex according to routine procedures in place for dealing with interstitial lung diseases (30).

The state of knowledge of asbestosis is very limited in Bangladesh. The Institute for Chest and Diseases Hospital in Dhaka is familiar with silicosis, but more used to dealing with asthma, bronchiolitis, COPD, and tuberculosis. Doctors are poorly trained in the recognition and diagnosis of occupational diseases, especially pneumoconioses.

4.5 Strengths and limitations

Strengths

This is the first report describing asbestosis in a Bangladeshi shipbreaker population, and the first to attempt to gain a full understanding of where asbestos would be encountered on the shipbreaking yards.

Design:

This study makes use of a situation whereby internal migrant workers come from the same general location in northern Bangladesh to work in the south. Older, sick or injured workers who would not be at the shipbreaking yards became accessible.

Data collection and analysis:

Standardized English-language surveys were adapted using rigorous translations, back-translations and consultations with other Bangladeshi researchers. In-depth interviews allowed us to characterize determinants of exposure, and potential confounders. The use of a B-reader and ILO classification system should have minimized misclassification of outcome, and makes it easier to compare results to other studies.

Other strengths:

In combination with support from local government health officials, we met the target 100 subjects and ensured the respect and trust of the villagers during recruitment and subsequent interviews. The genuine interest displayed by the government health officials made this study

feasible by allowing us access to local medical facilities, and raised the profile of occupational health research in Bangladesh. Collaboration with a local health institute, NIPSOM, during the course of the study, and other networking opportunities, provides the foundation for future studies on respiratory illnesses in this region.

Limitations

Limitations are addressed throughout the discussion section, but they are summarized here:

Design:

Study size is important because a greater number of people in the study reduces random error, provides the power for statistically significant results, and aids generalizations to be made about the whole population. The last point also requires the sample to be representative of the entire population. A sample size of 104 was not enough to make our results significant, and even with a larger sample, generalizations would not have been possible without a more representative sample, i.e., more ship-based workers who were more likely to be heavily exposed.

Recruitment and interviews:

Small study size and inclusion into the study could have been caused by our inability to visit villages more than once, or during the evening when more people would have been at home. Without these constraints, we may have been able to include more people in the study; however, those we were unable to contact during the day were likely younger, healthier individuals, which could have lowered the average age of the cohort and brought results towards the null, i.e., increased the healthy worker effect. We had an overrepresentation of beach-based workers but increasing numbers alone would not have solved this; in order to recruit more ship-based workers, we required access to workers living near the shipbreaking yards in southern Bangladesh.

Cultural and language barriers, particularly during recruitment and interviews were a problem because I could not always understand what was being said, or agree with how something was being said. While I was able to understand and remain in control of the situation most of the time, translated data is a limitation of any foreign language study. We tried to overcome this by me learning some Bengali, hiring a bilingual research assistant, use of the translated and validated questionnaire, and consistent data entry by only the research assistant and myself.

However, researcher-subject relationship, i.e., tone of voice, was often different from what I expected.

Exposure:

Inability to access the shipbreaking yards prevented us from characterizing asbestos exposures on and around the yards. Lack of cooperation from yard owners and managers made it difficult to gain a full understanding of not only asbestos exposures, but general work conditions, leading us to rely on anecdotal evidence from shipbreakers and grey literature. Anecdotal evidence gained during interviews was helpful but without a way to validate the comments, it was difficult to determine how accurate they were. Our findings suggest that for the beach-based workers we studied, exposure may have been low. This also leads us to believe the way we categorized high and low exposure groups as ship-based and beach-based, could have been overstated. A more detailed job analysis with exposure information from the yards is necessary.

Diagnosis and analysis:

Asbestosis cannot be diagnosed unless there has been certain exposure to asbestos. While there is much circumstantial evidence for exposure to asbestos during shipbreaking, its presence could not be confirmed. However, assuming the presence of asbestos, airborne asbestos fibre concentrations would likely be highest within a ship, and because workers tend to stay in the same job groups their whole working career, it was easy to assign job groups as surrogates for exposure. Ninety-four percent of subjects were beach-based workers, who are less likely to be as highly exposed as those working within the ships, especially those involved in removing asbestos. We were unable to characterize outcomes for ship-based workers or the most representative scenario. Without an external control group, we were also unable to compare the prevalence we saw in beach-based workers to background levels, but we assumed the prevalence in the general community to be to be close to zero.

Diagnosis and case ascertainment could also have been affected by having only one B-reader; B-reader variability is affected by x-ray quality, and the readers' own training, experience and individual interpretation, especially due to a large 12-point disease classification system. At least two readers should have been used to minimize bias and for quality assurance. X-ray quality was acceptable for 74% of x-rays and poor for 14% of x-rays; however, the B-reader did not believe this affected his ability to diagnose correctly. Recommendations to improve future

film quality were made to the x-ray technicians in Bogra after the first batch of x-rays were sent to the B-reader, but these requests were met with some resistance and quality of x-rays did not improve. Switching to digital x-ray technology may aid in improving quality and consistency by ability to control factors such as density and contrast, independently of the exposure conditions during image acquisition, but to comply with ILO classification guidelines, readers must continue to use standard film x-rays (90).

For other respiratory illnesses, the work relatedness criteria we used could have produced under-reporting due to the nature of the disease. For example, shortness of breath usually does not resolve outside of work except for occupational asthma. The approach we used might not have been sensitive for non-asthma outcomes. However, this technique has been used successfully elsewhere (91). The seasonal nature of work in Bangladesh could mean symptom resolution is more expected (going from yards to a month in the paddy fields) compared to more economically developed countries where most people have work absences of two days weekly, to two to three weeks annually.

This study was based on multiple assumptions, anecdotal evidence, and grey literature. Being one of the first studies of its kind, there was not a lot of peer-reviewed literature to draw on or make comparisons to, particularly in regards to asbestosis prevalence in shipbreaking, asbestosis prevalence in Bangladesh, and the impact of an exaggerated healthy worker effect.

Informed consent:

Informed consent was addressed to the best of our ability by having the assistant health inspector, who was known and trusted by the local villagers, explain the study and the consent process orally. Sixty three percent of the subjects had no schooling at all, and nobody had experience with medical surveys, so everything was explained thoroughly, but there was a concern over how much was genuinely understood. Fourteen (12%) of those recruited in this study withdrew (demonstrating an understanding of their right to withdraw), but ten of these people did not participate because they were afraid of being operated on, which demonstrated a lack of understanding about the goals of the study. In another study involving 105 Bangladeshi women, 67% of whom were illiterate, 94% were found to understand the objectives of the study, but 35% did not realize they were free to decline to participate, and 52% did not know they could withdraw from the study after giving consent (112). While this is not unique to Bangladesh (in a

similar survey in Sweden, 40% of women did not know they could withdraw from participation), challenges around informed consent must be improved for future studies.

5. Conclusion

This was a pilot study with a small sample size. The prevalence of asbestosis was six percent, lower than anticipated given our hypothesis of high asbestos exposure levels. Risk was elevated in those with longer duration of exposure, but no consistent trend was evident. The prevalence of respiratory symptoms was low relative to the general Bangladeshi public; there was an apparent inverse trend with increasing exposure, but estimates were not statistically significant.

While these disease and symptom estimates are relatively low, it would not be appropriate to conclude that the prevalence of asbestosis among shipbreakers in Bangladesh was low. The subset of the shipbreaker population studied was not representative of the entire population of shipbreakers, and likely did not include job groups with the highest exposures (e.g. fitters). We were unable to characterize asbestos on the yards; exposure levels, where it was most likely to be found, how it was handled and which job groups were most exposed.

Even with its limitations, the study saw evidence of asbestosis and found a profound lack of knowledge of asbestos and protocols to reduce personal exposure. We made recommendations for future studies to generate more representative figures. An extension of this study with a more representative population, focusing on asbestos in addition to other exposures such as polycyclic aromatic hydrocarbons and welding fumes, as well as injuries, is important to more fully understand the impact shipbreaking is having on occupational health in Bangladesh. Reports of an underground trade in recycled asbestos are particularly worrisome in light of the potential for community exposure in addition to the known worker exposure. Exposure to asbestos is predicted to decrease over time as the average age of ships being dismantled rises, but exposure will continue on for many years, and asbestos-related diseases will continue to rise as a result of past and current exposures due to the latency of several years seen between initial exposure and onset of disease.

6. Recommendations

We have demonstrated the feasibility of conducting asbestosis surveillance in Bangladesh using this study design. Several limitations have been identified, and recommendations to improve future studies on occupational health in Bangladesh have been generated:

Study improvement recommendations:

Design:

- This was a pilot study, but subsequent studies should have a larger number of subjects for increased statistical power, in order to make inferences about the whole shipbreaker population.
- More ship-based workers with theoretically higher exposure to asbestos need to be included in the study, to understand their health risks and for comparison to the lower exposed group.

Recruitment and interviews:

- The study should take place in both northern and southern Bangladesh so a wider spectrum of job types can be captured during recruitment.
- Recruitment, especially if closer to larger cities, could be shifted to evenings in order to contact people who work during the day and include more subjects. More people could also be contacted on the weekend (Friday in Bangladesh) but it may be difficult arrange research assistants and other support on this day.
- Due to the variation of interview responses, validation of responses by re-interviewing a random selection would be useful (105).
- To address the limitations of cross-language interviews, emphasis should be placed on consistency of the questions and data entry, preferably by the same people or using interviewers trained for the task, and with as few steps in translating the responses for data entry as possible.

Exposure:

- Airborne asbestos fibre concentration measurements should be taken on and/or near the yards as well as downwind of the yards to characterize levels of asbestos exposure being experienced during different job tasks on the yards, and by residents beyond the walls of

the shipbreaking yards. As explained in section 1.4, we experienced trouble obtaining access to the shipbreaking yards. It is difficult to recommend how to secure access to the yards in the future, but the key is obtaining some form of permission from a higher government authority. Overall power structures in Bangladesh and how they interact are not well understood, especially with corruption taken into account, but it has been suggested informally that certain academic or medical groups have unlimited access granted by the government, and to make these contacts early on in the planning stages would be vital.

- In order to understand how the asbestos from these ships affects the health of other workers, it will be important to better establish the complete life course and fate of asbestos in ships destined for these yards, as it is removed, and where it is further processed and/or in which industries the asbestos eventually used.

Diagnoses and analysis:

- For quality control and assurance purposes, more than one B-reader should read and grade all x-rays.
- Ensure quality x-rays:
    - To ensure consistency and quality with every x-ray, arrange a weeklong training program for the x-ray technicians in Dhaka at a local health institute such as the Institute for Chest Diseases and Hospital. The x-ray technicians will already have basic training, but methods may vary slightly from between hospitals and between technicians.
    - Due to theoretically lower exposure of asbestos experienced on the beach, the inclusion criteria for YSFE should be raised from a minimum of ten years, to fifteen years. As explained in the introduction, early signs of asbestosis will only be seen after ten YSFE if concentrations reach hundreds of asbestos fibers/ml.
- Inclusion of spirometric evaluation and more specific questions on shortness of breath, or dyspnoea, would help in determining severity of disease.

Informed consent:

- It is difficult to address the limitations stated earlier and suggest how we could have improved the current consent process. However, I will highlight here the importance of building a relationship with the district health authorities early on. This allowed us

access to a health assistant with trust and respect of the villagers, who explained the consent process to the best of our ability.

- Incorporating suggestions from Bangladeshi researchers, a modification for the consent process would be to allow illiterate subjects to use a fingerprint for the form, rather than signing an "x" which they did for this pilot study.

Knowledge translation and networking:

The results of this study are intended for use by other researchers, intergovernmental organizations, labour unions and other non-governmental organizations (NGO), policy makers in the Bangladeshi government, local health institutes, shipbreakers and other workers. During the course of this project, we established connections with all of these groups, but aside from the governmental support received in northern Bangladesh, we did not initiate contact with higher governmental ministries. For future studies, I recommend involving the Department of Environment and the Ministry of Labour and Employment. Shipbreaking in Bangladesh has been featured in the news more and more frequently (see Appendix II) and has been prioritized more in governmental agendas in the last year than ever before. This is an opportune time to get the Bangladeshi government involved and interested in occupational health research. Without governmental backing, the shipbreaking yards will remain impenetrable.

Safety recommendations:

The control strategy hierarchy of engineering, administrative, and PPE is the standard thought process which will be applied here.

Engineering controls either change the physical workplace or substitute less harmful substances for more harmful ones. In terms of asbestos exposure, in more economically developed countries, engineering controls would include isolating the source, working in a negative pressure enclosure, and using HEPA ventilation systems. The most realistic, immediate control that could be implemented on a shipbreaking yard is to keep any insulation wet at all times to prevent airborne fibres.

In terms of other safety, suggestions by shipbreakers during the interviews included:

- Cutting steel sheets into smaller pieces before loading; the reluctance there by supervisors being larger heavier sheets are more valuable to purchasers.

- Using sirens and a red and green flag system to warn when cables are being pulled up the beach or when a large structure is about to fall; some yards already do this, but it would be easy for all of them to do this.
- Using harnesses for fitters and cutters who often fall while within the ship.
- Easier access to first aid and medical supplies.
- More mechanization such as cranes or giant magnets.
- Cleaning debris off the field more frequently.

Administrative controls reduce the duration and frequency of exposure by means of some workplace policy or procedure. In terms of asbestos, in more economically developed countries, administrative controls would include limiting the workers exposure time, providing showers and changing into other clothes before returning home for the day. On the shipbreaking yards, this could be achieved by rotating workers between older and newer ships perhaps. Rotating tasks would be unlikely to take place as the job groups all receive a different amount of money; cutters would not be willing to be a loader, for instance. The shipbreaking yards all have different facilities available for washing up; some have communal water pumps or taps, while others only have ponds. They could be directed to set up simple showers and instruct workers to shower and change their clothes before leaving the yards. Even if they did not provide proper clothing, they could at least provide an extra "lungi", or sarong type garment most workers wear.

In terms of other safety, suggestions by shipbreakers during the interviews included:

- More training about safety and hazard awareness, for example, training how to coordinate the team better while loading heavy sheets, or informing people about the dangers within the ship such as broken stairs.
- More breaks.

Correct PPE for working with asbestos (clothing and respirators) was covered in section 4.4.1. This type of PPE is costly and requires a lot of maintenance; the special clothing and filters for respirators would need to be replaced often to be effective. Even if this PPE was available to the workers, there would need to be training on proper use and fit-testing for the respirators. Finally, this PPE is designed to be used in temperature controlled environments in more economically developed countries, not beaches where some seasons it is scorching hot, flooded by monsoon rains, or incredibly dry and dusty. When PPE is donated, efforts should be focused on providing

simple equipment that locals will use, training about why this is important to wear, and fit-testing for respirators if they are deemed useable, for these gestures to be useful.

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Appendix I. Strategies for literature review

Shipbreaking

A literature search for exposure assessments on shipbreaking yards was carried out using various approaches. Due to limited literature on shipbreaking, searches in Pubmed and Web of Science were not limited by time frame and initial terms looked up included: "shipbreak*", "ship-break*", "ship-scrap*", "ship scrap*", "ship-recycl*", and "ship recycle*". Only "ship scrap" was found and there were over 6000 unrelated articles. My next approach was to search for shipbreaking beaches: Chittagong in Bangladesh, and Alang and/or Sosiya in India. This generated two papers for Bangladesh and five for India. Using the references from these journals, plus references in three reports published by a shipbreaker advocacy group from Bangladesh, I located more papers. Searches in Google Scholar generated reports and other grey literature by classification societies and groups like Greenpeace and the Basel Action Network. Out of ten papers, six reports and a dissertation, nine were relevant to Bangladesh, two contained exposure assessment information for asbestos, two reported health of shipbreakers, and one mentioned prevalence of asbestosis in shipbreakers.

Shipbuilding/Ship-repair and asbestos-related diseases

The review of literature for shipbuilding/repair and asbestos-related diseases was not limited by a time frame because I wanted to capture the earliest studies to make this association. Results were narrowed down by becoming familiar with the literature, choosing those most cited and authored by well known asbestos exposure researchers. Twelve papers were selected to summarize the early links and discuss historical trends of this industry and asbestosis.

Asbestosis prevalence in asbestos-related industries other than shipbreaking

There are no studies of asbestosis prevalence in Bangladesh, and there is one report of asbestosis prevalence from an Indian shipbreaking yard, but in order to compare my results I searched the literature for studies of asbestosis prevalence for any South Asian industry. A search for "asbestosis AND India" in Pubmed and Web of Science generated four papers.

Appendix II. Recent Bangladeshi shipbreaking news

- In 2006, shipbreaking was included in the Bangladeshi Labour Code for the first time.
- In 2009, 65 countries became signatories to the new IMO convention for the safe and environmentally sound recycling of ships.
- In March 2009, the Bangladeshi High Court ordered eight directives, including closure of any shipbreaking yards without environmental clearance and banning any ships that had not been cleared of hazardous materials at source or outside the territory from being beached on a yard, in response to a writ filed by the Bangladesh Environmental Lawyers Association (BELA). They also directed the Department of Environment to frame rules on shipbreaking according to the Basel Convention (1989), the Environment Conservation Act, (1995) and the Environment Conservation Rules, (1997); the order to close the yards was stayed after an appeal from the shipbreaking yard owners association.
- In July, October and December 2009, local politicians in Chittagong were charged with illegally clearing over 20,000 trees in over 60 acres of forest, planted to protect the coastal belt against typhoons, to create new shipbreaking plots in response to an order by IMO to phase out over 2000 single-hull oil tankers by 2012. According to the Department of Environment, there are now 69 yards on the coastal belt of Chittagong, compared to 36 in 2008. In December, a shipbreaking trader, who is also the nephew of a local politician, was arrested in connection to the illegal plundering of trees.
- In September 2009, five shipbreakers sustained severe burns after a fire broke out on a ship, and in 2009 alone, at least 18 workers died from reasons including being crushed, suffocating in a confined space, and an oil tanker explosion.
- In January 2010, the Prime Minister, Sheik Hasina, announced her government was going to formulate a policy for the shipbreaking industry in order to save the environment and the lives of workers. Days later a 17-member committee was formed by the Ministry of Environment and Forests. They plan to formulate a policy called, “the Ship Breaking and Dangerous Waste Management Rule” and amend the existing Environment Conservation Act to allow the shipbreaking

industry to proceed while focusing on the interests and welfare of the shipbreakers and the coastal zone environment.

- In January 2010 the High Court ordered the government to submit a report within three weeks on the number of ships imported after the order to ban ships that had not been cleared of hazardous materials from March 17, 2009.

Appendix III. Clinical definitions

Parenchymal abnormalities

Parenchymal abnormalities indicate pneumoconiosis, but not necessarily asbestosis. Pneumoconiosis is a diffuse scarring of lung tissue in reaction to inhaled dusts such as asbestos, silica and other dusts. The terms “pulmonary fibrosis” and “interstitial lung disease” can refer to the same scarring process at the interstitium of the lung. This is why work history with known asbestos exposure is important for differentiating asbestosis from other pneumoconioses.

Profusion and ILO grading scheme:

Degree of pneumoconiosis is graded using the ILO Classification of Radiographs of Pneumoconioses, which consists of a 12-point scale. The number of opacities per visual unit area is called the profusion. A profusion score of “0” is considered anatomically normal, a mild amount of profusion is given a grading of "1", while moderate and severe profusions are given “2” and “3” respectively. These numbers form the numerator and an uncertainty factor of “+/- 1” is added to the denominator because the subjective nature of the diagnosis. A profusion of 1/1 represents a definite mild amount of visual profusion. A profusion of 1/0 would mean the B-reader thinks that this chest x-ray is primarily of a mild with a secondary thought that it is a normal/insignificant reading. A profusion of 0/1 would mean the B-reader thinks that this is a normal reading, but is secondarily considering a mild profusion (see Figure A.1.).

Scar shape:

The profusion, or lung scarring, is classified into size and shape. The letters “s”, “t”, and “u” correspond to irregular or linear opacities with which asbestosis is most consistent, that are less than 1.5 mm (small), 1.5 mm to 3 mm (medium), and greater than 3 mm (large), respectively (see Figure A.2.). The letters “p”, “q”, and “r” correspond to rounded opacities with which silicosis and other pneumoconioses are most consistent, that are small, medium, and large, respectively.

Pleural abnormalities

Pleural abnormalities support a history of asbestos exposure, but are not absolutely necessary for diagnosis of asbestosis. These include pleural plaques, costophrenic angle obliteration, and diffuse pleural thickening (only for those who already have costophrenic angle obliteration).

Pleural plaques are further classified into pleural location: next to the chest wall (in profile and/or face on), diaphragmatic, para-vertebral and para-cardial (see Figure A.3.).

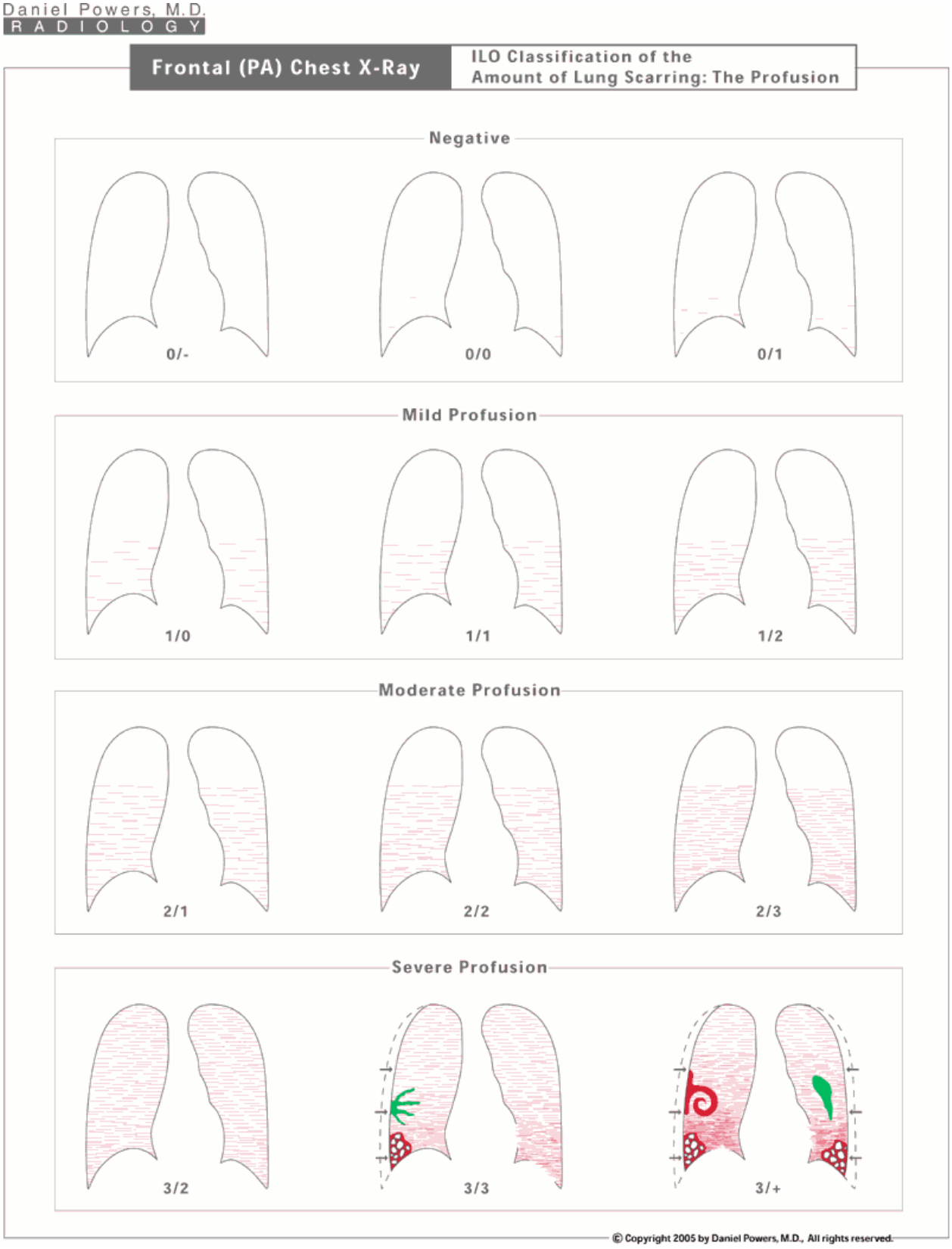


Figure A.1: ILO Classification of Radiographs of Pneumoconioses, grading scheme for profusion. Source: (Powers 2009) (113)

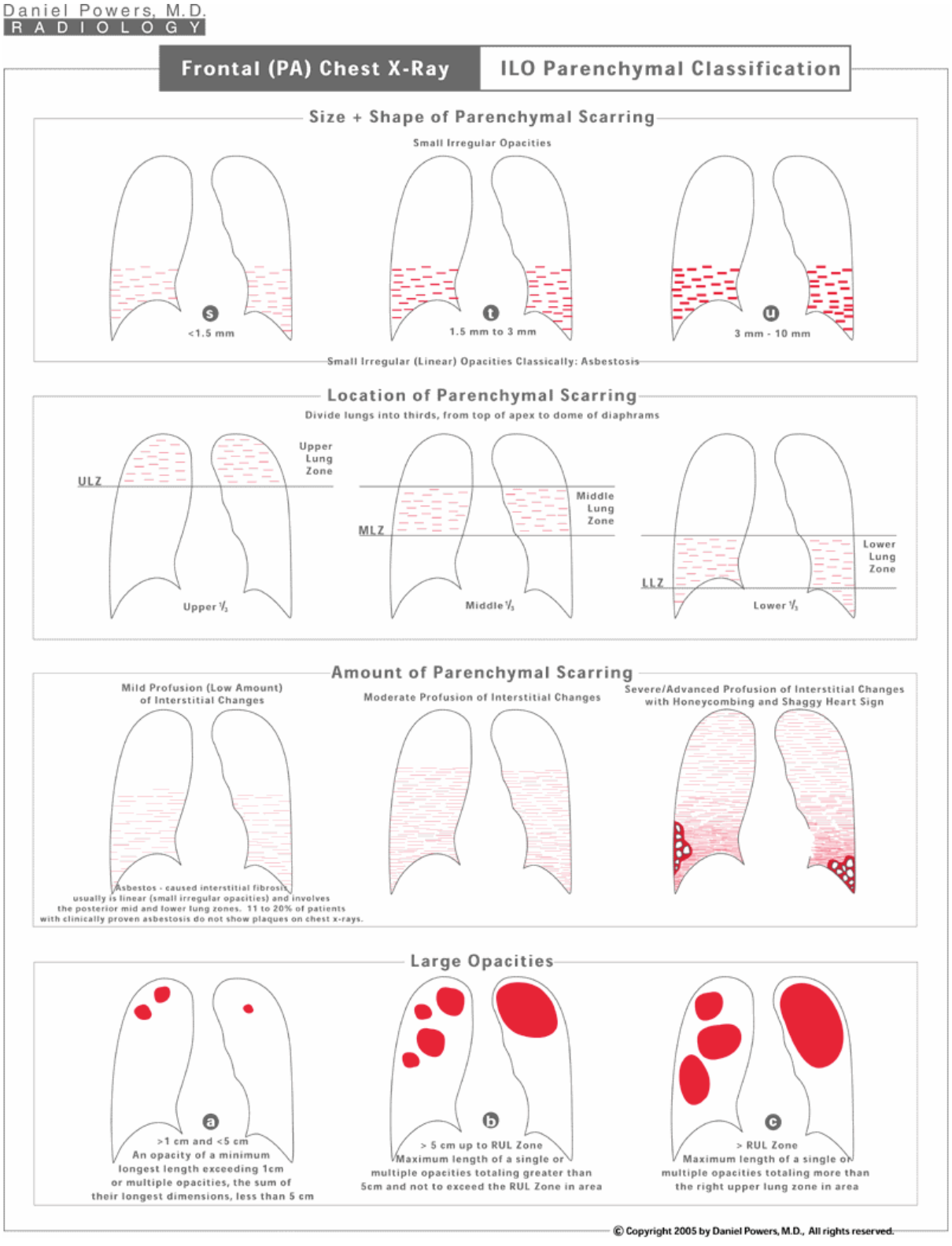


Figure A.2: ILO classification guide for size and shape of parenchymal scarring, or opacities.

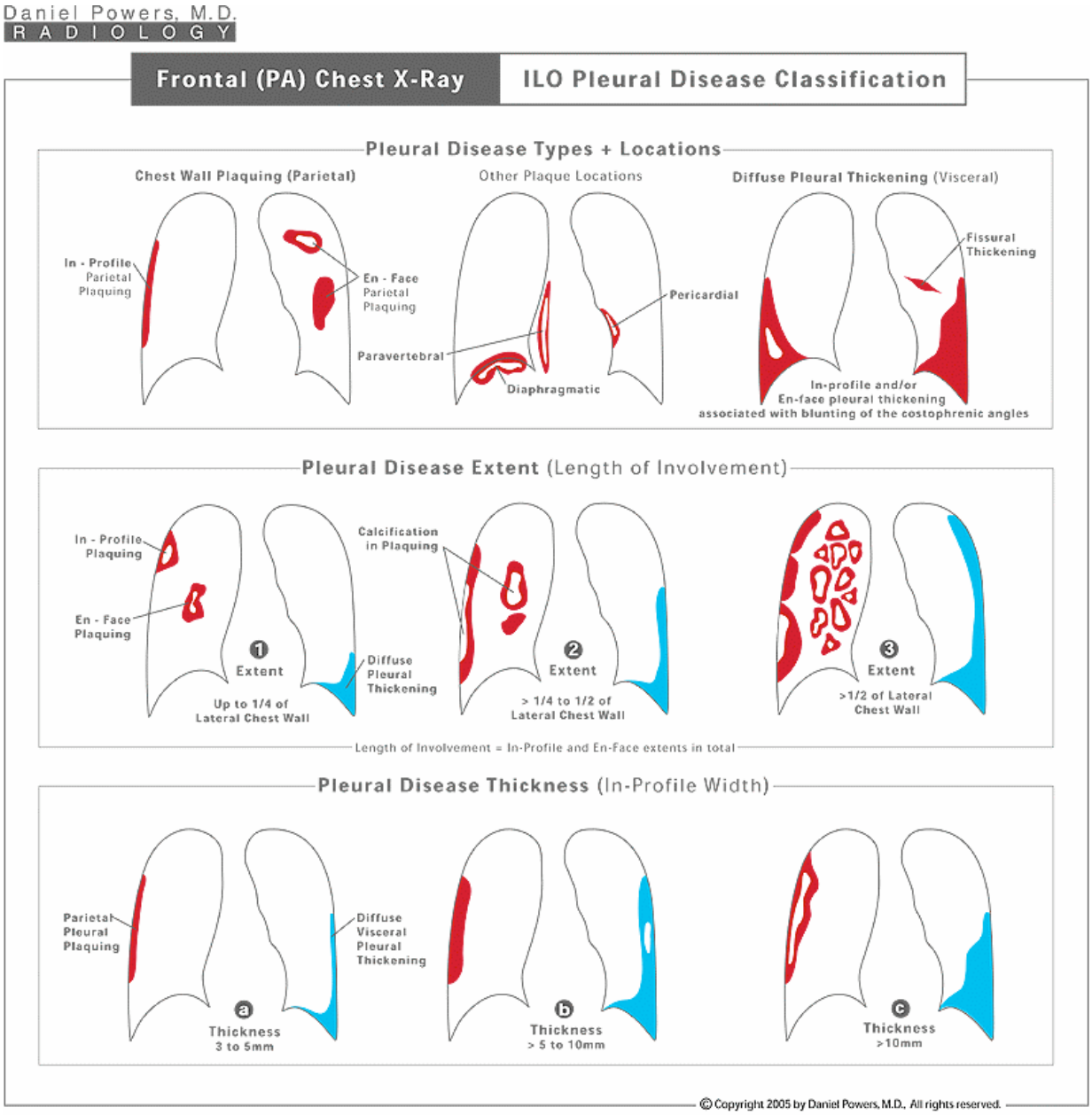


Figure A.3: Classification guide for degree of pleural abnormalities.

Appendix IV. Review of other shipbreaking studies

A study was conducted on the impacts of shipbreaking on marine biodiversity in 1986 where sand and ocean water samples were analyzed for: pH, EC, chloride, iron and ammonia, turbidity, total solids (including dissolved), oil content, dissolved oxygen and biological oxygen demand. In soil samples, pH was found to be higher on beaches with shipbreaking activities at 8.3 versus 7.4, as was ammonia at 18.62 mg/l on shipbreaking yards and 0.95 mg/l on regular beach. Accumulation of metal fragments in sand was 1.2 cm down in the deepest spot. According to ocean water samples, higher turbidity likely lead to less dissolved oxygen in water closer to shipbreaking operations and increased the biological oxygen demand (114).

A series of studies focus on persistent organic pollutants and heavy metals, but do not investigate asbestos. Heavy metal content in suspended particulate matter from Alang was quantified and compared to levels in a control site 30 km away. Suspended particulate matter was collected in six air monitoring stations and analyzed for lead, cadmium, cobalt, nickel, chromium, manganese, iron, copper and zinc. All metals except for chromium exceeded US EPA and WHO air quality standards, by up to 250 times (115).

A 2001 study collected, classified, and quantified solid waste from the Indian shipbreaking sites of Alang and Sosiya. Sosiya had more solid waste than Alang with 15.63 kg/m^2 versus 10.19 kg/m^2. Seventeen percent of total waste was classified as non-combustible, and 5.56% was miscellaneous non-combustible (116).

A 2002 study investigated the distribution and amount of heavy metals on the Indian shipbreaking sites of Alang and Sosiya. Sediment samples were collected from twelve locations in the intertidal zone of the shipbreaking yards and five reference samples from a location on the beach 60 km to the south. Samples were analyzed three times each for Cd, Co, Cu, Cr, Fe, Mn, Ni, Pb, and Zn by flame atomic absorption spectrophotometry, in both the bulk fraction of sediment (BF) 63μm-2mm, and in the fine fraction (FF) <63μm particle size. Total organic carbon (TOC) and aluminum composition were determined. TOC levels were higher from shipbreaking sites compared to controls, and higher in the FF particles at 4.74 times the control level than in the BF particles at 3.3 times, due to a greater surface area to particle ratio. Similar trends were seen for all heavy metals at two to 19 times greater in the shipbreaking yards than

seen in control BF particles and two to seven times greater than in control FF particles. Averages for heavy metals in parts per million (ppm) in the BF are as follows: Cd (32.7±2.80), Co (52.22±14.24), Cu (214.41±53.47), Cr (290.18±63.18), Fe (137,990±78,573), Mn (4643.1±1769.5), Ni (172.53±47.68), Pb (169.98±69.17), and Zn (1222.18±147.06). More heavy metals were found in the intertidal zone when compared to other studies that looked at sub-tidal zones (0.49 to 0.89 times lower) (67) and marine sediments (0.04 to 0.73 times lower) (117), suggesting "metals become enriched in the intertidal zone, before dispersing vertically into the sea" (118).

A 2005 study investigated seasonal distribution of petroleum hydrocarbons (PHC), polyaromatic hydrocarbons (PAH) and heavy metals at the Indian shipbreaking sites of Alang and Sosiya. Seawater samples from ten locations were collected at high tide during the summer (May 2003), monsoon season (August 2003), and winter (December 2003). Samples were collected from a reference station 60 km away. Averages from three repeated analyses were presented. Concentrations of PHC and PAH were three times higher in the winter and two times higher in the summer/monsoon seasons as compared to the reference station, due to high water residence times influencing accumulation and retention of these compounds in the winter. Concentration of heavy metals was highest in the winter. Increased rain during the monsoon may also account for a dilution seen through the summer with higher concentrations appearing in the winter months. No mention is made about how shipbreaking activities may influence levels of these compounds (119).

An environmental impact assessment in 2001 quantified heavy metals, PHCs, and bacterial, phytoplankton and zooplankton growth in Alang, compared to levels found in Piram, 4.5 miles to the southwest. Two seawater samples were taken at each location, one at each respective shore station, and another ten km further out in the sea. Concentrations of the heavy metals, iron, manganese, cobalt, copper, zinc, lead, cadmium, nickel and mercury were 25% to 15,000% higher in the shore station samples from Alang, compared to the control shore site. The concentration of PHC's was 17,000% greater, and pathogenic and non-pathogenic bacterial concentrations were 17% to 600% greater in Alang compared to the control site. In spite of the increased levels of heavy metals and PHC, phytoplankton showed increased growth in Alang by up to 3700%, but zooplankton showed reduced growths down to 100% (117).

Shipbreaking in Taiwan was banned around 1985; a 13 year retrospective cohort study followed up on 4186 former Taiwanese shipbreakers. The shipbreakers had all belonged to the Kaohsiung Shipbreaking Workers Union, and employment records from the union along with Vital Statistics Registry mortality data from 1985 to 1997 for 339 men, were used to establish age-adjusted standardized mortality ratios (SMR). SMRs were determined for neoplasms, injuries and other causes of death. SMR of deaths from all causes was 1.11 (1.00 - 1.23), and for injuries and poisonings was 1.75 (1.47 - 2.09). Cutters in the youngest age group (20 to 39) had a high risk of mortality from nasopharynx neoplasms with an odds ratio and 95% confidence interval of 5.2 (1.7 - 16.2), and from pleural neoplasms with an odds ratio and 95% confidence interval of 104.1 (14.0 - 739.0). Loaders were 5.1 times more likely to die from falls than cutters (120).

Asbestos exposure assessment from a study on Indian millers and miners

An exposure assessment and health outcome study was carried out on 633 Indian miners and millers in 1994. Airborne asbestos concentrations were determined by taking 157 personal samples[u] and using phase contrast microscopy. Work and clinical histories were collected as well as information on smoking habits, a physical exam, spirometry and chest x-rays. Films were read by three chest physicians. In mines, the airborne asbestos concentration was less than two fibres/ml, the Indian threshold limit value (TLV) at the time, and in mills, the highest average concentration was 244 fibres/ml near a "vibrating operation" (46).

[u] Indian Bureau of Standards IS 11450-1986. Method of determination of airborne asbestos fiber concentration in work environment by light microscopy.

Appendix V. Asbestosis diagnosis

Table A.1: Asbestosis cases against diagnostic criteria.

	1/1 Mild Profusion	**0/1**
Irregular opacities	SB6 (t)	SB111 (t), SB72 (u), SB7 (t)
Round opacities	SB11 (r), SB71 (r)	SB97 (p)

"s", "t", and "u" are irregular opacities with diameters of <1.5 mm, 1.5-3 mm, and 3-10 mm, respectively. "p", "q", and "r" are round opacities with diameters of <1.5 mm, 1.5-3 mm, and 3-10 mm, respectively.

Probable cases:

SB6 had a mild profusion score of 1/1 in combination with irregular opacities (1.5-3 mm). This subject also displayed crepitation during the physical examination, a lung sound consistent with asbestosis.

Possible:

SB11 and SB 71 had mild profusion scores of 1/1 with round opacities, (3-10 mm). They did not exhibit crepitation.

SB111 and SB72 had profusion scores of 0/1, indicating absence of profusion, with the secondary consideration of mild profusion. Opacities were irregularly shaped, with SB72 having slightly thicker opacities (1.5 mm – 3 mm) than SB111 (<1.5 mm). They were both found to exhibit crepitation during the examination.

SB7 had a profusion score of 0/1 and irregular opacities (<1.5 mm).

Unlikely:

SB97 has a profusion score of 0/1, round opacities (<1.5 mm), and was found to exhibit crepitation.

Appendix VI. Calculation for pack years

A pack-year is smoking 20 cigarettes a day for one year.

$$\text{Pack-years} = \frac{(c)(n)}{20}$$

c = average number of cigarettes smoked per day

n = number of years spent as a smoker

This calculation was done only for those subjects that had no missing values for any of the two variables involved.

Appendix VII. Work-related symptoms

Variable Name	Explanation of Variable
Any cough	Subject reported yes to any of the following questions: Do you usually have a cough?/Do you usually cough at all on getting up or first thing in the morning?/Do you usually cough at all during the rest of the day or night?
Work-related cough	Subject was positive for any cough and reported: improvement of cough on days off AND/OR long holidays AND/OR reported work-related situations or environments (i.e. general work-related environments, mask/respirator, dust, humidity, engine fumes, smokes and fogs) making the cough worse. (If cough started before the age of starting work in the industry, then subject was considered not to have work-related cough.)
Any phlegm	Subject reported yes to any of the following questions: Do you usually bring up phlegm from your chest (exclude phlegm with first smoke or fist going out of doors. Count swallowed phlegm. Exclude phlegm from the nose)?/Do you usually bring up phlegm at all on getting up or first thing in the morning/Do you usually bring up phlegm at all during the rest of the day or night.
Work-related phlegm	Subject was positive for any phlegm and reported: improvement of phlegm on days off AND/OR long holidays AND/OR reported work-related situations or environments (i.e. general work-related environments, mask/respirator, dust, humidity, engine fumes, smokes and fogs) making them bring up phlegm. (If phlegm symptom started before the age of starting work in the industry then worker was considered not to have work-related phlegm.)
Occasional wheeze	Subject reported: chest sounding wheezy or whistling occasionally apart from colds or most days and nights
Work-related wheeze	Subject reported: chest sounding wheezy or whistling occasionally apart from colds or most days and nights AND wheeze improving on days off and/or long holidays AND/OR reported work-related situations or environments (i.e. general work-related environments, mask/respirator, dust, humidity, engine fumes, smokes and fogs) making them wheeze or wheeze worse. (Subjects who had wheeze starting before the age of starting work in the industry were considered not to have work-related wheeze).
Breathlessness	Subject reported: episodes of breathlessness
Work-related breathlessness	Subject reported: episodes of breathlessness which were associated in difficulty in breathing AND the episodes improving on days off AND/OR long holidays AND/OR reported work-related situations or environments (i.e. general work-related environments, mask/respirator, dust, humidity, engine fumes, smokes and fogs)

making the chest tightness worse. (Subjects who had breathlessness starting before the age of starting work in the industry were considered not to have work-related breathlessness.)

Appendix VIII. UBC Clinical Research Ethics Board

The University of British Columbia
Office of Research Services
Clinical Research Ethics Board – Room 210, 828 West 10th Avenue, Vancouver, BC V5Z 1L8

ETHICS CERTIFICATE OF FULL BOARD APPROVAL

PRINCIPAL INVESTIGATOR:	INSTITUTION / DEPARTMENT:	UBC CREB NUMBER:
Hugh W. Davies	UBC/College for Interdisciplinary Studies/School of Environmental Health	H08-00602

INSTITUTION(S) WHERE RESEARCH WILL BE CARRIED OUT:

Institution	Site
UBC	Vancouver (excludes UBC Hospital)

Other locations where the research will be conducted:
In the field - Participants will be enrolled from their villages of Sariakandi, Bogra District, Bangladesh. District Hospital in Bogra, Bangladesh - This is where participant will be interviewed, and receive a physical exam, including a chest x-ray. National Institute of Preventive and Social Medicine (NIPSOM) affiliated under University of Dhaka, Bangladesh - Laboratory space will be provided here to perform asbestos identification.

CO-INVESTIGATOR(S):

Midori Courtice

SPONSORING AGENCIES:
- International Development Research Centre - "Exposure assessment of asbestos in dwellings and surrounding communities of shipbreakers in Chittagong, Bangladesh"

PROJECT TITLE:
Asbestosis in migrant shipbreakers from Northern Bangladesh

THE CURRENT UBC CREB APPROVAL FOR THIS STUDY EXPIRES: July 22, 2009

The full UBC Clinical Research Ethics Board has reviewed the above described research project, including associated documentation noted below, and finds the research project acceptable on ethical grounds for research involving human subjects and hereby grants approval.

REB FULL BOARD MEETING REVIEW DATE:

July 22, 2008

DOCUMENTS INCLUDED IN THIS APPROVAL:

Document Name	Version	Date	DATE DOCUMENTS APPROVED:
Protocol:			
Asbestosis in migrant shipbreakers from Northern Bangladesh	N/A	July 8, 2008	
Consent Forms:			
Consent form Version 2	Version 2	August 5, 2008	
Advertisements:			
Advertizement procedure	V1.0	July 9, 2008	August 12, 2008
Questionnaire, Questionnaire Cover Letter, Tests:			
Questionnaire V 2	Version 2	August 5, 2008	
Other Documents:			
Confirmation of Bangladesh Medical Research Council Ethics Submission	N/A	July 8, 2008	

CERTIFICATION:
In respect of clinical trials:
1. The membership of this Research Ethics Board complies with the membership requirements for Research Ethics Boards defined in Division 5 of the Food and Drug Regulations.
2. The Research Ethics Board carries out its functions in a manner consistent with Good Clinical Practices.
3. This Research Ethics Board has reviewed and approved the clinical trial protocol and informed consent form for the trial which is to be conducted by the qualified investigator named above at the specified clinical trial site. This approval and the views of this Research Ethics Board have been documented in writing.

The documentation included for the above-named project has been reviewed by the UBC CREB, and the research study, as presented in the documentation, was found to be acceptable on ethical grounds for research involving human subjects and was approved by the UBC CREB.

Approval of the Clinical Research Ethics Board by:

[redacted]

Appendix IX. Bangladesh Medical Research Centre

BMRC
বাংলাদেশ চিকিৎসা গবেষণা পরিষদ
Bangladesh Medical Research Council

Ref: BMRC/ERC/2007-2010/ 873

Date: 01/09/08

Ethical Review Committee

Hugh Davies
and
Midori Courtice
University of British Columbia
School of Environmental Health
Vancouver, Canada.

Subject: Ethical Clearance

With reference to your application on the above subject, this is to inform you that your Research Proposal entitled **"Asbestosis and general health among migrant Ship-breakers from Northern Bangladesh"** has been reviewed and approved by the Ethical Review Committee of Bangladesh Medical Research Council (BMRC).

.

You are requested to please note the following ethical guidelines as mentioned at page 2 (overleaf) of this memo.

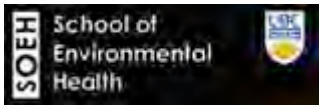
[redacted]

Mohakhali, Dhaka-1212, Bangladesh, Phone : 8811395, 8828396, Fax : 880-2-8828820
E-mail : bmrc@citechco.net

THE ETHICAL GUIDELINES TO BE FOLLOWED BY THE PRINCIPAL/CO-INVESTIGATORS

- The rights and welfare of individual volunteers are adequately protected.
- The methods to secure informed consent are fully appropriate and adequately safeguard the rights of the subjects (in the case of minors, consent is obtained from parents or guardians).
- The Investigator(s) assume the responsibility of notifying the Ethical Review Committee if there is any change in the methodology of the protocol involving a risk to the individual volunteers.
- To immediately report to the Ethical Review Committee if any evidence of unexpected or adverse reaction is noted in the subjects under study.
- This approval is subject to P.I.'s reading and accepting the BMRC ethical principles and guidelines currently in operation.

Appendix X. Consent Form English



The University of British Columbia

School of Environmental Health

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SUBJECT INFORMATION AND CONSENT FORM

Asbestosis in migrant shipbreakers from Northern Bangladesh

Principle Investigator: Dr. Hugh Davies, PhD
School of Environmental Health
University of British Columbia
Telephone: (604) 822 6777

Field Investigator: Midori Courtice, BMSc
School of Environmental Health
University of British Columbia
Mobile: 011 (880) 01820077784

Sponsor(s): International Development Research Centre (IDRC)

Emergency Contact Number (24 hours / 7 days a week):

Investigator: Midori Courtice 01820077784
Research assistant: 01911170125

Non-Emergency contact numbers are noted at the end of this document under the section heading "Contact".

Your Participation is Voluntary

Your participation is entirely voluntary. You are free to decide not to participate or to withdraw at any time.

Before you decide, it is important for you to understand what the research involves. This consent form will tell you about the study, why the research is being done, what will happen to you during the study and the possible benefits and risks.

If you wish to participate, you will be asked to sign this form. If you do decide to take part in this study, you are still free to withdraw at any time and without giving any reasons for your decision.

If you do not wish to participate, you do not have to provide any reason for your decision.

Please allow us to read the following information and stop us at any time to slow down, repeat, or explain information carefully. Please take the time to discuss it with your family, and friends before you decide.

Who is Conducting the Study?

This study is being conducted by researchers from the University of British Columbia in Canada, with the support of the National Institute of Preventive and Social Medicine (NIPSOM), in Dhaka. The study is funded by the International Development Research Centre (IDRC), in Ottawa, Canada.

Background

You are being invited to participate in this study because you presently work, or have previously worked on a shipbreaking yard in Chittagong, Bangladesh. Working on shipbreaking yards may increase the risk of developing a respiratory illness, and through the use of X-rays and an interview, we will determine the prevalence of certain respiratory diseases.

This study will determine the prevalence of asbestosis, a condition where the lung tissue becomes scarred due to presence of asbestos fibres, other lung diseases, and general health in a population of shipbreakers. The purpose is to diagnose the disease; this will not be treatment.

Purpose

This is a descriptive study to determine prevalence of asbestosis and other lung diseases, as well as general health, among a migrant shipbreaker population in Bogra district, Bangladesh. The study will also examine risk awareness amongst shipbreakers and characterize existing protection measures.

The study will consist of an interview and health assessment, including a chest X-ray at the Sariakandi health complex. Approximately 100 subjects will participate in this study.

It is important for you to understand that participation will lead to diagnosis and an understanding of prevalence of disease; there will be no treatment of disease. However, early diagnosis of a disease may help with its treatment by your family doctor, and since this is a pilot study, the knowledge gained will lead to the development of future studies that may benefit others.

Who Can Participate In This Study?

You may participate in this study if:

- You are a male shipbreaker
- You presently live in your home community in Bogra District
- You have worked on the shipyards for at least one year, and this year of work will have had to be at least 10 years ago

Who Should Not Participate In This Study?

You cannot participate in this study if:

- You did not work at a shipbreaking yard for at least one year
- This first year of work was less than 10 years ago
- You have worked in other asbestos-related industries
- You have not worked in one of the six main job types/tasks found on the shipbreaking yard: cutter/fitter/loader/hammerer/cable puller/oil group

Study Procedures

This study will take place in Bogra, Bangladesh. 100 subjects will be enrolled.

You will have to travel to the Bogra main hospital where you will be interviewed for one hour, given a health assessment, and chest X-ray. You will receive clear instructions about where to go, and the time and date. Money for the bus will be provided (70Tk). You will be asked to dedicate one half day (4 hour) session.

During the interview, the investigator and NIPSOM research assistant will be present. You will be interviewed by the research assistant in Bangla for approximately one hour. **You do not have to answer interview questions with which you do not feel comfortable.** All information collected will be coded so your identity will remain confidential.

The assistant will provide the physical examination and a hospital technician will take the chest X-ray.

You will be provided with another 140TK to recompense for lost wages, meals, travel, and time.

If you do not come on the appointed day, we will re-contact you but if you decline to participate, you may keep the travel fare already received.

What are my responsibilities?

Arrive at the appointment at the Bogra main hospital 15 minutes early, if you can. Contact the researchers by phone (phone number) if you wish to drop out, or cannot make your appointment.

Risks

A chest X-ray will be taken. Since a chest X-ray only involves taking a single, brief snapshot of an organ or area of the body, the radiation dose is low. The typical radiation dose to an adult from a chest X-ray is around 0.06 millisievert, which is equivalent to a few days exposure to natural background levels of radiation.

This diagnostic procedure is not treatment, and no reimbursement other than the incentive for one day's work and travel costs will be provided.

This study is not supported by the employers of the shipyards and there is potential that by participating in this study, I may affect my chances of being employed in the future.

Benefits

You may not receive any direct benefit form participating in this study. Early diagnosis of any disease may help chance of recovery or prolonged survival.

You will benefit from an increased understanding of how to protect yourself from future risks if you plan on returning to the yards, or if you have younger family and community members planning on working at the shipyards.

This study will benefit researchers in the field of occupational health and safety in Bangladesh, but also in other developing nations that are experiencing aggressive economic growth. When control measures can be designed and implemented, employers and yard owners will benefit from a healthier workforce, and ultimately it will benefit Bangladeshi society as a whole.

Confidentiality

Your confidentiality will be respected. No information that discloses your identity will be released or published without your specific consent to the disclosure. However, research records and medical records identifying you may be inspected in the presence of the Investigator or his or her designate by representatives of Health Canada and the UBC Research Ethics Board for the purpose of monitoring the research. However, no records which identify you by name or initials will be allowed to leave the Investigators' offices. In records that leave this centre you will be identified by a study code only. All information associated with this study will be kept behind locked doors or in secure computer files.

The information gathered from this study, with information identifying you removed, will be used to determine prevalence of asbestosis and general health among migrant shipbreakers in northern Bangladesh.

Personal results can be returned to you and your doctor, if you wish.

If you enrol in this study, your identity will only be known by myself and my research assistant, who will conduct the interview in Bangla. To ensure confidentiality beyond the interview room however, I will the use a unique study code that will only be known to me.

If you would like your results, sealed copies will be sent back to the assistant health inspector, who will distribute them to you in your home village. For illiterate subjects, the health inspector can read the letter to the subject. For those found to be ill, the letter will contain recommendations to seek medical help if that is thought to be necessary, at the Sariakandi health complex. A needs assessment is currently being conducted regarding local physician knowledge of asbestosis and pneumoconioses. Based on this assessment, a case-management strategy will be prepared for the local physicians, which will be followed to treat or consult subjects at the health complex.

Reimbursement:

You will be paid 210 Bangladeshi Takas for participating in this study. This is a reimbursement for one day's wages plus extra costs incurred due to meals and bus travel.

After the study is finished

Study results (without personal identifiers) will be shared with study participants, the community and health complexes of Sariakandi and Bogra, the University of Dhaka, local advocacy groups such as Young Power in Social Action, the University of British Columbia in Canada and international agencies such as the International Maritime Organization, and the International Labour Organization. Results will be submitted for publication in the form of a research paper.

Contact

If you have any questions or desire further information with respect to this study, contact the field investigator:

Midori Courtice__ Email:__midori@interchange.ubc.ca___Phone: 01820077784

Or the NIPSOM research assistant:

Zakia Siddique _ Email:__ zs_siddique@yahoo.com___ Phone: 01911170125

If you would like to attend in person to ask the field investigator or the research assistant any questions, the hospital address is:

Mohammed Ali hospital, Bogra, Bangladesh, 5830

If you have any concerns about your experience or rights as a research subject you may contact the Bangladeah Medical Research Council at Phone: +880 2 8811395.

Subject Consent

I understand that participation in this study is entirely voluntary. I may choose not to participate or I may withdraw from the study at any time. I understand that I may ask questions about this study in the future. ***Signing this consent form in no way limits my legal rights against the sponsor, investigators, or anyone else.***

I will receive a signed and dated copy of this consent form including all attachments, for my own records.

I consent to participate in this study.

_____	_____	
Subject's Signature	Printed name	
Date		
_____	_____	
Witness' Signature	Printed name	
Date		
_____	_____	_____
Signature of Person Obtaining Consent	Printed name	Study Role
Date		

If this consent process has been done in a language other than that on this written form, with the assistance of an interpreter/translator, indicate:

Language:_____Bengali_____

Was the subject assisted during the consent process?

☐ Yes ☐ No

If yes, please check the relevant box and complete the signature space below:

☐ The consent form was read to the subject, and the person signing below attests that the study was accurately explained to, and apparently understood by, the subject (**please check if subject is unable to read**).

☐ The person signing below acted as an interpreter/translator for the subject, during the consent process (**please check if an interpreter/translator assisted during the consent process**).

_____	_____	_____
Signature of Person Assisting in the Consent Discussion	Printed Name	Date

Appendix XI. Consent form Bangla

গবেষণা বিষয়ে তথ্য ও অনুমতি পত্র

বাংলাদেশের উত্তরাঞ্চলের জাহাজ-ভাঙা শিল্প শ্রমিক অভিবাসীর মধ্যে এ্যাসবেস্টোসিস

প্রধান গবেষক: ড. হিউ ডেভিস, পি-এইচ.ডি
স্কুল অব এনভায়রনমেন্টাল হেল্‌থ
ইউনিভার্সিটি অব ব্রিটিশ কলাম্বিয়া
টেলিফোন: (৬০৪) ৮২২ ৬৭৭৭

মাঠ গবেষক: মিডোরি কারটিস
স্কুল অব এনভায়রনমেন্টাল হেল্‌থ
ইউনিভার্সিটি অব ব্রিটিশ কলাম্বিয়া
মোবাইল: ০১৮২০০৭৭৭৮৪

সহযোগিতায়: আন্তর্জাতিক উন্নয়ন গবেষণা কেন্দ্র (আইডিআরসি), কানাডা

অতি জরুরি যোগাযোগ (২৪ ঘন্টা/৭দিন) এর জন্য:
গবেষক: মিডোরি কারটিস ০১৮২০০৭৭৭৮৪
গবেষণা সহকারী: ০১৯১১ ১৭০ ১২৫

অতি জরুরি নয় এমন ক্ষেত্রে যোগাযোগের জন্য টেলিফোন নম্বরগুলি 'যোগাযোগ' অধ্যায়ে সংযোজিত রয়েছে।

আপনার অংশগ্রহণ স্বেচ্ছাশ্রম মূলক

এই গবেষণায় আপনার অংশগ্রহণ সম্পূর্ণ স্বেচ্ছাশ্রমমূলক। যে কোন সময় এই গবেষণায় অংশগ্রহণ থেকে বিরত হবার কিংবা অব্যহতির সিদ্ধান্ত গ্রহণের স্বাধীনতা আপনার রয়েছে।

তাই, যে কোন সিদ্ধান্ত গ্রহণের আগে এই গবেষণার বিষয়বস্তু সম্পর্কে আপনার জানা প্রয়োজন। এই অনুমতি পত্র থেকে আপনি এই গবেষণার বিষয়বস্তু, কেন এই গবেষণা করা হচ্ছে, গবেষণা চলাকালীন আপনার কাজ কি হবে এবং সম্ভাব্য সুবিধা ও সমস্যা সম্পর্কে জানতে পারবেন।

যদি গবেষণায় অংশগ্রহণ করতে ইচ্ছুক হন তবে আপনাকে এই ফরমটিতে স্থাবর করতে হবে। যদি আপনি গবেষণায় অংশগ্রহণে ইচ্ছুক হন তবে ভবিষ্যতে যে কোন সময় কোন কারণ দর্শানো ব্যতিরেকেই গবেষণা থেকে বিরতি বা অব্যহতি লাভ করতে পারেন।

গবেষণায় অংশগ্রহণে ইচ্ছুক না হলেও আপনাকে সে সিদ্ধান্তের জন্য কোন কারণ দর্শাতে হবে না।

অনুগ্রহপূর্বক আমাদের নিচের তথ্যগুলি পাঠ করার অনুমতি দিন। পাঠ চলাকালীন সময়ে আপনি যে কোন সময় পাঠে ধীরগতি, পুনরুক্তি অথবা তথ্যের ব্যাখ্যা চাইতে পারেন। সিদ্ধান্ত গ্রহণের পূর্বে অনুগ্রপূর্বক আপনার পরিবার ও বন্ধুদের সাথে বিষয়টি আলোচনার জন্য পর্যাপ্ত সময় গ্রহণ করুন।

কে এই গবেষণা পরিচালনা করছে?

এই গবেষণাটি ঢাকার জাতীয় প্রতিষেধক ও সামাজিক চিকিৎসা প্রতিষ্ঠান (নিপসম)-এর সহযোগিতায় কানাডার ইউনিভার্সিটি অব ব্রিটিশ কলাম্বিয়া কর্তৃক পরিচালিত হচ্ছে। এতে আর্থিক সহায়তা প্রদান করছে কানাডার অটোয়ায় অবস্থিত আন্তর্জাতিক উন্নয়ন গবেষণা কেন্দ্র (আইডিআরসি)।

প্রেক্ষাপট

আপনাকে এই গবেষণায় অংশগ্রহণের জন্য আমন্ত্রণ জানানো হচ্ছে কারণ আপনি বাংলাদেশের চট্টগ্রামের জাহাজ-ভাঙা ইয়ার্ডে কাজ করছেন অথবা অতীতে কাজ করেছেন। জাহাজ-ভাঙা শিল্পে কাজ শ্রমিকদের মধ্যে বেশ কিছু শ্বাসতন্ত্রের রোগের ঝুঁকি বাড়িয়ে দেয়। আপনাকে প্রশ্ন করে এবং এক্স-রে-এর মাধ্যমে আমরা শ্বাসতন্ত্রের কতিপয় রোগ হয়েছে কিনা তা নির্ধারণ করব।

এই গবেষণার মাধ্যমে জাহাজ-ভাঙা শিল্পে নিয়োজিত জনগোষ্ঠির মধ্যে এ্যাসবেস্টোসিসসহ ফুসফুসের অন্যান্য রোগ এবং সাধারণ স্বাস্থ্য সমস্যার ব্যাপকতা নির্ধারণ করা সম্ভব হবে। এ্যাসবেস্টোসিস হ'ল এমন ধরণের রোগ যাতে এ্যাসবেস্টস তন্তুর উপস্থিতির ফলে ফুসফুসের কলাগুলি শক্ত হয়ে যায়। এই গবেষণার উদ্দেশ্য রোগ নির্ণয়, চিকিৎসা নয়।

উদ্দেশ্য:

বগুড়া জেলার জাহাজ-ভাঙা শিল্পে নিয়োজিত অভিবাসী শ্রমিকদের মধ্যে এ্যাসবেস্টোসিস ও ফুসফুসের অন্যান্য রোগ সহ সাধারণ স্বাস্থ্য সমস্যা চিহ্নিত করার জন্য এই গবেষণাটির আয়োজন করা হয়েছে। পাশাপাশি এই গবেষণার মাধ্যমে জাহাজ-ভাঙা শিল্পে নিয়োজিত শ্রমিকদের ঝুঁকি বিষয়ক সচেতনতা এবং বর্তমান প্রতিরোধমূলক ব্যবস্থা সম্পর্কে ধারণা পাওয়া যাবে।

এই গবেষণার দুটি অংশ হলো সাক্ষাতকার গ্রহণ এবং বগুড়া হাসপাতালে এক্স-রে সহ স্বাস্থ্য পরীক্ষা। আনুমানিক ১০০ ব্যক্তি এই গবেষণায় অংশগ্রহণ করবেন। এটা আপনাকে অবশ্যই বুঝতে হবে যে, আপনি এই গবেষণায় অংশগ্রহণ করলে আপনার শ্বাসতন্ত্রের রোগ হয়েছে কিনা সে বিষয়ে আপনি জানতে পারবেন তবে এই রোগের চিকিৎসা দেওয়া হবে না। যা হোক, এই গবেষণার জন্য প্রাথমিক অবস্থায় রোগ ধরা পড়লে আপনার পারিবারিক ডাক্তার দ্বারা রোগটি চিকিৎসায় সহায়তা করবে। এবং যেহেতু এটা একটা প্রাথমিক গবেষণা, এই গবেষণায় প্রাপ্ত জ্ঞান ভবিষ্যতে আরো গবেষণা করার দিক নির্দেশনা দিবে যা সকলকে উপকৃত করবে।

কে এই গবেষণায় অংশগ্রহণ করতে পারবেন?

আপনি এই গবেষণায় অংশগ্রহণ করতে পারবেন, যদি আপনি:

- একজন জাহাজ-ভাঙা শিল্পের একজন পুরুষ শ্রমিক হন
- বর্তমানে নিজস্ব নিবাস বগুড়ায় বসবাস করছেন
- অন্ততঃ এক বছর জাহাজ-ভাঙা শিল্পে কাজ করেছেন, যা অন্ততঃ ১০ বছর আগে করেছেন।

কে এই গবেষণায় অংশগ্রহণ করতে পারবেন না?
আপনি এই গবেষণায় অংশগ্রহণ করতে পারবেন না, যদি:

- আপনি জাহাজ-ভাঙা শিল্পে অন্ততঃ এক বছর কাজ না করে থাকেন
- দশ বছরের কম সময় আগে কাজ শুরু করে থাকেন
- আপনি যদি অ্যাসবেস্টস সংক্রান্ত অন্য কোন শিল্পে কাজ করে থাকেন
- আপনি যদি জাহাজ-ভাঙা শিল্পের প্রধান ছয়টি ক্ষেত্রের কোন একটিতে কাজ না করে থাকেন। এই ছয়টি ক্ষেত্র হলো: কাটার/ফিটার/লোডার/হ্যামার/ক্যাবল পুলার/অয়েল গ্রুপ

গবেষণা পদ্ধতি
এই গবেষণাটি বাংলাদেশের বগুড়া জেলায় পরিচালিত হবে যেখানে ১০০জন ব্যক্তিকে অন্তর্ভুক্ত করা হবে।

আপনাকে বগুড়া শহরের সদর হাসপাতালে যেতে হবে যেখানে এক ঘন্টা ব্যাপি একটি সাক্ষাতকার গ্রহণ, স্বাস্থ্য পরীক্ষা এবং বুকের এক্স-রে করা হবে। এ ব্যাপারে যাওয়ার স্থান, সময় ও তারিখ সুনির্দিষ্টভাবে জানিয়ে দেওয়া হবে। যাতায়াতের জন্য আপনি ভাতা (৭০ টাকা) পাবেন এবং এ সমস্ত কাজের জন্য আপনাকে অন্ততঃ অর্ধবেলা (চার ঘন্টা) সময় ব্যয় করতে হবে।

সাক্ষাতকার গ্রহণের সময় গবেষক এবং নিপসম-এর গবেষণা সহকারী উপস্থিত থাকবেন। গবেষণা সহকারী প্রায় এক ঘন্টা ব্যাপী বাংলায় আপনার সাক্ষাতকার গ্রহণ করবেন। আপনি চাইলে যে কোন প্রশ্নের উত্তর দেওয়া থেকে বিরত থাকতে পারবেন। সকল তথ্য সংকেতের মাধ্যমে গ্রহণ করা হবে যার ফলে আপনার পরিচয় গোপন রাখা সম্ভব হবে বা প্রকাশ পাবে না।

গবেষণা সহকারী আপনার স্বাস্থ্য পরীক্ষা করবেন এবং একজন হাসপাতাল টেকনিশিয়ান আপনার বুকের এক্স-রে গ্রহণ করবেন।

এছাড়া আপনাকে আরো ১৪০ টাকা প্রদান করা হবে পারিতোষিক ক্ষতিপূরণ, খাদ্য, যাতায়াত ও সময় ব্যয় হিসেবে।

আপনি যদি সাক্ষাতকারের জন্য নির্ধারিত দিনে উপস্থিত হতে ব্যর্থ হন তবে আমরা পুনরায় আপনার সাথে যোগাযোগ করব।

আপনার দায়িত্ব
আপনাকে সাক্ষাতকারের জন্য নির্ধারিত দিনে নির্ধারিত সময়ের ১৫ মিনিট আগে বগুড়া সদর হাসপাতালে উপস্থিত হতে হবে। সাক্ষাতকার থেকে অব্যহতি পেতে চাইলে অথবা নির্ধারিত সময়ে উপস্থিত হতে না পারলে গবেষণা সহকারীর সাথে যোগাযোগ করুন।

ঝুঁকিসমূহ
আপনার একটি বুকের এক্স-রে গ্রহণ করা হবে। যেহেতু এক্স-রে করার জন্য শরীরের কোন একটি নির্দিষ্ট অঙ্গের সংক্ষিপ্ত চিত্র নেয়া হয় তাই এতে কম শক্তিশালী রশ্মি ব্যবহার করা হয়। একজন পূর্ণ বয়স্ক রোগীর এক্স-রে-এর জন্য ব্যবহৃত রশ্মির পরিমাণ ০.৬ সি. (মিলি সিভার্ট) যা কয়েকদিনের প্রাকৃতিকভাবে বিকিরীত রশ্মি গ্রহণের সমপরিমাণ।

এই স্বাস্থ্য পরীক্ষা কোন চিকিৎসা নয় এবং দৈনিক ভাতা ও যাতায়াত ভাতা ছাড়া কোন ধরণের পারিতোষিক প্রদান করা হবে না।

সুবিধা সমূহ
এই গবেষণায় অংশগ্রহণের মাধ্যমে আপনি হয়তো সরাসরি কোন সুবিধা নাও পেতে পারেন। কিন্তু দ্রুত রোগ নির্ণয় রোগের চিকিৎসা ও আরোগ্য লাভের সম্ভাবনাকে বাড়িয়ে দেয়।

যদি আপনি পুণরায় জাহাজ-ভাঙা শিল্পে যোগ দেওয়ার পরিকল্পনা করে থাকেন অথবা আপনার পরিবার বা গ্রামের লোক এই শিল্পে যোগ দেওয়ার পরিকল্পনা করে থাকে সেক্ষেত্রে ভবিষ্যতের সম্ভাব্য ঝুঁকি থেকে নিজেদের রক্ষার বিষয়ে অধিকতর জ্ঞানের মাধ্যমে আপনি সতর্ক হতে পারবেন।

এই গবেষণার ফলাফল বাংলাদেশ এবং অন্যান্য উন্নয়নশীল দেশের পেশাগত স্বাস্থ্য ও নিরাপত্তা বিষয়ে গবেষণায় নিযুক্ত গবেষকদের সহায়তা করবে। এর দ্বারা উপযুক্ত নিয়ন্ত্রণ ব্যবস্থা নির্ধারণ করা সম্ভব হলে তা বাস্তবায়নের মাধ্যমে শিল্প মালিকরা স্বাস্থ্যবান শ্রমিক লাভ করতে পারবে এবং সামগ্রিকভাবে বাংলাদেশ লাভবান হবে।

গোপনীয়তা

আপনার গোপনীয়তার যথাযথ মূল্যায়ন করা হবে। এমন কোন তথ্য যা আপনার ব্যক্তিগত পরিচয়কে চিহ্নিত করে তা আপনার নির্ধারিত অনুমতি ব্যতীত কাউকে প্রদান বা প্রকাশ করা হবে না। এই গবেষণার কোন প্রতিবেদনেও আপনার কোন পরিচয় প্রকাশ করা হবে না। গবেষণার সকল নথিতে আপনার পরিচয় একটি সংখ্যার মাধ্যমে চিহ্নিত করা হবে। এই গবেষণার সকল তথ্য সুরক্ষিত কক্ষে অথবা কম্পিউটার ফাইলে সংরক্ষিত হবে।

আপনাকে চিহ্নিত করে এমন সব তথ্য বাদ দিয়ে এই সংগৃহীত তথ্যের মাধ্যমে বাংলাদেশের উত্তরাঞ্চলের অভিবাসী জাহাজ-ভাঙা শিল্প অভিবাসী শ্রমিকদের মধ্যে এ্যাসবেস্টোসিস এবং অন্যান্য সাধারণ স্বাস্থ্য সমস্যার বিস্তার নির্ধারণ করা হবে।

আপনি ইচ্ছা করলে আপনার ব্যক্তিগত স্বাস্থ্য পরীক্ষার ফলাফল আপনার অথবা আপনার চিকিৎসকের নিকট হস্তান্তর করা যেতে পারে।

এই গবেষণায় অন্তর্ভুক্ত হলে আপনার পরিচয় কেবলমাত্র আমার এবং গবেষণা সহকারী, যিনি বাংলায় সাক্ষাতকার গ্রহণ করবেন, তার জানা থাকবে। সাক্ষাতকারের বাইরে গোপনীয়তা বজায় রাখতে একটি অনন্য গবেষণা সংকেত ব্যবহার করা হবে, যা শুধুমাত্র আমার জানা থাকবে।

আপনার ব্যক্তিগত ফলাফল জানতে চাইলে আমরা তা সিলমোহরযুক্ত করে সহকারী স্বাস্থ্য পরিদর্শকের নিকট প্রেরণ করতে পারি যা তিনি আপনাদের নিজ নিজ বাড়িতে পৌছে দিবেন। নিরক্ষর ব্যক্তিদের ক্ষেত্রে স্বাস্থ্য পরিদর্শক তা তাদের পড়ে শোনাতে পারেন। গবেষণায় যারা অসুস্থ বলে চিহ্নিত হবেন, তাদের জন্য পত্রের মাধ্যমে সারিয়াকান্দি স্বাস্থ্য কমপ্লেক্সে উপযুক্ত চিকিৎসা গ্রহণের পরামর্শ দেওয়া হবে। বর্তমানে স্থানীয় চিকিৎসকদের মধ্যে এ্যাসবেস্টোসিস এবং নিউমোকোনিওসিস বিষয়ক জ্ঞানের চাহিদা সম্পর্কে ধারণা নেওয়ার কাজ চলছে। এই ধারণার ভিত্তিতে স্থানীয় চিকিৎসকদের জন্য একটি রোগী-ব্যবস্থাপনা কৌশল তৈরি করা হবে যা স্বাস্থ্য কমপ্লেক্সে গবেষণায় অন্তর্ভুক্ত ব্যক্তিদের চিকিৎসা বা পরামর্শ প্রদানে অনুসরণ করা হবে।

ব্যয় পরিশোধ

এই গবেষণায় অংশগ্রহণের জন্য আপনি মোট ২১০ টাকা পাবেন। এই অর্থ আপনার একদিনের আয় এবং গবেষণা সংক্রান্ত কাজের বিভিন্ন ব্যয় যেমন খাদ্য ও যোগাযোগের জন্য।

গবেষণা সমাপ্তির পর

গবেষণার ফলাফল (ব্যক্তিগত পরিচিতি ব্যতীত) গবেষণায় অংশগ্রহণকারী, তাদের কমিউনিটি, বগুড়া ও সারিয়াকান্দি স্বাস্থ্য কমপ্লেক্স, নিপসম, স্থানীয় পরামর্শক দল যেমন ইয়ং পাওয়ার ইন সোশ্যাল এ্যাকশন, কানাডার ইউনিভার্সিটি অব ব্রিটিশ কলাম্বিয়া এবং আন্তর্জাতিক সংস্থাসমূহ যেমন ইন্টারন্যাশনাল মেরিটাইম অর্গানাইজেশন, ইন্টারন্যাশনাল লেবার অর্গানাইজেশন প্রভৃতি সংস্থাকে জানানো হবে। গবেষণার ফলাফল গবেষণাপত্র হিসেবে প্রকাশের জন্য প্রদান করা হবে।

যোগাযোগ

আপনার যে কোন প্রশ্ন বা অতিরিক্ত তথ্যের জন্য প্রধান মাঠ গবেষকের সাথে যোগাযোগ করুন:

মিডোরি কারটিস

ই-মেইল: midori@interchange.ubc.ca

ফোন: ০১৮২০০৭৭৭৮৪

অথবা নিপসম গবেষণা সহকারী:

জাকিয়া চৌধুরী

ই-মেইল: zs_siddique@yahoo.com

ফোন: ০১৯১১ ১৭০১২৫

এছাড়াও আপনি যদি ব্যক্তিগতভাবে গবেষক বা গবেষণা সহকারীকে কোন প্রশ্ন করতে চান সেক্ষেত্রে মোহাম্মদ আলী হাসপাতাল, বগুড়ায় যোগাযোগ করতে পারেন। গবেষণায় অন্তর্ভুক্ত ব্যক্তি হিসেবে অভিজ্ঞতা বা অধিকার সম্পর্কে কোন সংশ্লিষ্টতা থাকলে আপনি বাংলাদেশ মেডিক্যাল রিসার্চ কাউন্সিল-এ যোগাযোগ করতে পারেন। ফোন: +৮৮০ ২ ৮৮১১৩৯৫

৩

অনুমতিপত্র

আমি এই মর্মে অবগত আছি যে এই গবেষণায় অংশগ্রহণ সম্পূর্ণ স্বেচ্ছামূলক। আমি যে কোন সময় গবেষণায় অংশগ্রহণ থেকে বিরত থাকতে বা গবেষণা ত্যাগের সিদ্ধান্ত গ্রহণ করতে পারি। আমি অবগত আছি যে, ভবিষ্যতে যে কোন সময়ে আমি এই গবেষণা সম্পর্কে তথ্য জানতে পারি।

আমি ব্যক্তিগত সংরক্ষণের জন্য এই স্বাক্ষরিত অনুমতিপত্র এবং এর সাথে সংযুক্ত কাগজপত্রাদির একটি অবিকল নকল গ্রহণ করব।

আমি এই গবেষণায় অংশগ্রহণের জন্য সম্মতি দিলাম।

_____	_____	
ব্যক্তির স্বাক্ষর	নাম (স্পষ্ট অক্ষরে)	
তারিখ		
_____	_____	
সাক্ষীর স্বাক্ষর	নাম (স্পষ্ট অক্ষরে)	
তারিখ		
_____	_____	_____
অনুমতি গ্রহণকারীর স্বাক্ষর	নাম (স্পষ্ট অক্ষরে)	গবেষণায় ভূমিকা
তারিখ		

যদি এই ফরমটি মুদ্রিত ভাষা ব্যতীত অন্য কোন ভাষায় দোভাষী বা অনুবাদকের সাহায্যে পরিপূরণ করা হয়ে থাকে সেক্ষেত্রে ভাষার নাম লিখুন:

ভাষা: --------বাংলা---------

৭।

অনুমতি গ্রহণের সময় গবেষণার জন্য নির্বাচিত ব্যক্তিকে কেহ সহযোগিতা করেছিলেন?

☐ হ্যাঁ ☐ না

উত্তর হ্যাঁ হলে, সংশ্লিষ্ট ছক নিরীক্ষা করুন এবং নিচে স্বাক্ষর করুন:

- অনুমতিপত্রটি গবেষণার জন্য নির্বাচিত ব্যক্তির নিকট পড়ে শোনানো হয়েছে, এবং নিম্নস্বাক্ষরকারী এই মর্মে সত্যায়ন করছেন যে ঐ ব্যক্তির নিকট গবেষণার বিষয়বস্তু যথাযথভাবে ব্যাখ্যা করা হয়েছে এবং তিনি তা বুঝতে পেরেছেন বলে অনুমিত হয়েছে **(নিরক্ষর নির্বাচিত ব্যক্তিদের ক্ষেত্রে)**।
- নিম্নস্বাক্ষরকারী অনুমতিগ্রহণ প্রক্রিয়ায় গবেষণার জন্য নির্বাচিত ব্যক্তির পক্ষে একজন দোভাষী/অনুবাদক হিসেবে কাজ করেছেন **(কেবলমাত্র অনুমতি গ্রহণ প্রক্রিয়ায় কোন দোভাষী/অনুবাদকের সহায়তা গ্রহণ করা হয়ে থাকলে)**।

_____	_____	_____
অনুমতি গ্রহণ আলোচনায় সহায়তাকারী ব্যক্তির স্বাক্ষর	নাম (স্পষ্ট অক্ষরে)	তারিখ

Appendix XII. Questionnaire English

Asbestosis in migrant shipbreakers from Northern Bangladesh

Demographic data

This page is to be detached and stored separately in a secure location by the field investigator ONLY, as soon as the information has been gathered. The rest of the questionnaire will be marked by a unique identifier known only to the field investigator.

Unique Study Code: ABSP0388
Date
Time

1. What is your full name?

Last
First
Middle

2. What is your father's full name?

Last
First
Middle

3. What is your age in years?

4. What is your

Height (cm)
Weight (kg)

5. What is your nationality?

☐ Bangladeshi

Other (please specify)

6. What is your permanent address?

Village
Thana
District

7. What is your level of education?

☐ None
☐ Primary
☐ Secondary School Certificate (SSC)
☐ Higher Secondary Certificate (HSC)
☐ Graduate

Other (please specify)

Asbestosis in migrant shipbreakers from Northern Bangladesh

ATS Questions - Cough

Unique Study Code: ABSP0388

8. Do you usually have a cough? (Count cought with first smoke or first going out of doors. Exclude clearing throat)

◯ Yes
◯ No

If yes to #8, answer #9

9. Do you cough as much as 4 times a day, 4 or more days out of the week?

◯ Yes
◯ No

If no to #8, ask #10 and #11

10. Do you usually cough in the morning when you wake up?

◯ Yes
◯ No

11. Do you usually cough at all during the rest of the day or at night?

◯ Yes
◯ No

If yes to any of the above (#8-11) , ask #12-15

12. Do you usually cough like this most days for 3 consecutive months or more during the year?

◯ Yes
◯ No

13. For how many years have you had this cough?

14. Does the cough improve:

	Yes	No
On days off?	☐	☐
On long breaks from work (more than a week)?	☐	☐

15. Is there anything or situation which makes your cough worse?
Specify:

Asbestosis in migrant shipbreakers from Northern Bangladesh

ATS Questions - Cough

Unique Study Code: ABSP0388

16. In the last 12 months, have you been awakened by coughing?

- ◯ Yes
- ◯ No

17. If yes to #16, how often have you been awakened by coughing on the last 12 months?

- ◯ Most days or nights
- ◯ A few days or nights a week
- ◯ A few days or nights a month
- ◯ A few days or nights a year, or less

Asbestosis in migrant shipbreakers from Northern Bangladesh

ATS Questions - Phlegm

Unique Study Code: ABSP0388

18. Do you usually bring up phlegm from your chest?

- ◯ Yes
- ◯ No

If yes to #18, answer #19

19. Do you usually bring up phlegm like this as much as twice a day, 4 or more days out of the week?

- ◯ Yes
- ◯ No

If no to #18, ask #20 and #21

20. Do you usually bring up phlegm in the morning when you wake up?

- ◯ Yes
- ◯ No

21. Do you usually bring up phlegm at all during the rest of the day or at night?

- ◯ Yes
- ◯ No

If yes to any of the above (#18-21), ask #22-25

22. Do you bring up phlegm like this on most days for 3 consecutive months or more during the year?

- ◯ Yes
- ◯ No

23. For how many years have you had trouble with phlegm?

24. Does the phlegm improve:

	Yes	No
On days off?	☐	☐
On long breaks from work (more than a week)?	☐	☐

25. Is there anything or situation which makes you bring up phlegm?
Specify:

Asbestosis in migrant shipbreakers from Northern Bangladesh

ATS Questions - Phlegm

Unique Study Code: ABSP0388

26. In the last 12 months, have you had periods or episodes of cough with phlegm that lasted 1 week or more? (If you usually have cough and phlegm, please count only periods or episodes of increased cough and phlegm.)

- ◯ Yes
- ◯ No

27. About how many such episodes have you had in the past 12 months?

28. For how many years have you had at least 1 such episode?

Asbestosis in migrant shipbreakers from Northern Bangladesh

ATS Questions - Wheezing

Unique Study Code: ABSP0388

29. Have you ever had wheezing or whistling in your chest?

- ◯ Yes
- ◯ No

If no to #29, skip to "ATS Questions - Chest Tightness"
If yes to #29, answer #30

30. Did you have wheezing or whistling in your chest when you were:

	Yes	No
Younger than 2 years old?	◯	◯
2-18 years old?	◯	◯
Older than 18 years old?	◯	◯

31. In the last 12 months, have you had wheezing or whistling in yoru chest at any time?

- ◯ Yes
- ◯ No

If no to #31, skip to #38

32. In the last 12 months, how often have you had this wheezing or whistling?

- ◯ Most days or nights
- ◯ A few days or nights a week
- ◯ A few days or nights a month
- ◯ a few days or nights a year, or less

33. In the last 12 months, have you had this wheezing or whistling in the chest when you had a cold?

- ◯ Yes
- ◯ No

34. In the last 12 months, have you had this wheezing or whistling in the chest apart from colds?

- ◯ Yes
- ◯ No

Asbestosis in migrant shipbreakers from Northern Bangladesh

ATS Questions - Wheezing

Unique Study Code: ABSP0388

35. In the last 12 months have you had an attack of wheezing or whistling in the chest that has made you feel short of breath?

- ◯ Yes
- ◯ No

36. In the last 12 months, has this wheezing or whistling improved?

	Yes	No
On days off?	◯	◯
On long breaks from work? (more than a week)	◯	◯

37. When does the wheeze occur MOST frequently? (Only one answer)

- ◯ At work
- ◯ On return home
- ◯ During sleep
- ◯ No difference
- ◯ Upon waking up

38. In the last 12 months, have you been awakened from sleep by wheezing or whistling in your chest?

- ◯ Yes
- ◯ No

If no to #38, skip to "ATS Questions - Chest Tightness"
If yes to #38, answer #39

39. In the last 12 months, how often have you been awakened by wheezing or whistling in your chest?

- ◯ Most days or nights
- ◯ A few days or nights a week
- ◯ A few days or nights a month
- ◯ A few days or nights a year, or less

Asbestosis in migrant shipbreakers from Northern Bangladesh

ATS Questions - Chest Tightness

Unique Study Code: ABSP0388

40. In the last 12 months, have you been awakened from sleep by shortness of breath or a feeling of tightness in your chest?

- ◯ Yes
- ◯ No

If yes to #40, answer #41

41. In the last 12 months, how often have you been awakened by shortness of breath or a feeling of tightness in your chest?

- ◯ Most days or nights
- ◯ A few days or nights a week
- ◯ A few days or nights a month
- ◯ A few days or nights a year, or less

Asbestosis in migrant shipbreakers from Northern Bangladesh

ATS Questions - Breathlessness

Unique Study Code: ABSP0388

If disabled from walking by any condition other than heart or lung disease, describe and skip to "ATS Questions - Past Illnesses"

42. Are you troubled by shortness of breath when hurrying on level ground or walking up a slight hill?

- ◯ Yes
- ◯ No

Answer #43-48 if you answered yes to #42

43. Do you have to walk slower than people of your own age on level ground because of breathlessness?

- ◯ Yes
- ◯ No

44. Do you ever have to stop for breath when walking at your own pace on level ground?

- ◯ Yes
- ◯ No

45. Do you ever have to stop for breath after walking about 100 yards (or after a few minutes) on level ground?

- ◯ Yes
- ◯ No

46. Are you too short of breath to leave the house or short of breath on dressing or undressing?

- ◯ Yes
- ◯ No

47. Does it improve:

	Yes	No
On days off?	◯	◯
On long breaks from work? (Longer than one week)	◯	◯

48. Which of the following best describes your breathing?

- ◯ I rarely get into trouble with my breathing
- ◯ I do get regular trouble with my breathing but it always gets completely better
- ◯ My breathing is never quite right

Asbestosis in migrant shipbreakers from Northern Bangladesh

ATS Questions - Past Illnesses

Unique Study Code: ABSP0388

49. Have you ever had bronchitis?

- ◯ Yes
- ◯ No

If yes to #49, answer #50-52

50. Was it confirmed by a doctor?

- ◯ Yes
- ◯ No

51. At what age did you first have bronchitis?

52. How many times did you have bronchitis?

53. Have you ever had pneumonia?

- ◯ Yes
- ◯ No

If yes to #53, answer #54-56

54. Was it confirmed by a doctor?

- ◯ Yes
- ◯ No

55. At what age did you first have pneumonia?

56. How many times did you have pneumonia?

57. Have you ever had chronic bronchitis?

- ◯ Yes
- ◯ No

If yes to #57, answer #58-61

58. Was it confirmed by a doctor?

- ◯ Yes
- ◯ No

Asbestosis in migrant shipbreakers from Northern Bangladesh

ATS Questions - Past Illnesses

Unique Study Code: ABSP0388

59. At about what age did it start?

60. Do you still have it?

- ◯ Yes
- ◯ No

61. In the past 12 months, have you recieved medical treatment, taken medication or used an inhaler for chronic bronchitis?

- ◯ Yes
- ◯ No

62. Have you ever had emphysema?

- ◯ Yes
- ◯ No
- ◯ Do not know what this is

If yes to #62, answer #63-66

63. Was it confirmed by a doctor?

- ◯ Yes
- ◯ No

64. At about what age did it start?

65. Do you still have it?

- ◯ Yes
- ◯ No

66. In the past 12 months, have you recieved medical treatment, taken medication or used an inhaler for emphysema?

- ◯ Yes
- ◯ No

67. Have you ever heard of COPD (Chronic obstructive pulmonary disease)? [Don't know skip to #25]

- ◯ Yes
- ◯ No

Asbestosis in migrant shipbreakers from Northern Bangladesh

Asbestosis in migrant shipbreakers from Northern Bangladesh

ATS Questions - Past Illnesses

Unique Study Code: ABSP0388

68. Have you ever had COPD? [Don't know, skip to #25]

- ◯ Yes
- ◯ No

If yes to #68, answer #69-72

69. Was it confirmed by a doctor?

- ◯ Yes
- ◯ No

70. At about what age did it start?

71. Do you still have it?

- ◯ Yes
- ◯ No

72. In the past 12 months, have you recieved medical treatment, taken medication or used an inhaler for COPD?

- ◯ Yes
- ◯ No

73. Have you ever had pulmonary fibrosis?

- ◯ Yes
- ◯ No
- ◯ Do not know what this is

If yes to #73, answer #74-78

74. Was it confirmed by a doctor?

- ◯ Yes
- ◯ No

75. If it was confirmed by a doctor, do you know what kind of fibrosis?

76. At about what age did it start?

Asbestosis in migrant shipbreakers from Northern Bangladesh

ATS Questions - Past Illnesses

Unique Study Code: ABSP0388

77. Do you still have it?

- ◯ Yes
- ◯ No

78. In the past 12 months, have you recieved any treatment for pulmonary fibrosis?

- ◯ Yes
- ◯ No

79. Have you ever had:

Any other chest illness? (Specify)

Any chest injuries? (Specify)

Any chest operations? (Specify)

Are you currently taking any medications for your breathing? (Specify)

80. Has a doctor every told you that you had heart trouble?

- ◯ Yes
- ◯ No

81. If so, have you ever had treatment for heart trouble in the past 12 months?

- ◯ Yes
- ◯ No

82. Has a doctor ever told you that you had high blood pressure?

- ◯ Yes
- ◯ No

83. If so, have you had any treatment for high blood pressure in the past 12 months?

- ◯ Yes
- ◯ No

84. Has a doctor ever told you that you had diabetes?

- ◯ Yes
- ◯ No

Asbestosis in migrant shipbreakers from Northern Bangladesh

ATS Questions - Past Illnesses

Unique Study Code: ABSP0388

85. If so, have you had any treatment for diabetes in the past 12 months?

- ◯ Yes
- ◯ No

86. Do you have any other health problems? (Specify)

87. Are you taking any medications for other illness at present? (Specify)

88. Currently, would you say your overall health is:

- ◯ Excellent
- ◯ Good
- ◯ Fair
- ◯ Poor
- ◯ Bad

Asbestosis in migrant shipbreakers from Northern Bangladesh

Smoking

Unique Study Code: ABSP0388

89. Have you ever smoked cigarettes with/without filter, and/or bidi? (No means <20 packs of cigarettes in your lifetime or <1 cigarette a day for one year at any time in your life.)

	Yes	No
Cigarettes	◯	◯
Bidi	◯	◯

If no to cigarettes but yes to bidi, skip to #99
If no to both, skip to #108

90. How old were you (in years) when you first started regular cigarette smoking?

91. Do you presently smoke cigarettes (as of one month ago)?

- ◯ Yes
- ◯ No

If yes to #91, answer #92-94. If no to #91, answer #95-97.

92. How many cigarette sticks do you smoke per day now?

93. Did you ever quit smoking for 6 months or longer? [If no, skip to #98]

- ◯ Yes
- ◯ No

94. For how many years in total did you quit smoking?

95. How old were you when you completely stopped smoking?

96. When you were a smoker, did you ever stop smoking for 6 months or longer before you completely stopped smoking? [If no, skip to #98]

- ◯ Yes
- ◯ No

97. During the time that you were a smoker, for how many years in total did you quit smoking?

98. On the average of the entire time you smoked, how many cigarettes did you smoke per day?

Asbestosis in migrant shipbreakers from Northern Bangladesh

Smoking

Unique Study Code: ABSP0388

99. How old were you (in years) when you first started smoking bidi?

100. Do you presently smoke bidi (as of one month ago)?

- ◯ Yes
- ◯ No

If yes to #100, answer #101-103. If no to #100, answer #104-106

101. How many bidi sticks do you smoke per day now?

102. Did you ever stop smoking bidi for 6 months or longer? [If no, skip to #107]

- ◯ Yes
- ◯ No

103. For how many years in total did you stop smoking bidi?

104. How old were you when you completely stopped smoking?

105. When you were smoking bidi, did you ever stop smoking for 6 months or longer before you completely stopped smoking? [If no, skip to #107]

- ◯ Yes
- ◯ No

106. During the time that you were smoking bidi, for how many years in total did you stop smoking?

107. On the average of the entire time you smoked, how many bidi sticks did you smoke per day?

108. In your childhood, did you live with a regular smoker who smoked in your home?

- ◯ Yes
- ◯ No
- ◯ Don't know

If yes to #108, answer #109-112

Asbestosis in migrant shipbreakers from Northern Bangladesh

Smoking

Unique Study Code: ABSP0388

109. Mother smoked in home

- ◯ Yes
- ◯ No
- ◯ Don't know

110. Father smoked in home

- ◯ Yes
- ◯ No
- ◯ Don't know

111. Others in household

- ◯ Yes
- ◯ No
- ◯ Don't know

112. If yes to Others, how many others?

- ◯ 1
- ◯ 2-3
- ◯ >4
- ◯ Don't know

113. As an adult, have you ever lived with a regular smoker (not including yourself) who smoked in your home? [If no, skip to #117]

- ◯ Yes
- ◯ No

If yes to #113, answer #114-116

114. As an adult, for how many total years did you live with a regular smoker who smoked in your home?

115. In the past 12 months have you lived with a regular smoker who smoked in your home? [If no, skip to #117]

- ◯ Yes
- ◯ No

Asbestosis in migrant shipbreakers from Northern Bangladesh

Smoking

Unique Study Code: ABSP0388

116. In the past 12 months, for how many hours per day on average are you at home while someone other than yourself is smoking there?

117. In the past 12 months when you are not at home, do you regularly spend time indoors where there are people who are smoking?

- ◯ Yes
- ◯ No

If yes to #117, answer #118-119

118. As an adult, for how many total years have you spent time, when you are not at home, indoors where there are people smoking?

119. In the past 12 months, how many hours per week on average do you spend in a place where people are smoking?

120. Do you ever smoke from a hookah or kolki? If so, how often?

Asbestosis in migrant shipbreakers from Northern Bangladesh

Work History

Unique Study Code: ABSP0388

121. What is your present job status?

- ◯ Employed, full time
- ◯ Employed, but not full time
- ◯ Retired
- ◯ Sick or disabled
- ◯ Unemployed

Other (please specify)

122. If not working due to sickness or disability, when did you stop working due to your sickness or disability?

Approximate: MM / DD / YYYY

123. Which job has been your usual occupation or the one you have worked in longest?

- ◯ Shipbreaker
- ◯ Agricultural worker (rice planting/harvest)
- ◯ Rice miller
- ◯ Fisherman
- ◯ Brick factory worker
- ◯ Rickshaw puller
- ◯ Shopkeeper
- ◯ Tradesman
- ◯ Day labourer

Other (please specify)

Asbestosis in migrant shipbreakers from Northern Bangladesh

Work History

Unique Study Code: ABSP0388

124. If you are presently employed, what is your current job?

- ◯ Shipbreaker
- ◯ Agricultural worker (rice planting/harvest)
- ◯ Rice miller
- ◯ Fisherman
- ◯ Brick factory worker
- ◯ Rickshaw puller

Other (please specify)

125. What was your first year of work as a shipbreaker?

126. How many years in total did you work as a shipbreaker?

127. How many different shipbreaking yards have you worked in?

128. How long did you work at the first shipbreaking yard?

129. Of these tasks, which did you have, and how many months did you spend in each?

Cutter	
Fitter	
Loader	
Cable Puller	
Oil Group	
Hammer Group	

130. Where did you learn the skills needed for these tasks?

131. Describe your hours:

Hours/Day	
Days/Week	
Months/Year	

132. How long did you work at the second shipbreaking yard?

Asbestosis in migrant shipbreakers from Northern Bangladesh

Work History

Unique Study Code: ABSP0388

133. Of these tasks, which did you have, and how much time did you spend in each?

Cutter	
Fitter	
Loader	
Cable Puller	
Oil Group	
Hammer Group	

134. Describe your hours:

Hours/Day	
Days/Week	
Months/Year	

135. How long did you work at the third shipbreaking yard?

136. Of these tasks, which did you have, and how much time did you spend in each?

Cutter	
Fitter	
Loader	
Cable Puller	
Oil Group	
Hammer Group	

137. Describe your hours:

Hours/Day	
Days/Week	
Months/Year	

Repeat until all yards have been covered

138. Did you ever leave the shipyard to return to your home district for a period of time, if so, for how long?

Asbestosis in migrant shipbreakers from Northern Bangladesh

Work History

Unique Study Code: ABSP0388

139. If yes to #18, you would return to your home district because of:

- [ ] Seasonal work (rice harvest)
- [ ] Injury
- [ ] Vacation

Other (please specify)

140. After a period of time home, what determined which shipbreaking yard you would go back to?

- [ ] Recruiter's decision
- [ ] Your desicion based on where you previously worked
- [ ] Your desicion based on salary
- [ ] Your desicion based on where peers have returned

Other (please specify)

Asbestosis in migrant shipbreakers from Northern Bangladesh

Work History

Unique Study Code: ABSP0388

141. Which of these jobs have you had for more than 3 months, for how long, and when?

Rice planter/harvester	
Rice miller	
Jute miller	
Cotton miller	
Tea planter	
Textile miller	
Paper and board miller	
Garment factory worker	
Automobile mechanic	
Construction worker	
Cement worker	
Brick factory worker	
Brick crusher	
Stone crusher	
Fertilizer manufacturer	
Welder	
Foundry or metal worker	
Steel re-roller	
Furniture maker	
Glass manufacturer	
Ceramics industry worker	
Fisherman	
Rickshaw puller	
Other	

142. Which jobs did you have for more than one year that were very dusty? [Very dusty means some employees used a mask or cloth to cover their face as they worked.]

Asbestosis in migrant shipbreakers from Northern Bangladesh

Clinical History

Unique Study Code: ABSP0388

143. Have you ever had a work-related illness or injury? (Describe)

144. Have you ever had an illness or injury as a result of working on the shipyard? (Describe)

If yes to #144, answer #145-149

145. Did the injury or illness result in time off work?

- ◯ Yes
- ◯ No

146. How much time did you take off work?

147. Did you recieve treatment and/or compensation?

- ◯ Yes
- ◯ No

148. If so, please describe in what form the treatment/compensation was provided.

149. If you were treated, by whom and where were you treated?

- ☐ MBBS Doctor at Private clinic
- ☐ MBBS Doctor at Public hospital
- ☐ Local apothecary
- ☐ Drugstore/Pharmacy
- ☐ Homeopath/Unai/Ayurvedic practitioner
- ☐ Was not treated

Other (please specify)

Asbestosis in migrant shipbreakers from Northern Bangladesh

Hazard Recognition and Awareness

Unique Study Code: ABSP0388

150. Do you think it is important to protect yourself while at work?

- ◯ Yes
- ◯ No

151. If you do, what do you do to protect yourself while at work?

- ☐ Wear personal protective equipment (pictures)
- ☐ Change clothes before leaving yards
- ☐ Take shower before leaving yards
- ☐ Wash hands
- ☐ I don't do anything extra to protect myself at work

Other (please specify)

152. If you use personal protective equipment, which ones do you use: (pictures)

- ☐ Respirator
- ☐ Dust mask
- ☐ Goggles
- ☐ Hard hat
- ☐ Gloves
- ☐ Steel toe boots
- ☐ Special clothing

Other (please specify)

153. If you use personal protective equipment, how do you get it?

- ☐ Company supplies it
- ☐ I buy it on my own
- ☐ Another worker gave it to me
- ☐ I found it

Other (please specify)

Asbestosis in migrant shipbreakers from Northern Bangladesh

Hazard Recognition and Awareness

Unique Study Code: ABSP0388

154. If you do not use personal protective equipment, why not:

- [ ] Don't want to because uncomfortable
- [ ] Don't want to because job is safe
- [ ] Don't want to because I am careful
- [ ] Want to, but too expensive
- [ ] Want to, but not available
- [ ] Want to, but not sure which kind to wear
- [ ] Want to, but not sure where to get it

Other (please specify)

155. I want you to think about the health risks of shipbreaking.

	more safe than most other occupations in Bangladesh	equally safe as most other occupations in Bangladesh	less safe than most other occupations in Bangladesh
Shipbreaking is:	◯	◯	◯

156. On a scale of 1-10, how would you rate the risk of your becoming ill as a result of working in the shipbreaking industry?

	Very low-- 1	2	3	4	5	6	7	8	9	Very high- 10
Risk:	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯

157. In your opinion, what are the main hazards, if any, associated with shipbreaking?

- [ ] Lifting heavy objects
- [ ] Heavy falling objects
- [ ] Working in small spaces
- [ ] Working in small spaces with gas cutters
- [ ] Removing and processing insulation
- [ ] Electrocution
- [ ] Suffocation
- [ ] Solvents (working in areas with strong chemical odours)

Other (please specify)

Asbestosis in migrant shipbreakers from Northern Bangladesh

Hazard Recognition and Awareness

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158. Have you ever felt unsafe while working on a shipbreaking yard?

- ◯ Yes
- ◯ No

159. If yes, what would have made you feel safer at work?

160. Have you ever stopped work due to hazards or hazardous conditions?

- ◯ Yes
- ◯ No

161. Do you think you may develop an illness due to working in the shipbreaking industry? If yes, please specify.

162. Are you concerned about asbestos?

- ◯ Yes
- ◯ No
- ◯ I have never heard about asbestos
- ◯ I have heard about asbestos but I do not know if I am concerned

163. If you have heard about asbestos, to the best of your knowledge, which of the following are correct: (more than one can be selected)

- [ ] Asbestos is a toxic material
- [ ] Asbestos is a toxic mineral
- [ ] Asbestos is a toxic dust
- [ ] Asbestos is a toxic fibre

Other (please specify)

Asbestosis in migrant shipbreakers from Northern Bangladesh

Hazard Recognition and Awareness

Unique Study Code: ABSP0388

164. Have you ever handled insulation? If so, which kinds: (Pictures will be shown)

- ◯ Around cabins/living areas
- ◯ Between deck floorboards
- ◯ Pipe lagging
- ◯ Around Engines/Boilers

Other (please specify)

165. Which of the following job groups would normally handle insulation?

- ☐ Fitters
- ☐ Cutters
- ☐ Loaders
- ☐ Cable pullers
- ☐ Hammerers
- ☐ Oil Group
- ☐ Foreman

Other (please specify)

Asbestosis in migrant shipbreakers from Northern Bangladesh

Additional Information

Unique Study Code: ABSP0388

166. What is your monthly income?

- ☐ Tk 0 - 1500
- ☐ Tk 1501 - 3000
- ☐ Tk 3001-5000
- ☐ Tk 5001 - 10,000
- ☐ Tk 10,001-15,000
- ☐ More than Tk 15,000

167. How did you start working as a shipbreaker?

- ☐ Recruited by shipyard foreman
- ☐ Family or friend already works on the shipyards
- ☐ Heard about it from family or friend

Other (please specify)

168. Why did you choose to become a shipbreaker?

169. Do you get rest periods during the day, if so, how long?

170. Do you know where the insulation goes after it is removed from the ships?

171. Who buys most of the insulation?

Appendix XIII. Questionnaire Bangla

বাংলাদেশের উত্তরাঞ্চলে জাহাজ ভাঙা শিল্প শ্রমিক অভিবাসীদের মধ্যে এসবেস্টোসিস
(এই পাতাটি তথ্য নেওয়ার পরপরই গবেষণা সহকারী আলাদা করে নিবে এবং সংরক্ষিত করে রাখবে। পরবর্তী পাতার প্রশ্নগুলি নির্দিষ্টভাবে চিহ্নিত হয়ে থাকবে যা শুধু গবেষণা সহকারী জানবে)

১. জনমিতি উপাত্ত

অনন্য গবেষণা সংকেত: এবিএসপি ০৩৮৮
তারিখ:
সময়:

১. আপনার পূর্ণ নাম কি?
প্রথম অংশ
মাঝের অংশ
শেষের অংশ

২. আপনার পিতার পূর্ণ নাম কি?
প্রথম অংশ
মাঝের অংশ
শেষের অংশ

৩. আপনার বয়স কত বছর? _____

৪. আপনার
উচ্চতা (সে.মি.)
ওজন (কেজি)

৫. আপনার জাতীয়তা কী?
☐ বাংলাদেশী
অন্যান্য (নির্দিষ্ট করুন)

৬. আপনার স্থায়ী ঠিকানা কী?
গ্রাম
থানা
জেলা

৭. আপনার শিক্ষাগত যোগ্যতা কি?
☐ নেই
☐ প্রাইমারী
☐ মাধ্যমিক (এসএসসি)
☐ উচ্চ মাধ্যমিক (এইচএসসি)
☐ স্নাতক
অন্যান্য (নির্দিষ্ট করুন)

২. এটিএস প্রশ্ন - কাশি

স্টাডি কোড - এবিএসপি ০৩৮৮

৮. আপনি কি সাধারণত কাশিতে ভোগেন? (প্রথম ধুমপান করার জন্য অথবা বাইরে যাওয়ার জন্য কাশি হয় কিনা, তবে গলা পরিষ্কার করার জন্য কাশি নয়)
○ হ্যাঁ
○ না

৮ নং প্রশ্নের উত্তর হ্যাঁ হলে ৯ নং প্রশ্নে যান

৯. আপনি কি দিনে ৪ বারের বেশি কাশিতে ভোগেন, সপ্তাহে ৪দিন বা তার চেয়ে বেশি দিন?
○ হ্যাঁ
○ না

৮ নং প্রশ্নের উত্তর না হলে ১০ ও ১১ নং প্রশ্নে যান

১০. সাধারণত সকালে ঘুম থেকে ওঠার পর কাশি হয়?
○ হ্যাঁ
○ না

১১. দিনে অথবা রাতের সকল সময় কাশি হয়?
○ হ্যাঁ
○ না

৮-১১ নং প্রশ্নের যে কোনটি হ্যাঁ হলে ১২-১৫ নং প্রশ্ন করুন

১২. এবছরে এধরণের কাশি কি পরপর ৩ মাস ধরে চলছিল?
○ হ্যাঁ
○ না

১৩. কত বছর ধরে এ ধরণের কাশিতে ভুগছেন?

১৪. কখন কাশির অবস্থার উন্নতি হয়:

	হ্যাঁ	না
যে দিন কাজ থেকে বিরত থাকেন	☐	☐
কাজ থেকে দীর্ঘ দিন বিরত থাকলে (এক সপ্তাহের বেশি)	☐	☐

১৫. কোন কারণে বা কি অবস্থায় কাশির অবনতি ঘটে? (বর্ণনা করুন)

১৬. গত ১২ মাসে কখনও কি কাশির কারণে ঘুম থেকে জেগে উঠেছেন?
○ হ্যাঁ
○ না

১৭. প্রশ্ন নং ১৬ -এর উত্তর হ্যাঁ হলে, বিগত ১২ মাসে কত বার এধরণের কাশির কারণে ঘুম থেকে জেগে উঠেছেন?

○ বছরের প্রায় সব দিনে অথবা রাতে
○ সপ্তাহের অল্প কিছু দিনে অথবা রাতে
○ মাসে অল্প কয়েক দিনে অথবা রাতে
○ বছরে অল্প কয়েক দিনে অথবা রাতে

৩. এটিএস প্রশ্ন- শ্লেষ্মা

স্টাডি কোড নং- এবিএস ০৩৮৮

১৮. আপনার কি সাধারণত বুক থেকে শ্লেষ্মা নির্গত হয়?

○ হ্যাঁ
○ না

১৮ নং প্রশ্নের উত্তর হ্যাঁ হলে ১৯ নং প্রশ্ন করুন

১৯. সাধারনত এধরণের শ্লেষ্মা কি দিনে দুই বারের বেশি এবং সপ্তাহে চার দিনের বেশি নির্গত হয়?

○ হ্যাঁ
○ না

প্রশ্ন নং ১৮ এর উত্তর না হলে ২০ ও ২১ নং প্রশ্ন করুন

২০. সাধারনত সকালে ঘুম থেকে ওঠার পর কি শ্লেষ্মা নির্গত হয়?

○ হ্যাঁ
○ না

২১. অন্তত সারাদিনে বা সারারাতে একবার শ্লেষ্মা নির্গত হয়?

○ হ্যাঁ
○ না

প্রশ্ন নং ১৮-২১ এর যে কোন একটির উত্তর হ্যাঁ হলে, ২২-২৫ নং প্রশ্ন করুন

২২. এ বছরে কি এ ধরণের শ্লেষ্মা পরপর তিনমাস যাবৎ নির্গত হয়েছে?

○ হ্যাঁ
○ না

২৩. কত বছর যাবৎ শ্লেষ্মার সমস্যায় ভুগছেন?

[ ]

২৪. কখনও শ্লেষ্মা সমস্যার উন্নতি হয়?

	হ্যাঁ	না
যে দিন কাজ থেকে বিরত থাকেন	☐	☐
কাজ থেকে দীর্ঘ বিরতিতে বা ছুটিতে (এক সপ্তাহের বেশি)	☐	☐

২৫. কোন অবস্থায় বা কারণে আপনার শ্লেষ্মা আসে ? (নির্দিষ্ট করে বলুন)

[ ]

২৬. গত এক বছরে আপনার কোন সময় বা হঠাৎ কোন সময় বা হঠাৎ কাশি এবং শ্লেষ্মাএকসাথে হয়েছিল কিনা এবং সেটা এক সপ্তাহ বা তার বেশী দিন স্থায়ী ছিল ?(শুধুমাত্র অতিরিক্ত কাশি ও শ্লেষ্মা, সাধারন কাশি বা শ্লেষ্মা নয়)

○ হ্যাঁ

○ না

২৭. বিগত ১২ মাসে এক ধরণের অবস্থা কতবার ঘটেছিল?

২৮. কত বছর যাবৎ এ ধরণের সমস্যা বছরে অন্ততঃ একবার হয়েছে?

৪. এটিএস প্রশ্ন: শ্বাস গ্রহণের সময় বুকে শব্দ হওয়া

স্টাডি কোড নং- এবিএস ০৩৮৮

২৯. আপনার কি কখনও **সশব্দে শ্বাস গ্রহণ** বা **বুকের ভেতর বাঁশির মত শব্দ** হয়েছে?

○ হ্যাঁ

○ না

প্রশ্ন ২৯ এর উত্তর না হলে 'এটিএস প্রশ্ন: বুকে চাপ' অধ্যায়ে যান।

২৯ নং প্রশ্নের উত্তর হ্যাঁ হলে পরবর্তী প্রশ্ন করুন।

৩০. আপনার **সশব্দে শ্বাস গ্রহণ** বা **বুকের ভেতর বাঁশির মত শব্দ ছিল ?**

	হ্যাঁ	না
যখন আপনার বয়স ২ বছরের কম ছিল	○	○
যখন আপনার বয়স ২-১৮ বছরের মধ্যে ছিল	○	○
যখন আপনার বয়স ১৮ বছরের বেশি ছিল	○	○

৩১. গত ১২ মাসে কখনও কি **সশব্দে শ্বাস গ্রহণ** বা **বুকের ভেতর বাঁশির মত শব্দ** হয়েছে?

○ হ্যাঁ

○ না

৩১ নং প্রশ্নের উত্তর না হলে ৩৮ নং প্রশ্নে যান।

৩২. গত ১২ মাসে কতবার **সশব্দে শ্বাস গ্রহণ** বা **বুকের ভেতর বাঁশির মত শব্দ** হয়েছে?

○ অধিকাংশ দিনে ও রাতে

○ অল্প কয়েক দিন ও রাতে

○ এক মাসে অল্প কয়েক দিন ও রাতে

○ এক বছর বা তার কম সময়ে, অল্প কয়েক দিন ও রাতে

৩৩. গত ১২ মাসে ঠান্ডা লেগে **সশব্দে শ্বাস গ্রহণ** বা **বুকের ভেতর বাঁশির মত শব্দ** হয়েছিল?

○ হ্যাঁ

○ না

৩৪. গত ১২ মাসে ঠান্ডা লাগা ছাড়াও কি **সশব্দে শ্বাস গ্রহণ** বা **বুকের ভেতর বাঁশির মত শব্দ** হয়েছিল?

○ হ্যাঁ

○ না

৩৫. গত ১২ মাসে **সশব্দে শ্বাস গ্রহণ** বা **বুকের ভেতর বাঁশির মত শব্দ** হওয়ার কারণে কখনও কি শ্বাসকষ্ট হয়েছে?

○ হ্যাঁ

○ না

৩৬. গত ১২ মাসে কখন **সশব্দে শ্বাস গ্রহণ** বা **বুকের ভেতর শব্দের** অবস্থার উন্নতি হয়েছিল?

	হ্যাঁ	না	
যে দিন কাজ থেকে বিরত থাকেন	○	○	
কাজ থেকে দীর্ঘ বিরতিতে (এক সপ্তাহের বেশি)		○	○

৩৭. কোন সময় **সশব্দে শ্বাস গ্রহণ** সবচে' বেশি ঘটে? (যে কোন একটি উত্তর দিন)

○ কর্মস্থলে
○ বাড়িতে ফিরে এসে
○ ঘুমানোর সময়
○ যে কোন সময়
○ ঘুম থেকে ওঠার উপর নির্ভর

৩৮. গত ১২ মাসে কখনও কি **সশব্দে শ্বাস গ্রহণ** বা **বুকের ভেতর শব্দ** -এর কারণে ঘুম থেকে জেগে উঠেছেন?

○ হ্যাঁ
○ না

৩৮ নং প্রশ্নের উত্তর না হলে 'এটিএস প্রশ্ন: বুকে চাপ' অধ্যায়ে যান।

৩৮ নং প্রশ্নের উত্তর হ্যাঁ হলে পরবর্তী প্রশ্ন করুন।

৩৯. বিগত ১২ মাসে কত বার এধরণের কারণে ঘুম থেকে জেগে উঠেছেন?

○ বছরের অধিকাংশ দিনে অথবা রাতে
○ সপ্তাহের অল্প কিছু দিনে অথবা রাতে
○ এক মাসে অল্প কয়েক দিনে অথবা রাতে
○ এক বছরে অল্প কয়েক দিনে অথবা রাতে

৫. এটিএস প্রশ্নন: বুকে চাপ অনুভব

৪০. গত ১২ মাসে কখনও কি **বুকে চাপ অনুভব** -এর কারণে ঘুম থেকে জেগে উঠেছেন?

○ হ্যাঁ
○ না

৪০ নং প্রশ্নের উত্তর হ্যাঁ হলে পরবর্তী প্রশ্ন করুন।

৪১. বিগত ১২ মাসে কত বার এধরণের কারণে ঘুম থেকে জেগে উঠেছেন?

○ অধিকাংশ দিনে অথবা রাতে
○ অল্প কিছু দিনে অথবা রাতে
○ এক মাসে অল্প কয়েক দিনে অথবা রাতে
○ এক বছর বা কম সময়ে, অল্প কয়েক দিনে অথবা রাতে

৬. এটিএস প্রশ্ন: শ্বাসকষ্ট

যদি উত্তরদাতা হৃদরোগ ও ফুসফুস জনিত রোগ ব্যতিত অন্য কোন কারণে হাঁটাচলায় অক্ষম হন সেক্ষেত্রে তা উল্লেখ করুন এবং 'এটিএস প্রশ্ন: অতীত অসুস্থতা' অধ্যায়ে যান।

৪২. সমতল ভূমিতে কাজ করার সময় বা সামান্য উচ্চতায় ওঠার সময় কি শ্বাসকষ্টে ভোগেন?

○ হ্যাঁ

○ না

৪২ নং প্রশ্নের উত্তর হ্যাঁ হলে ৪৩-৪৮ নং প্রশ্ন করুন।

৪৩. শ্বাসকষ্টের কারণে কি আপনাকে সমতলে হাঁটাচলার সময় অন্যান্য সমবয়সীদের তুলনায় ধীরে হাঁটতে হয়?

○ হ্যাঁ

○ না

৪৪. সমতলে হাঁটাচলার সময় কখনও কি আপনাকে শ্বাস নেওয়ার জন্য থামতে হয়?

○ হ্যাঁ

○ না

৪৫. সমতলে প্রায় ১০০ মিটার(বা কয়েক মিনিট) হাঁটাচলার পর কি আপনাকে শ্বাস নেওয়ার জন্য কিছুক্ষণ থামতে হয়?

○ হ্যাঁ

○ না

৪৬. আপনার কি খুব বেশী শ্বাস কষ্ট হয় যে আপনি বাড়ির বাইরে বের হতে পারেন না বা পোশাক পরিধান ও পরিবর্তনের সময় কি খুব বেশী শ্বাস কষ্ট হয় ?

○ হ্যাঁ

○ না

৪৭. কখন এ অবস্থার উন্নতি ঘটে?

	হ্যাঁ	না
যে দিন কাজ থেকে বিরত থাকেন	○	○
কাজ থেকে দীর্ঘ বিরতিতে বা ছুটিতে (এক সপ্তাহের বেশি)	○	○

৪৮. নিম্নলিখিত বাক্যের কোনটি আপনার শ্বাসগ্রহণকে সবচেয়ে সঠিকভাবে বর্ণনা করতে পারে?

○ খুব কম শ্বাস কষ্ট হয়

○ নিয়মত শ্বাসকষ্ট হয় কিন্তু আবার ঠিক হয়ে যায়

○ আমার শ্বাস-প্রশ্বাস কখনওই স্বাভাবিক নয়

৭. এটিএস প্রশ্ন: অতীত অসুস্থতা

৪৯. আপনার কি কখনও ব্রঙ্কাইটিস হয়েছিল?

○ হ্যাঁ

○ না

৪৯ নং প্রশ্নের উত্তর হ্যাঁ হলে ৫০-৫২ নং প্রশ্ন করুন।

৫০. এটি কি কোন চিকিৎসক নিশ্চিত করেছিলেন?

○ হ্যাঁ

○ না

৫১. কত বছর বয়সে আপনার প্রথম ব্রঙ্কাইটিস হয়?

[ ]

৫২. আপনার কতবার ব্রঙ্কাইটিস হয়েছে?

[ ]

৫৩. আপনার কি কখনও নিউমোনিয়া হয়েছিল?

○ হ্যাঁ

○ না

৫৩ নং প্রশ্নের উত্তর হ্যাঁ হলে ৫৪-৫৬ নং প্রশ্ন করুন।

৫৪. এটি কি কোন চিকিৎসক নিশ্চিত করেছিলেন?

○ হ্যাঁ

○ না

৫৫. কত বছর বয়সে আপনার প্রথম নিউমোনিয়া হয়েছিল?

[ ]

৫৬. আপনার কতবার নিউমোনিয়া হয়েছিল?

[ ]

৫৭. আপনার কি কখনও দীর্ঘমেয়াদী ব্রঙ্কাইটিস হয়েছিল?

○ হ্যাঁ

○ না

৫৭ নং প্রশ্নের উত্তর হ্যাঁ হলে ৫৮-৬১ নং প্রশ্ন করুন।

৫৮. এটি কি কোন চিকিৎসক নিশ্চিত করেছিলেন?

○ হ্যাঁ

○ না

৫৯. কত বছর বয়সে এটি আরম্ভ হয়েছিল?

[ ]

৬০. এটি কি এখনও আছে?

○ হ্যাঁ

○ না

৬১. দীর্ঘমেয়াদী ব্রঙ্কাইটিসের জন্য গত ১২ মাসে আপনি কি কোন চিকিৎসা, ওষুধ বা **ইনহেলার** গ্রহণ করেছেন?

○ হ্যাঁ

○ না

৬২. আপনার কি কখনও **এমফায়েজমা** হয়েছিল?

○ হ্যাঁ

○ না

○ এটি কী আমি জানি না

৬২ নং প্রশ্নের উত্তর হ্যাঁ হলে ৬৩-৬৬ নং প্রশ্ন করুন।

৬৩. এটি কি কোন চিকিৎসক নিশ্চিত করেছিলেন?

○ হ্যাঁ

○ না

৬৪. কত বছর বয়সে এটি আরম্ভ হয়েছিল?

[ ]

৬৫. এটি কি এখনও আছে?

○ হ্যাঁ

○ না

৬৬. দীর্ঘমেয়াদী **এমফায়েজমার** জন্য গত ১২ মাসে আপনি কি কোন চিকিৎসা, ওষুধ বা **ইনহেলার** গ্রহণ করেছেন?

○ হ্যাঁ

○ না

৬৭. আপনি কি কখনও সিওপিডি (ফুসফুসের দীর্ঘমেয়াদী শ্বাসরোধ সৃষ্টিকারি রোগ) -এর নাম শুনেছেন?

○ হ্যাঁ

○ না

৬৭ নং প্রশ্নের উত্তর না হলে ৭৩ নং প্রশ্নে যান।

৬৮. আপনার কি কখনও সিওপিডি হয়েছিল?

○ হ্যাঁ

○ না

উত্তর হ্যাঁ হলে ৬৯-৭২ নং প্রশ্ন করুন।

৬৯. এটি কি কোন চিকিৎসক নিশ্চিত করেছিলেন?

○ হ্যাঁ

○ না

৭০. কত বছর বয়সে এটি আরম্ভ হয়েছিল?

[ ]

৭১. এটি কি এখনও আছে?

○ হ্যাঁ

○ না

৭২. দীর্ঘমেয়াদী সিওপিডি -এর জন্য গত ১২ মাসে আপনি কি কোন চিকিৎসা, ওষুধ বা **ইনহেলার** গ্রহণ করেছেন?

○ হ্যাঁ

○ না

৭৩. আপনার কি কখনও **পালমোনারী ফাইব্রোসিস** হয়েছিল?

○ হ্যাঁ

○ না

○ এটি কী আমি জানি না

৭৩ নং প্রশ্নের উত্তর হ্যাঁ হলে ৭৪-৭৮ নং প্রশ্ন করুন।

৭৪. এটি কি কোন চিকিৎসক নিশ্চিত করেছিলেন?

○ হ্যাঁ

○ না

৭৫. চিকিৎসক দ্বারা নিশ্চিত হলে, এটা কি ধরণের **পালমোনারী ফাইব্রোসিস** ছিল?

[ ]

৭৬. কত বছর বয়সে এটি আরম্ভ হয়েছিল?

[ ]

৭৭. এটি কি এখনও আছে?

○ হ্যাঁ

○ না

৭৮. দীর্ঘমেয়াদী **পালমোনারী ফাইব্রোসিস** -এর জন্য গত ১২ মাসে আপনি কি কোন চিকিৎসা, ওষুধ বা **ইনহেলার** গ্রহণ করেছেন?

○ হ্যাঁ

○ না

[ ]

৭৯. আপনার কি কখনও নিম্নলিখিত রোগগুলি ছিল?

কোন ধরণের বুকের অসুস্থতা (নির্দিষ্ট করুন) _____

কোন ধরণের বুকের আঘাত (নির্দিষ্ট করুন) _____

কোন ধরণের বুকের শল্য চিকিৎসা (নির্দিষ্ট করুন) _____

শ্বাসকষ্টের জন্য আপনি কি বর্তমানে কোন অসুধ গ্রহণ করছেন (নির্দিষ্ট করুন) _____

৮০. আপনার হৃদরোগ আছে বলে কখনও কোন চিকিৎক জানিয়েছেন কি?

○ হ্যাঁ

○ না

৮১. উত্তর হ্যাঁ হলে, গত ১২ মাসে এর জন্য কোন চিকিৎসা গ্রহণ করেছেন কি?

○ হ্যাঁ

○ না

৮২. আপনার উচ্চ রক্তচাপ আছে বলে কখনও কোন চিকিৎক জানিয়েছেন কি?

○ হ্যাঁ

○ না

৮৩. উত্তর হ্যাঁ হলে, গত ১২ মাসে এর জন্য কোন চিকিৎসা গ্রহণ করেছেন কি?

○ হ্যাঁ

○ না

৮৪. আপনার ডায়াবেটিস আছে বলে কোন চিকিৎক কখনও জানিয়েছেন?

○ হ্যাঁ

○ না

৮৫. উত্তর হ্যাঁ হলে, গত ১২ মাসে এর জন্য কোন চিকিৎসা গ্রহণ করেছেন কি?

○ হ্যাঁ

○ না

৮৬. আপনার কি অন্য কোন স্বাস্থ্যগত সমস্যা আছে? (নির্দিষ্ট করুন)

_____

৮৭. এই স্বাস্থ্যগত সমস্যার জন্য বর্তমানে কোন চিকিৎসা গ্রহণ করছেন কি? (নির্দিষ্ট করুন)

_____

৮৮. বর্তমানে আপনার সার্বিক শারীরিক অবস্থা কেমন?

○ খুব ভাল

○ ভাল

○ মোটামুটি

○ খারাপ

○ খুব খারাপ

৮. ধূমপান

৮৯. আপনি কি কখনও ফিল্টার সহ বা ফিল্টার ছাড়া সিগারেট এবং/অথবা বিড়ি ধূমপান করেছেন? (সারাজীবনে ২০ প্যাকেটের কম বা এক বছরে দিনে একটির কম শলাকার ধূমপান অন্তর্ভুক্ত হবে না)

	হ্যাঁ	না
সিগারেট	○	○
বিড়ি	○	○

উত্তর সিগারেট না এবং বিড়ি হ্যাঁ হলে ৯৯ নং প্রশ্নে যান।

উভয়ের জন্য উত্তর না হলে ১০৮ নং প্রশ্নে যান।

৯০. কত বছর বয়স থেকে আপনি নিয়মিত ধূমপান আরম্ভ করেন?

[ ]

৯১. আপনি কি বর্তমানে সিগারেট ধূমপান করেন (গত একমাসের তথ্য অনুযায়ী)?

○ হ্যাঁ
○ না

৯১ নং প্রশ্নের উত্তর হ্যাঁ হলে ৯২-৯৪ নং প্রশ্ন করুন।

৯১ নং প্রশ্নের উত্তর না হলে ৯৫-৯৭ নং প্রশ্ন করুন।

৯২. আপনি একদিনে কতটি শলাকা ধূমপান করেন?

[ ]

৯৩. আপনি কি কখনও ৬ মাস বা তার বেশি সময়ের জন্য ধূমপান থেকে বিরত ছিলেন? (উত্তর না হলে ৯৮ নং প্রশ্নে যান)

○ হ্যাঁ
○ না

৯৪. সর্বমোট কত বছর ধরে ধূমপান থেকে বিরত আছেন?

[ ]

৯৫. কত বছর বয়সে সম্পূর্ণভাবে ধূমপান পরিত্যাগ করেন?

[ ]

৯৬. যখন আপনি ধূমপান করতেন তখন সম্পূর্ণভাবে ধূমপান পরিত্যাগের পূর্বে কখনও কি ৬ মাস বা তার বেশি সময়ের জন্য ধূমপান থেকে বিরত ছিলেন? (উত্তর না হলে ৯৮ নং প্রশ্নে যান)

○ হ্যাঁ
○ না

৯৭. ধূমপায়ী থাকা অবস্থায় সর্বমোট কত বছরের জন্য ধূমপান থেকে বিরত ছিলেন?

[ ]

৯৮. ধূমপায়ী থাকা অবস্থায় গড়ে প্রতিদিন কতটি সিগারেট গ্রহণ করতেন?

[ ]

৯৯. কত বছর বয়সে আপনি প্রথম বিড়ি খাওয়া আরম্ভ করেন?

[ ]

১০০. আপনি কি বর্তমানে বিড়ি গ্রহণ করেন (গত একমাসের তথ্য অনুযায়ী)?

○ হ্যাঁ
○ না

১০০ নং প্রশ্নের উত্তর হ্যাঁ হলে ১০১-১০৩ নং প্রশ্ন করুন।

১০০ নং প্রশ্নের উত্তর না হলে ১০৪-১০৬ নং প্রশ্ন করুন।

১০১. আপনি একদিনে কতটি শলাকা বিড়ি গ্রহণ করেন?

[ ]

১০২. আপনি কি কখনও ৬ মাস বা তার বেশি সময়ের জন্য বিড়ি গ্রহণ থেকে বিরত ছিলেন? (উত্তর না হলে ১০৭ নং প্রশ্নে যান)

○ হ্যাঁ
○ না

১০৩. সর্বমোট কত বছরের জন্য বিড়ি গ্রহণ থেকে বিরত ছিলেন?

[ ]

১০৪. কত বছর বয়সে সম্পূর্ণভাবে বিড়ি গ্রহণ পরিত্যাগ করেন?

[ ]

১০৫. যখন আপনি বিড়ি গ্রহণ করতেন তখন সম্পূর্ণভাবে তা পরিত্যাগের পূর্বে কখনও কি ৬ মাস বা তার বেশি সময়ের জন্য বিড়ি গ্রহণ থেকে বিরত ছিলেন? (উত্তর না হলে ১০৭ নং প্রশ্নে যান)

○ হ্যাঁ
○ না

১০৬. বিড়ি গ্রহণে অভ্যস্ত থাকা অবস্থায় সর্বমোট কত বছরের জন্য ধূমপান থেকে বিরত ছিলেন?

[ ]

১০৭. বিড়ি গ্রহণে অভ্যস্ত থাকা অবস্থায় গড়ে প্রতিদিন কতটি বিড়ি গ্রহণ করতেন?

[ ]

১০৮. শৈশবে আপনি কি কোন ধূমপায়ীর সাথে বসবাস করেছেন যিনি আপনার বাড়িতে অবস্থান করতেন?

○ হ্যাঁ
○ না
○ জানিনা

১০৮ নং প্রশ্নের উত্তর হ্যাঁ হলে ১০৯-১১২ নং প্রশ্ন করুন।

১১০. বাবা বাড়িতে ধুমপান করতেন?

○ হ্যাঁ
○ না
○ জানিনা

১১১. অন্য কেউ বাড়িতে ধুমপান করতেন?

○ হ্যাঁ
○ না
○ জানিনা

১১২. উত্তর হ্যাঁ হলে, অন্য কতজন?

○ ১
○ ২-৩
○ ৪ জনের বেশি
○ জানিনা

১১৩. পূর্ণ বয়স্ক হিসেবে আপনি কি কখনও নিয়মিত ধুমপায়ীর (আপনি ব্যতিত) সাথে বসবাস করেছেন যিনি বাড়িতে ধুমপান করতেন?

(যদি না হয় তাহলে ১১৭ নং প্রশ্নে যান)

○ হ্যাঁ
○ না

১১৩ নং প্রশ্নের উত্তর হ্যাঁ হলে ১১৪-১১৬ নং প্রশ্ন করুন।

১১৪. পূর্ণ বয়স্ক হিসেবে আপনি কতদিন নিয়মিত ধুমপায়ীর সাথে বসবাস করেছেন যিনি বাড়িতে ধুমপান করতেন?

১১৫. গত ১২ মাসে আপনি কি কোন নিয়মিত ধুমপায়ীর সাথে বসবাস করেছেন যিনি বাড়িতে ধুমপান করতেন?

○ হ্যাঁ
○ না

১১৬. গত ১২ মাসে প্রতিদিন গড়ে কত ঘন্টা আপনি একজন ধুমপায়ীর সাথে এক বাড়িতে থেকেছেন (আপনি ব্যতীত) যিনি সেখানে ধুমপান করতেন?

১১৭. গত ১২ মাসে বাড়ির বাইরে আপনি কি নিয়মিত কোন বদ্ধ স্থানে অবস্থান করেছেন যেখানে লোকেরা ধুমপান করত?

○ হ্যাঁ
○ না

১১৭ নং প্রশ্নের উত্তর হ্যাঁ হলে ১১৮-১১৯ নং প্রশ্ন করুন।

১১৮. একজন পূর্ণ বয়স্ক হিসেবে আপনি কত বছর বাড়ির বাইরে কোন বদ্ধ স্থানে অবস্থান করেছেন যেখানে লোকেরা ধুমপান করত?

১১৯. গত ১২ মাসে প্রতি সপ্তাহে গড়ে কত ঘন্টা আপনি এমন কোন স্থানে অবস্থান করেছেন যেখানে লোকেরা ধুমপান করত?

১২০. আপনি কি কখনও পানি উৎপাদিত ধুমপান পাইপের দ্বারা গ্রহন (হুক্কা/কল্কি) করেছেন? উত্তর হ্যাঁ হলে, কতবার?

৯. কাজের ইতিহাস

স্টাডি কোড: এবিএস ০৩৮৮

১২১. বর্তমানে আপনার পেশাগত অবস্থা কি?

- ○ পূর্ণকালীন কর্মরত
- ○ খন্ডকালীন কর্মরত
- ○ অবসর
- ○ অসুস্থ বা পঙ্গু
- ○ বেকার

অন্যান্য (নির্দিষ্ট করুন)

১২২. যদি অসুস্থতা বা অক্ষমতার জন্য কাজ না করে থাকেন তবে কখন থেকে কাজে বিরত আছেন?

	দিন	মাস	বছর
প্রায়			

১২৩. নিচের কোন কাজটি আপনি পেশা হিসেবে দীর্ঘসময় ধরে করেছেন?

- ○ জাহাজ-ভাঙা শিল্পের শ্রমিক
- ○ কৃষি শ্রমিক (ধান চাষ ও উৎপাদন)
- ○ ধান ভাঙানো
- ○ মৎসজীবী
- ○ ইট উৎপাদন শ্রমিক
- ○ রিক্সা/ভ্যান চালক
- ○ দোকানদান
- ○ ব্যবসায়ী
- ○ দিনমজুর

অন্যান্য (নির্দিষ্ট করুন)

১২৪. বর্তমানে কর্মরত হলে, বর্তমান পেশা?

- ○ জাহাজ-ভাঙা শিল্পের শ্রমিক
- ○ কৃষি শ্রমিক (ধান চাষ ও উৎপাদন)
- ○ ধান ভাঙানো
- ○ মৎসজীবী
- ○ ইট উৎপাদন শ্রমিক
- ○ রিক্সা চালক

অন্যান্য (নির্দিষ্ট করুন)

১২৫. জাহাজ-ভাঙা শিল্পের শ্রমিক হিসেবে কত বছর আগে কাজ আরম্ভ করেন?

১২৬. জাহাজ-ভাঙা শিল্পের শ্রমিক হিসেবে মোট কত বছর কাজ করেন?

১২৭. মোট কতটি জাহাজ-ভাঙা শিল্প ক্ষেত্রে আপনি কাজ করেছেন?

১২৮. প্রথম জাহাজ-ভাঙা শিল্প ক্ষেত্রে আপনি কতদিন কাজ করেছেন?

১২৯. নিচের কোন কাজগুলি আপনি কত দিন যাবৎ করেছেন?

কাটার

ফিটার

লোডার

ক্যাবল পুলার

অয়েল গ্রুপ

হ্যামার গ্রুপ

১৩০. এই কাজের দক্ষতার জন্য কোথায় প্রশিক্ষণ পেয়েছেন?

১৩১. আপনার কাজের সময় বলুন।

ঘন্টা/দিন

দিন/সপ্তাহ

মাস/বছর

১৩২. দ্বিতীয় জাহাজ-ভাঙা শিল্পে আপনি কতদিন কাজ করেছেন?

১৩৩. নিচের কোন কাজগুলি আপনি কত দিন যাবৎ করেছেন?

কাটার

ফিটার

লোডার

ক্যাবল পুলার

অয়েল গ্রুপ

হ্যামার গ্রুপ

১৩৪. আপনার কাজের সময় বলুন।

ঘন্টা/দিন

দিন/সপ্তাহ

মাস/বছর

১৩৫. তৃতীয় জাহাজ-ভাঙা শিল্পে আপনি কতদিন কাজ করেছেন?

১৩৬. নিচের কোন কাজগুলি আপনি কত দিন যাবৎ করেছেন?

কাটার
ফিটার
লোডার
ক্যাবল পুলার
অয়েল গ্রুপ
হ্যামার গ্রুপ

১৩৭. আপনার কাজের সময় বলুন।

ঘন্টা/দিন
দিন/সপ্তাহ
মাস/বছর

শেষ না হওয়া পর্যন্ত কাজ করে থাকা সকল জাহাজ ভাঙা শিল্পের বিষয়ে পুনরাবৃত্তি করতে থাকুন।

১৩৮. আপনি কি কখনও কোন নির্দিষ্ট সময়ের জন্য জাহাজ ভাঙা শিল্প ত্যাগ করে আপনার বাড়িতে অবস্থান করেছেন? করে থাকলে কত সময়ের জন্য?

১৩৯. ১৩৮ নং প্রশ্নের উত্তর হ্যাঁ হলে, বাড়িতে আসার কারণ কি?

○ মৌসুমি কাজ (ধান কাটার জন্য)
○ আঘাতের জন্য
○ ছুটির জন্য

অন্যান্য (নির্দিষ্ট করুন)

১৪০. বাড়িতে অবস্থানের পর কোন জাহাজ ভাঙা শিল্পে যোগ দিবেন তা কিভাবে নির্ধারণ করতেন?

○ নিয়োগকর্তার ইচ্ছানুযায়ী
○ ইতোপূর্বে যেখানে কাজ করেছেন তার উপর ভিত্তি করে সিদ্ধান্ত গ্রহণ
○ বেতনের উপর ভিত্তি করে সিদ্ধান্ত গ্রহণ
○ অন্যান্য সঙ্গীরা কোথায় যোগ দিচ্ছে তার উপর ভিত্তি করে সিদ্ধান্ত গ্রহণ

অন্যান্য (নির্দিষ্ট করুন)

১৪১. নিচের কাজগুলি ৩ মাসের বেশি সময় ধরে কতদিন এবং কখন আপনি করেছেন?

ধান চাষ/ধান কাটা
ধান কলে
পাট কলে
চা চাষ
তুলা চাষ/ টেক্সটাইল মিল
কাগজ ও বোর্ড কলে
গার্মেন্ট শ্রমিক
গাড়ির মেকানিক
নির্মাণ শ্রমিক
সিমেন্ট কারখানায় শ্রমিক
ইট শিল্পে শ্রমিক
ইট ভাঙার কাজ
পাথর ভাঙার কাজ
সার কারখানায়
ঝালাইকারী
ধাতু গলানো শ্রমিক
স্টিল রি-রোলিং শ্রমিক
কাঠ মিস্ত্রি
কার্চ শিল্পের শ্রমিক
সিরামিক শিল্পের শ্রমিক
মৎস্যজীবি
রিক্সাচালক
অন্যান্য

১৪২. আপনি এক বছরের বেশি সময় ধরে অত্যধিক ধুলাযুক্ত পরিবেশে কোন কাজ করেছেন কি? (অত্যধিক ধুলা যুক্ত পরিবেশ যেখানে শ্রমিকরা তাদের মুখমন্ডল ঢেকে রাখতে মুখোশ বা কাপড় ব্যবহার করেন)।

১০. চিকিৎসার ইতিহাস

১৪৩. আপনি কি কখনও পেশাগত অসুস্থতা বা আঘাতে ভুগেছেন? (বিস্তারিত বলুন)

১৪৪. আপনার কি কখনও জাহাজ-ভাঙা শিল্পে কাজ করার কারণে কোন অসুস্থতায় ভুগেছেন বা আঘাত পেয়েছেন? (বিস্তারিত)

১৪৪ নং প্রশ্নের উত্তর হ্যাঁ হলে ১৪৫-১৪৯ নং প্রশ্ন করুন।

১৪৫. এই অসুস্থতা বা আঘাত কি কাজের সময় ঘটেছিল? এই অসুস্থতা বা আঘাতের জন্যে কি াপনি কাজ ছেড়ে দিয়েছিলেন?

- ○ হ্যাঁ
- ○ না

১৪৬. এর জন্য আপনি কত দিন কাজ থেকে বিরত ছিলেন?

১৪৭. আপনি কি এর জন্য কোন চিকিৎসা এবং/অথবা ক্ষতিপূরণ লাভ করেছেন?

- ○ হ্যাঁ
- ○ না

১৪৮. উত্তর হ্যাঁ হলে, কি ধরণের চিকিৎসা/ক্ষতিপূরণ পেয়েছিলেন বর্ণনা করুন।

১৪৯. চিকিৎসা পেয়ে থাকলে, কার দ্বারা এবং কোথায় চিকিৎসা পেয়েছিলেন?

- ○ বেসরকারি ক্লিনিকে এমবিবিএস চিকিৎসক দ্বারা
- ○ সরকারি হাসপাতালে এমবিবিএস চিকিৎসক দ্বারা
- ○ স্থানীয় ঔষধের দোকানদার
- ○ হোমিওপ্যাথ/ইউনানী/আয়ুর্বেদ
- ○ চিকিৎসা দেওয়া হয় নাই

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১১. ঝুঁকি চিহ্নিতকরণ ও সচেতনতা (বিশেষ প্রশ্ন জাহাজ ভাঙ্গা শ্রমিকদের জন্য)

১৫০. আপনি কি মনে করেন কাজ করার সময় আপনার নিজেকে রক্ষা করা জরুরি?

- ○ হ্যাঁ
- ○ না

১৫১. উত্তর হ্যাঁ হলে, আপনি নিজেকে রক্ষার জন্য কি ধরণের ব্যবস্থা গ্রহণ করেন?

- ○ ব্যক্তিগত নিরাপত্তা উপকরণ সমূহ ব্যবহার (ছবি)
- ○ কর্মস্থল ত্যাগের আগে পোশাক পরিবর্তন
- ○ কর্মস্থল ত্যাগের আগে গোসল
- ○ হাত ধোয়া
- ○ আমি নিজেকে রক্ষার জন্য অতিরিক্ত কিছু করি না।

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১৫২. আপনি কোন ব্যক্তিগত নিরাপত্তা উপকরণটি ব্যবহার করেন? (ছবি)

- ○ শ্বাসযন্ত্র
- ○ মুখোশ/মাস্ক
- ○ চশমা
- ○ শক্ত টুপি
- ○ দস্তানা/ গ্লভস্
- ○ বুট জুতা
- ○ বিশেষ পোশাক

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১৫৩. যদি ব্যক্তিগত নিরাপত্তা উপকরণ ব্যবহার করেন থাকেন তবে সেগুলি কোথায় পান?

- ○ কোম্পানি সরবরাহ করে
- ○ আমি নিজে ক্রয় করি
- ○ অন্য শ্রমিকেরা দেয়
- ○ আমি খুঁজে নিই

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১৫৪. আপনি ব্যক্তিগত নিরাপত্তা উপকরণ ব্যবহার না করে থাকলে, এর কারণ:

○ এগুলি ব্যবহার অসুবিধাজনক
○ আমার কাজ নিরাপদ সেই জন্যে
○ আমি নিজে সচেতন
○ ব্যবহার করতে চাই কিন্তু এগুলি ব্যয়বহুল
○ ব্যবহার করতে চাই কিন্তু এগুলি দুস্প্রাপ্য
○ ব্যবহার করতে চাই কিন্তু কোনটি ব্যবহার করতে হবে জানি না
○ ব্যবহার করতে চাই কিন্তু কোথায় পাব জানি না

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১৫৫. জাহাজ-ভাঙা শিল্পের ঝুঁকিকে আপনি কিভাবে দেখেন?

	এটি বাংলাদেশের অন্য পেশার চেয়ে নিরাপদ	এটি বাংলাদেশের অন্য যে কোন পেশার মতোই নিরাপদ	এটি বাংলাদেশের যে কোন পেশার চেয়ে কম নিরাপদ
জাহাজ-ভাঙা শিল্প	○	○	○

১৫৬. আপনার অসুস্থ হওয়ার ঝুঁকি হিসেবে জাহাজ-ভাঙা শিল্পে কাজ করাকে আপনি ১-১০ এর মধ্যে কত নম্বর দিবেন?

	খুব কম									খুব বেশি
	১	২	৩	৪	৫	৬	৭	৮	৯	১০
ঝুঁকি	○	○	○	○	○	○	○	○	○	○

১৫৭. আপনার মতে, জাহাজ-ভাঙা শিল্পের সাথে জড়িত ঝুঁকি কোনগুলি?

○ ভারী জিনিস উত্তোলন
○ ভারী পতনশীল বস্তু
○ বদ্ধ জায়গায় কাজ
○ বদ্ধ জায়গায় গ্যাস কাটারের দ্বারা কাজ
○ বিদ্যুৎ অপরিবাহীর আস্তরণ সরানো বা তৈরীর করার কাজ
○ বিদ্যুৎ স্পৃষ্টকরণ
○ শ্বাসবদ্ধ
○ কর্ম এলাকায় তীব্র গন্ধযুক্ত রাসায়নিক পদার্থের অবস্থান

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১৫৮. জাহাজ-ভাঙা শিল্পে কাজ করতে গিয়ে আপনি কি কখনও অনিরাপদ বোধ করেছেন?

○ হ্যাঁ
○ না

১৫৯. উত্তর হ্যাঁ হলে, কি করলে আপনার কাজের পরিবেশকে নিরাপদ করবে?

১৬০. বিপদ বা বিপজ্জনক পরিস্থিতির কারণে আপনি কি কখনও কাজ থেকে বিরত থেকেছেন?

○ হ্যাঁ
○ না

১৬১. আপনি কি মনে করেন, জাহাজ-ভাঙা শিল্পে কাজ করার কারণে আপনার কোন রোগ হতে পারে? উত্তর হ্যাঁ হলে, কি ধরণের রোগ হতে পারে নির্দিষ্ট করুন।

১৬২. আপনি কি এ্যাসবেস্টোস সম্পর্কে সচেতন?

○ হ্যাঁ
○ না
○ আমি এ্যাসবেস্টোসের নাম কখনও শুনিনি
○ আমি এর নাম নাম শুনেছি কিন্তু এটা আমার কাজের সাথে সম্পর্কিত কিনা জানি না

১৬৩. যদি আপনি এ্যাসবেস্টাসের নাম শুনে থাকেন তাহলে আপনার ধারণা মতে নিচের কোনগুলি সঠিক? (উত্তর একাধিক হতে পারে)

○ এটি একটি বিষাক্ত উপাদান
○ এটি একটি বিষাক্ত ধুলা
○ এটি একটি বিষাক্ত মিনারেল
○ এটি একটি বিষাক্ত ফাইবার
○ অন্যান্য

১৬৪. আপনি কি কখনও তড়িৎ অপরিবাহী নিয়ে কাজ করেছেন? উত্তর হ্যাঁ হলে, কি ধরণের? (ছবি) জাহাজের কোন জায়গায়?

○ কেবিনের চারপাশে/থাকার জায়গা
○ ডেকের ফ্লোরবোর্ডের মাঝখানে
○ পাইপ এর চারপাশে
○ ইঞ্জিন/ব্রয়লারের চারপাশে

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১৬৫. নিচের কোন ধরণের কাজে তরিৎ অপরিবাহী ব্যবহার করা হয়?

- ○ ফিল্টার
- ○ কাটার
- ○ লোডার
- ○ ক্যাবল পুলার
- ○ হ্যামার
- ○ অয়েল গ্রুপ
- ○ ফোরম্যান

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১২. অতিরিক্ত তথ্য

১৬৬. আপনার মাসিক আয় কত?

- ○ ০-১৫০০ টাকা
- ○ ১৫০১-৩০০০ টাকা
- ○ ৩০০১-৫০০০ টাকা
- ○ ৫০০১-১০,০০০ টাকা
- ○ ১০,০০১-১৫,০০০ টাকা
- ○ ১৫,০০১ টাকা এর বেশি

১৬৭. আপনি কিভাবে জাহাজ-ভাঙা শিল্পের কাজে সম্পৃক্ত হলেন?

- ○ ফোরম্যানের মাধ্যমে নিয়োগ
- ○ পরিবারের সদস্য বা বন্ধুরা জাহাজ ভাঙা শিল্পে কাজ করে
- ○ পরিবারের সদস্য বা বন্ধুদের নিকট থেকে শুনে

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১৬৮. আপনি কেন একজন জাহাজ-ভাঙা শিল্পে শ্রমিক হতে চাইলেন?

১৬৯. আপনি কি দিনের বেলা বিশ্রামের সময় পান? উত্তর হ্যাঁ হলে, কতক্ষণ?

১৭০. আপনি কি জানেন জাহাজ থেকে অপসারণের পর তড়িৎ অপরিবাহী আস্তরণগুলি কোথায় যায়?

১৭১. প্রধানত কারা এই তড়িৎ অপরিবাহী আস্তরণগুলি ক্রয় করে?