

Occupational Hazards

Only a fraction of the myriad hazards faced by women in their paid and unpaid work can be addressed here. Of those selected, some address actual or potential health effects arising directly from exposure to specific hazards; some stress the dearth of information on the health effects of work allocated to women; others point out that jobs allocated to women purportedly to protect their health may, on investigation, be found to pose greater risks than non-female jobs. Key points include the following:

- \$ repetitive motions and fast work speed in factories or at home is increasingly linked to disablement. More pieceworkers are disabled than fixed wage workers, and repetitive strain injury is common among assembly line workers.
- \$ investigating the reproductive risks and outcomes from exposure to toxic substances is methodologically difficult, but essential, given the rapidly-increasing use of chemicals in industry and agriculture.
- \$ behavioural problems in women traditionally attributed to mass hysteria may result from occupational exposure to neurotoxins.
- \$ subjective factors appear to be an important determinant of women's health status in Mexico. This is a consideration often neglected in epidemiological studies.
- \$ silicosis in women, although rare in developed countries, is usually contracted in the pottery industry and tends to progress more rapidly in women than in men. Many women in developing countries are exposed to silica dust through pottery work or hand-grinding grain.
- \$ "fetal protection" policies often serve to protect the employer rather than the employee or the fetus.
- \$ low social and economic status, combined with outdoor work in poor environmental conditions, produces permanent chronic ill-health in women.

Women's job ghettos C the fish-processing industry

Women workers are often concentrated in female employment "ghettos": that is, job categories where the majority of workers are women. Biological explanations concerning size, strength, hormones, the reproductive system, or the need for women to be "protected", are often used to justify differential job assignment, although there is little information on the health effects of the types of work usually allocated to women. This study analyses work conditions and related health effects in male and female job ghettos in fish-processing plants in Quebec, Canada.

A 1980 study included a self-administered questionnaire on workers' environmental and socioeconomic conditions, and their health-related symptoms. The questionnaire was not specifically designed to examine the health effects of women's work. But in view of the paucity of data on this issue, the authors examined the responses as a function of the gender of the 209 respondents (94 women and 115 men).

Work in fish-processing plants is seasonal (April to November). At the time of the study, work was available for an average of 25.2 weeks. The majority of workers (95%) lived on unemployment insurance or welfare for the rest of the year. Women earned a lower hourly rate than men, and worked slightly fewer hours. Of the women, 82.4% worked in jobs categorized as female ghettos (over 75% of workers performing the function were women), and 87.5% of men were employed in exclusively "male" jobs. It was found that even if men and women held the same job title, their tasks often differed. For the purpose of analysis, each job title was therefore assumed to be completely gender segregated.

Most of the women worked as either a checker, sorter or packer. This involved standing in a fixed position and making small movements with the hands. Checkers removed with scissors any remaining skin and bone from filleted fish arriving on a moving conveyor; sorters examined shrimp arriving on conveyor belts for imperfections and remaining bits of shell. Both jobs involved working very quickly to supply other lines and keep up with arriving loads. Packers put the fish into packages and then loaded them into larger boxes.

In terms of noise and temperature, factory conditions were poor. Wherever measured, noise levels were at or above the permitted regulations for an 8-hour day (90 dbA). Women reported significantly more noise at their work sites than did men,

and more often claimed that noise levels were too high for communication.

All factories were cold and humid, with temperatures of 16 EC and 13 EC recorded at checkers' and sorters' positions respectively. Of the women, 81.8% worked with their hands in water, and 70.1% worked with their feet in water. In the fall, the water was colder. Women reported this as a source of discomfort more often than men. However, this perception may be influenced by the relative immobility of their jobs compared to the men's.

Work speed and potential health impact

Women reported more often than men that their jobs were uninteresting, that they could not move around, and that their work speed was fast. They also reported doing more night and weekend shifts (possibly for economic reasons). All job categories entailed lifting.

Women reported feelings of fatigue and stress, and tired hands, feet, back and legs more often than men, as well as greater insomnia, more aches and pains, digestive problems, and headaches. Taken in conjunction with their reports of more uncomfortable environments and more unpleasant working conditions than men, the question therefore arises as to whether these health problems are related to the sex difference itself, to differences in reporting between the two sexes, or to differences in working conditions. Work speed in relation to the health variables was therefore examined, for two reasons. Firstly, in a large study of poultry slaughterhouse workers, women reported a significantly higher work speed than men. Secondly, other workers' reports seemed to indicate fast work speed as a relatively constant characteristic of women's factory and hospital jobs. In the fish factory, fast work speed was found to be associated with fatigue, stress, insomnia, and digestive problems in both sexes, and with aches and pains in women.

Clearly, the methodology used restricted analysis to workers' own perceptions of their health problems. But it did reveal some additional data not perceptible through routine measurements. A measurement of temperature alone, for example, cannot determine the influence of worker immobility, degree of humidity, or whether adequate protective clothing is worn. Similarly, physical medical examinations may not detect the role of symptoms such as stress, insomnia, and random aches and pains, and the beginnings of acute conditions with a long latency period. This analysis therefore related perceived environmental variables to perceived health effects. Workers reporting a specific problem in their micro-environment tended to report the same health effect, which suggested that such a correlation actually existed. The best control, however, for a cause and effect association between an environmental hazard and a health effect is the removal or attenuation of the hazard, with consequent verification of the health effect.

It remains to be explained why women in the fish-processing and poultry slaughtering industries manifested higher health risk factors in relation to fast work speed. The traditional explanations of less tolerance in women are unsatisfactory. The authors suggest that women's factory work often requires them to work at a faster and more constant rate than men, even if men describe their work speed as fast. Women also do housework and undertake childcare, which may have a synergistic effect on the health symptoms reported through factory work. All women's tasks need to be taken into account in estimating occupational health risk.

Task characteristics and health problems reported by sex

	% women (n=94)	% men (n=115)	Ratio women /men	Signifi- cance ^a
<u>Task characteristics</u>				
Shift work	35.8	22.0	1.63	*
Interest relatively low	41.8	27.4	1.53	*
Immobility	75.6	50.4	1.50	***
Work speed fast	63.2	45.8	1.38	*
Weight lifted regularly	41.9	42.4	0.99	n.s.
<u>Health problems reported</u>				
Insomnia	33.7	8.3	4.06	***
Aches and pains	45.2	19.1	2.37	***
Digestive problems	27.7	13.4	2.07	**
Hair loss	40.2	26.0	1.55	n.s.
Headaches	59.3	39.1	1.52	*
Colds, flu	69.9	58.0	1.21	n.s.
Back problems	10.6	9.9	1.07	n.s.
Skin irritations	26.1	25.5	1.02	n.s.

^a*p<0.05; ***p<0.001; n.s. = not significant

Summary of the work of:

Messing K, Reveret J-P. Are women in female jobs for their health? A study of working conditions and health effects in the fish-processing industry in Quebec. *International journal of health services*, 1983, 13(4):635B648.

Parental exposure to lead and solvents

Conflicting results have been obtained from studies of maternal occupational exposure to solvents and lead, and its effects on spontaneous abortion. Lead and solvent exposure has also been linked to male reproductive problems, although there is little information on spontaneous abortion following paternal exposure.

Six Finnish studies of parental occupational exposure to organic solvents or inorganic lead in relation to spontaneous abortion were reviewed by the authors. Solvent exposure in pharmaceutical factory workers, laundry and dry-cleaning workers, and the records of men and women biologically monitored for solvent exposure, were also examined, as was lead exposure among workers biologically monitored for inorganic lead.

Study populations were identified through Finnish national registers, workers' records, workers' unions and employers' files. All men and women who had been biologically monitored at the Institute of Occupational Health for exposure to solvents (styrene, toluene, trichloroethylene, tetrachloroethylene, and 1,1,1-trichloroethane) or lead, formed the cohorts of workers for the solvent and lead studies. The pregnancies of workers, or wives of male workers, were identified from the nationwide database on births and spontaneous abortions in hospitals for the years 1973-1983, which covered 94% of all officially recorded births. It is estimated that 80-90% of all recognized spontaneous abortions can be detected from the database. A case-referent design was used; each wife of a male worker or woman who had a spontaneous abortion was defined as a case. Two or three referents were selected for every case from among the women who had given birth. The referents were individually matched for age with the cases. The woman's occupational exposure was assessed for the first trimester of pregnancy and the husband's exposure for the time of spermatogenesis of the study pregnancy (80 days before conception).

Results showed that the odds ratio of spontaneous abortion for maternal exposure to solvents was increased among the pharmaceutical factory workers, and significantly increased among the women monitored for solvents. In terms of exposure to individual solvents, high exposure to methylene chloride, tetrachloroethylene, and aliphatic hydrocarbons was associated with the occurrence of spontaneous abortion. Analysis by occupational task showed that the odds ratio for toluene was elevated in

a small group of shoe workers.

Paternal exposure

The odds ratios for spontaneous abortion in relation to paternal exposure to organic solvents in general, and high exposure to toluene and miscellaneous solvents such as thinners, were significantly increased. Analysis by occupation revealed that the wives of solvent-exposed painters and woodworkers had an increased odds ratio. Maternal exposure to lead was not found to be related to spontaneous abortion at these low levels.

The analysis of all the men biologically monitored for lead did not show a statistically significant association between paternal lead exposure and spontaneous abortion, although women whose husbands had been monitored during or close to the relevant period of spermatogenesis were found to have an increased odds ratio. The association between the husband's exposure to lead and spontaneous abortion was modified by the age of the wife. The odds ratio for lead exposure was increased for women under 27 years but not for wives over this age.

The results of the studies suggested that maternal occupational exposure to certain organic solvents may increase the risk of spontaneous abortion. An increased risk of abortion was observed for exposure to organic solvents in general, and for high exposure to some specific solvents, such as tetrachloroethylene, methylene chloride, and aliphatic hydrocarbons. Paternal occupational exposure to solvents in general, and high exposure to toluene or miscellaneous solvents in particular, was also associated with spontaneous abortion. Maternal exposure to lead during pregnancy was not related to spontaneous abortion, although it should be noted that exposure among Finnish women is generally quite low. Therefore, an increased risk at high exposure levels cannot be ruled out. The study among the lead-exposed men suggested that there may be an association between paternal exposure to inorganic lead and spontaneous abortion, and further study of paternal occupational exposure on pregnancy outcome is warranted.

Summary of the work of:

Lindbohm M-L et al. Effects of parental occupational exposure to solvents and lead on spontaneous abortion. *Scandinavian journal of work, environment and health*, 1992, 18(Suppl.2):37B39.

Pesticides exposure and reproductive outcomes

Of the 350 million cut flowers imported every year into the United States, 90% are grown in Colombia. Although a relatively new industry, floriculture employs large numbers of Colombians. Floriculture workers risk exposure to 127 different kinds of pesticides. A study was undertaken among 8867 employees of 58 companies who had worked for at least six months in the flower growing industry to ascertain the occurrence of certain reproductive events among a population occupationally exposed to a heterogeneous group of pesticides, and to assess the possible association between adverse reproductive events and such exposure.

A questionnaire administered through an interviewer was used to obtain information on the occurrence of fetal loss, prematurity, congenital malformation, and cancer among the offspring of workers (female employees, or wives of male employees) in Bogota. "Exposed" pregnancies were defined as those occurring during the time the relevant parent worked in floriculture; "unexposed" pregnancies were those occurring before this time.

The following variables were used to assess different exposures: size of employing company, quantity of pesticides used, job category, and length of time worked in floriculture. Information on these variables was obtained during a survey on patterns of pesticide use conducted in each of the 58 companies. Jobs were classified on a 6-point scale from no exposure (administration) to high exposure (sorting and packing). In terms of time worked, 6-11 months was considered as low exposure, 12-36 months as medium exposure, and over 36 months as high exposure.

Of the 8867 workers, 33% were men and 67% women, with mean ages of 29.2 and 27.0 years respectively. Most of the workers had been educated to primary level. The mean length of time worked in floriculture was about three years. The total number of pregnancies included in the analysis was 13,984; 10,481 were pregnancies of female employees and 3,503 of wives of male workers.

Various adverse outcomes

The rates and odds ratios for the various adverse outcomes of pregnancies before and after exposure to pesticides in floriculture are shown in the table below. All

rates, except for stillbirths, were higher for pregnancies occurring after exposure for both female workers and wives of male workers. This gave significantly higher odds ratios for abortions, premature births, and malformed babies. No dose-response relationship with any of the variables used as indicators of degree of exposure was observed for either spontaneous abortion or prematurity; an inverse relationship was observed with the two variables which could be regarded as more objective (type of job and length of time worked in floriculture). The highest odds ratios were observed for the unexposed jobs C administration, and those with 6B11 months experience. These results are not surprising considering that exposure only during a short critical period is relevant in the induction of embryotoxic effects.

An increased risk among female workers and wives of male workers was observed in relation to congenital malformation, spontaneous abortion and prematurity in pregnancies after having worked in floriculture. Subsequent physical examination of the children showed though that about half the children reported as malformed by their parents were in fact normal, while about 10% of those reported as normal were malformed. All confirmed cases of cancer proved to have occurred before the parents began working in floriculture.

Regarding spontaneous abortion, the risk ratios may have been increased by recall bias rather than exposure to pesticides. While spontaneous abortion occurring early in pregnancy is an excellent indicator of embryotoxicity, it is very difficult to record accurately. It is highly probable that if a spontaneous abortion occurs very early in pregnancy, the woman will not recognize it as such, but perceive it as a delayed menstrual period. Alternatively, if identified correctly, it may be forgotten over time.

The rates obtained in this study indicated a significant under-reporting of spontaneous abortion, which was more pronounced when the information on a woman's reproductive history was given by her husband. Lack of perception of the event by husbands is an adequate explanation in the case of wives of male workers, as is early unrecognized spontaneous abortion in the case of the female employees. In this instance, an environmental embryotoxic agent could be suspected. However, the data in this study cannot support this explanation given that the problem of perception was the same for the pregnancies occurring before and after work in floriculture, and that the actual rates for spontaneous abortion from 1978B81 were shown to be very similar to those reported for other population groups.

Multiple exposures

Multiple exposures pose the problem of identifying the toxic chemical responsible, but also of interaction between chemicals and the resulting toxic effects. Given the assumptions made in this study to estimate exposure and the multiple nature of the exposure, a random misclassification of exposure may have played a role in underestimating the observed effects. It was not possible here to estimate the degree of such a bias or, if present, to correct it.

Occupational Hazards - 3

Rates and odds ratios (OR) for various adverse pregnancy outcomes before and after work in floriculture (95% CI=95% confidence interval)

Pregnancy outcome	Female workers				Wives of male workers			
	Prevalence rates (%)		OR	95% CI	Prevalence rates (%)		OR	95% CI
Before exposure	After exposure	Before exposure			After exposure			
Induced abortion	1.46	2.84	1.98**	1.47-2.67	0.29	1.06	3.63**	1.51-8.70
Spontaneous abortion	3.55	7.50	2.20**	1.82-2.66	1.85	3.27	1.79**	1.16-2.77
Premature baby	6.20	10.95	1.86**	1.59-2.17	2.91	7.61	2.75**	2.01-3.76
Stillbirth	1.37	1.34	0.99	0.66-1.48	1.01	0.89	0.87	0.42-1.83
Malformed baby	3.78	5.00	1.34*	1.07-1.68	2.76	4.16	1.53*	1.04-2.25

* P=0.05-0.01; ** P<0.01

The overall results of no association or a moderate increase in risk for some adverse pregnancy outcomes, with the possibility that these are due to recall bias and/or misclassification of exposure, accord with the results reported previously for other populations. Although some studies in Seveso, Italy, and in Vietnam suggested an increase in spontaneous abortions after possible maternal exposure to phenoxy herbicides and dioxins, methodological problems relating to difficulties in assessing exposure, and in eliminating possible confounding and bias, prevented definitive conclusions. Similar limitations apply to studies on paternal exposure to these substances.

This and previous studies should be considered as preliminary approaches to a very complex problem which needs considerable further research. Further research is urgent for two reasons. First, the use of pesticides C especially in developing countries C is increasing rapidly and is often uncontrolled. Second, in this example, two-thirds of the workers questioned were women of reproductive age, indicating a large population at risk.

Summary of the work of:

Restrepo M et al. Prevalence of adverse reproductive outcomes in a population occupationally exposed to pesticides in Colombia. *Scandinavian journal of work, environment and health*, 1990, 16:232B238.

Exposure to neurotoxins in the microelectronics industry

Women are employed in the majority of production and assembly jobs in the microelectronics industry. Organic solvents are used in many of the industry's production and assembly processes. Neurotoxic effects of organic solvent exposure include abnormalities and impairments in the behavioural area, notably mood change, irritability, anxiety, fatigue, depression, mood lability, defective impulse control, personality change, and development of psychosis. Emotional and personality changes are among the first symptoms reported by persons exposed to neurotoxins. In many cases, affective changes are present even when neuropsychological or neurologic effects cannot be detected.

Despite evidence that microelectronics work is ergonomically stressful and involves the handling of hazardous substances, the industry gives the impression of being well-organized and clean. This may provide some explanation as to why, for over 20 years, complaints from female workers have often been ascribed to problems of mass psychogenic illness.

Persistent long-term effects of solvent exposure are being reported with increasing frequency. One study found no evidence of recovery when retesting solvent-exposed patients 8 months after exposure had ceased. Another found that two years after removal from solvent exposure, subjects continued to report negative effects on their personal, social, and employment situations.

Effects on former workers

A study was carried out to evaluate the stability of affective and personality disturbance among former electronics workers over a two-year period. The Minnesota Multiphasic Personality Inventory (MMPI) [©] the most widely used standardized adult mood and personality measure [©] was used to evaluate 79 former microelectronics workers, all of whom had been awarded compensation for work-related injuries. Review of work medical records showed that they had complained

frequently of headaches, dizziness, respiratory distress and skin irritation, suggesting high exposure levels. Two years after the initial evaluation, a second MMPI was undertaken involving 63 of the original 79 workers. This sample consisted of 56 women and 7 men, who had worked in the plant for an average of 6.8 years, and had ceased working there an average of 5.7 years previously. Prior to employment, all the workers had been screened for good health and mental stability. Reference data were obtained by matching the former employees with current workers involved in a neurotoxic effects study in the same plant.

Work in the plant involved direct handling of organic solvents, without adequate ventilation and/or without respiratory protection. The solvents included fluorochlorohydrocarbons, chlorinated hydrocarbons, glycol ethers, isopropanol, acetone, toluene, ethyl alcohol and xylene, used in a variety of cleaning and degreasing operations. The former workers reported having handled these substances with bare hands and without protective equipment.

Analysis of the MMPI scores revealed that the workers manifested affective and personality disturbances that persisted over the two-year period between testings. The score elevations were remarkably stable over time, with slight but significant increases on the depression (D), psychasthenia (Pt) and schizophrenia (Sc) scales. These findings indicate that affective and personality disorders diagnosed 5-6 years after cessation of employment appear to be long-lasting disabling psychiatric conditions. As is the case with most retrospective studies, no pre-employment personality profiles were available. However, in pre-employment screening, each individual had been considered mentally stable.

The MMPI profiles of this group are remarkably similar to profiles reported by other investigators studying workers with a history of solvent exposure. The findings are also similar to studies of Vietnam combat veterans exposed to Agent Orange; with the exception of two categories, the veterans' MMPI scores were lower than those of the former microelectronics workers.

Previous studies of women microelectronics workers have tended to attribute the type of affective and personality disturbance observed in this study to mass hysteria. It has been assumed that an "hysterical" personality structure attributed to women workers was the source of these outbreaks. MMPI reports of hysteria and other work injuries show elevations on the hysteria (Hy), depression (D) and hypochondriasis (Hs) scales, whereas reports of organic solvent effects show elevations for psychasthenia (Pt) and schizophrenia (Sc), reflecting high anxiety and a psychotic process.

Mass psychogenic illness^C hitherto defined as a women's illness

Investigation of the mass psychogenic literature shows that women comprise the

majority of those afflicted, making up 82% of all reports of so-called hysteria. The authors suggest that this is not a gender effect but a reflection of the percentage of women at risk in this industry. In this study, the low percentage of participating men corresponded to the gender distribution within the assembly plant. Although there were few men among the former workers tested, the scores of men and women were very similar, except for the men's higher scores on the hypochondriasis (Hs), depression (D) and hysteria (Hy) scales. This may be explained by the potentially higher exposure in men's jobs, which often involved cleaning large tanks of organic solvents or painting with oil-based paints, without protection.

It is also possible that psychological and psychosocial factors exacerbate or interact with the physical problems of disabled workers. Workers who become disabled frequently experience difficulty in adjusting to being non-working members of society and may suffer loss of status and diminished feelings of self-worth. These in turn may lead to family disruption. Loss of health benefits and access to medical treatment may also result. Assessment of the effects of neurotoxic exposure should include the levels of social support and treatment available to victims.

This study raises doubts concerning one traditional explanation of the behavioural symptoms observed among microelectronic workers, and suggests that these could be the result of overexposure to organic solvents in the workplace. The findings here suggest that work rather than gender may be the cause of the problem.

Summary of the work of:

Bowler RM et al. Stability of psychological impairment: two-year follow-up of former microelectronics workers' affective and personality disturbance. *Women and health*, 1992, 18(3):27B48.

Psychological and ergonomic stressors in garment workers

Women's jobs are often seen as low-risk in terms of severe work accidents and specific industrial diseases. Consequently, the health problems of women's work have not been adequately researched, with the exception of risks associated with pregnancy. However, adverse health effects are associated with female-dominated jobs, including those in the manufacturing and service industries, involving high time pressure. This study documents the psychological and ergonomic stressors which can, over time, lead to adverse health effects.

The work speed of many assembly lines and other jobs continues to be determined by machines. Previous studies have demonstrated that workers employed in jobs involving high time pressure experience an elevated frequency of physiological, musculoskeletal and psychological symptoms. Little is known about these symptoms or the more severe adverse health conditions that may ensue.

Garment workers represent a valuable study population as they fall into two natural categories **B** those operating on a piecework basis and those on hourly wages. The purpose of this study was to demonstrate that piecework involves more time pressure than hourly wage jobs, and that long-term employment in jobs involving high time pressure leads to a deterioration of health which manifests itself in greater reliance on medicine, increased anxiety and depression, and the development of permanent disability.

The study population comprised 800 women who had worked in unionized garment factories in Québec between 1976 and 1985. At the time of the study, each woman was between 45 and 70 years of age and had been employed as a sewing machine operator (either piecework rate or hourly wage) for at least five consecutive years at 1000 hours per year. Of the total sample, 267 were still employed. This population was thought to be fairly homogenous and likely to reflect the long-term effects of garment work. For some comparisons, an external population of 1300 women employed in clerical work, services, or manufacturing was used. Disability was defined as the presence of one or more disabling conditions for at least the twelve preceding months and categorized as: i) no disability; ii) slight restriction of non-work activities; iii) moderate restriction of major activity such as paid employment or housework; iv) severe restriction (unable to maintain major activity). Yearly data on job title, type of remuneration and number of hours worked were obtained from a labour organization for each worker, for the 1956 to 1985 period.

Results showed that when compared with the external population, garment workers were more often disabled than women in other occupations (see Figure). Garment workers currently employed had an increased prevalence of moderate and slight disability, while garment workers no longer employed had an increased prevalence of severe disability. Employed garment workers had higher levels of symptoms of anxiety and depression than workers in other types of employment.

Comparison of pieceworkers and hourly wage workers showed that the prevalence of severe disability among those no longer employed increased with the number of years the workers had spent in piecework jobs. In a separate analysis conducted for disability due to specific causes, the association with duration of employment in piecework appeared to be linked mainly to musculoskeletal problems, and to a lesser extent to cardiovascular problems, although the small numbers produced unstable effect estimates. Among workers currently employed, pieceworkers took medication for stomach problems in greater proportion than hourly wage workers.

Mental workload and psychological stress

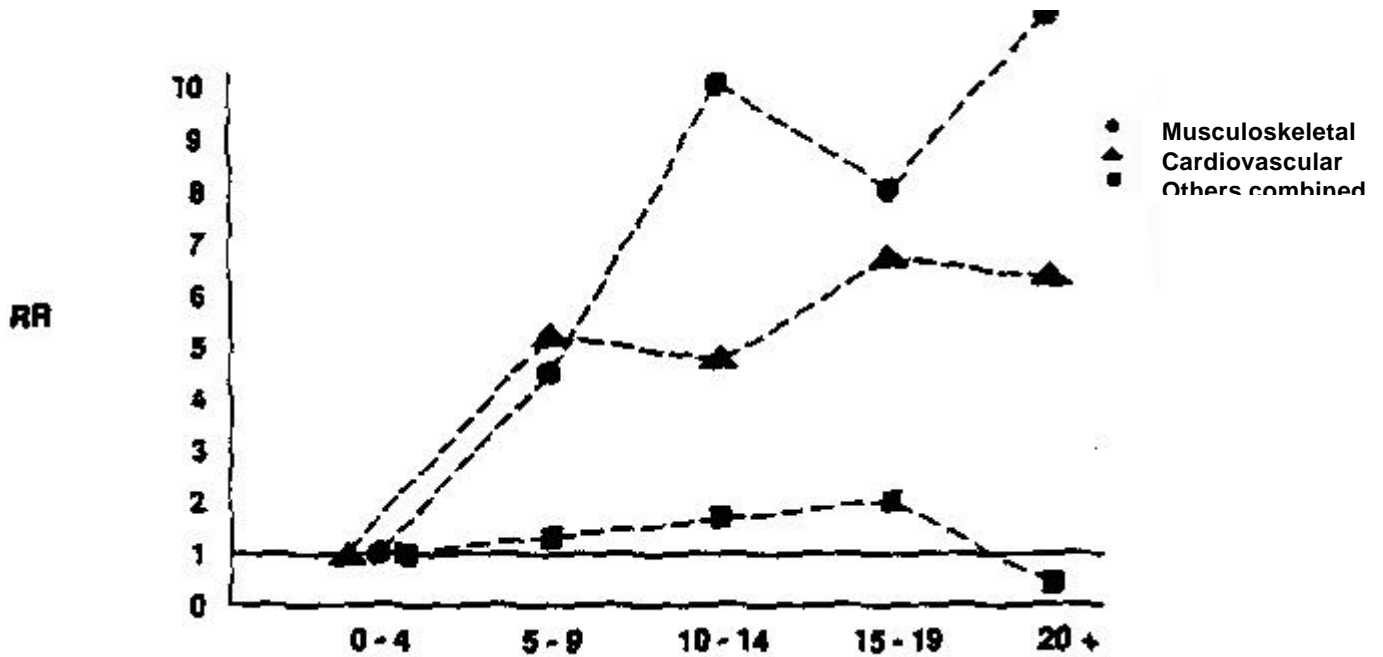
The level of psychological stress of pieceworkers is likely to be greater than that of hourly wage workers due to greater time pressure which directly increases their mental work load. The mental work-load associated with garment work is determined mainly by the complexity of the task and its speed. A high level of mental activity, visual attention and precision movement, in which eyes, hands and feet must be constantly coordinated, is required. Garment workers' task complexity tends to be identical for piecework and hourly wage work as the end result is the same, and equipment and indoor environment are similar. The main variation, therefore, relates to the time constraint under which pieceworkers operate.

An increased mental workload may represent a source of psychological stress. Under stress, complex adaptive mechanisms are activated and several parts of the endocrine system react simultaneously. Prolonged activation of the adaptive mechanisms are believed to be involved in the genesis of various chronic diseases (cardiovascular, gastrointestinal, musculoskeletal).

Regarding ergonomic stressors, the work of an operator in the garment industry necessitates a sitting position with the head bent forward, which must be sustained for long periods, coupled with repetitive movements of the upper limbs. Studies have shown that these characteristics are two of the six principal causes of absence from work due to back disorders. Also, repeated use of the same joints has been associated with the development of osteo-arthritis. It is possible that piecework acts directly on the biomechanical load by increasing the number of motions per unit of time, or by influencing the temporal distribution of work and rest. Evidence suggests that psychological tension associated with time pressure may play a direct role in the

development of musculoskeletal disorders, since muscle tension, measured by continuous electromyographic recording, increases with psychological tension.

Risk ratios^a for severe disability among specific causes by duration of employment in piecework among garment workers who left employment^b



a Adjusted by binomial regression for age, smoking type of task and total length of employment

b Quit during the 10 years preceding the interview

The results of this study indicated that moderate and slight disability, anxiety and depression, and the use of medication tend to reflect mild conditions, while severe disability involves health problems serious enough to prevent workers from remaining employed or doing housework. Short-term and non-disabling conditions identified by previous authors may therefore prove to have more important long-term sequelae than hitherto documented. These could be due either to the physiological reactions associated with psychological stress, or the enhancement of the ergonomic stressors involved in garment work. These findings are of interest given the large numbers of women employed in piece-work either at home or in factories in developing countries.

Summary of the work of:

Brisson C, Vézina M, Vinet A. Health problems of women employed in jobs involving psychological and ergonomic stressors: the case of garment workers in Quebec. *Women and health*, 1992, 18(3):49-65.

Health consequences of "maquiladora" work

Foreign-owned assembly plants in Mexico (maquiladoras) enable these industries to operate with low labour and operation costs, and to avoid stringent health and safety regulations enforced at home. The plants employ large numbers of predominantly young women (over 60% of the total maquiladora workforce). Adverse working conditions are frequently reported in the plants, including poor ventilation, few rest periods, excessive noise levels, unsafe machinery, long hours of microscopic assembly work, and exposure to toxic chemical and carcinogens. The work requires high production quotas and repetitive tasks which, coupled with lack of decision-making capacity and often poor supervisory relations, add to stressful work conditions. However, empirical data concerning the health issues are scarce.

High levels of stress among maquiladora workers have been associated with generic symptoms such as gastric disorders, menstrual problems, depression, and mass hysteria. Pulmonary and eye problems, dermatitis, hand injuries, and musculoskeletal disorders have been reported among textile and garment workers, while eye irritations, visual acuity loss, headaches, nervousness, allergies, and adverse pregnancy outcomes have been identified among electronic assembly plant workers. This evidence is, however, derived from studies with many methodological shortcomings and which did not control for multiple risk factors, including factors inherent to the living conditions in the urban shantytowns from which most of the female labour force is recruited.

A study was carried out to assess the health and lifestyle of women employed in electronic and garment assembly plants, comparing them with two reference groups: women employed in the service sector and women who were never part of the labour force. Thus the demographic, occupational, and psychosocial characteristics of maquiladora workers were compared with those of the two reference groups. The impact of maquiladora work on the health status and well-being of women was then examined, controlling for a number of social and occupational variables.

The total sample comprised 480 non-pregnant women between the ages of 16 and 28 years (mean age 21 years), divided into four groups: electronics workers, garment workers, service sector workers, and women with no work history. Over 70% were single and more than two-thirds were childless and lived with their families of origin. Housing conditions among all four groups were similar, although service sector workers were more likely to own a car and/or a telephone. Household incomes were

lowest among housewives, followed by electronics workers. The number of years of formal education was lower for maquiladora workers than for the two reference groups. On average, both electronics and garment workers worked 48 hours per week, and 6 hours longer than service sector workers. The mean hourly wage was US\$1.02 for electronics workers, US\$1.09 for garment workers, and US\$1.32 for women in services.

Identified sources of strain in maquiladora workers included few opportunities for skill development, and reduced autonomy in decision-making compared with service sector workers. Garment workers appeared to receive less support from colleagues and supervisors than other categories. Yet despite longer working hours at lower wages and with less freedom to make decisions, maquiladora workers reported job satisfaction levels equalling those of women in services. Although maquiladora workers received more benefits such as health insurance and performance incentives, these did not seem to be associated with job satisfaction. All four groups felt that the basic income of their household was too limited to satisfy basic needs, and levels of self-denigration were high, suggesting internalized strain related to low self-esteem. All groups perceived their health status to be fairly good, although women in garment plants were more likely to report lower health status than electronics workers.

Health outcomes better than anticipated

Given that women employed in electronics and garment maquiladoras are less well educated, earn less, work longer hours, and perceive themselves as having less control at work than service workers, worse health outcomes from these groups could have been expected. Evidence suggested, however, that they did not suffer more functional impediments than service workers or housewives. Neither did they experience more depression (all four groups had similar mean depression scores) and electronics workers reported nervousness significantly less frequently than service workers.

All four groups showed high stress scores on the control scale, indicating a low sense of control over their lives. The one factor which consistently "predicted" the four outcomes of health and wellbeing (functional impediment, nervousness, depression, and sense of control) was lack of financial resources. This was followed by work dissatisfaction, which predicted three health outcomes. Factors associated with family life and self-denigration were significant predictors of depression and sense of control. Demographic factors, such as education, number of children, and housing conditions, were important predictors of nervousness.

The main finding **C** that maquiladora workers did not suffer more depression or lack of control than other occupational groups **C** persisted in the multivariate analysis, which also confirmed that the two consistently strong and most significant predictors

of health and wellbeing (negative attitude toward economic adversity, and dissatisfaction with work) were subjective indicators C negative attitude towards economic adversity, and dissatisfaction with work. The intensity of these two subjective factors was directly associated with depression, nervousness, and lack of control over life.

It is possible, however, that more job dissatisfaction was not reported by maquiladora workers due to their young age, which dampens awareness of occupational stress. Or, particularly in the case of electronics workers, their jobs may reflect some degree of upward mobility as they are in the most modern and dynamic industrial sector, and the factories tend to be physically attractive places with cafeterias, air conditioning, heating, piped music, and other comforts unavailable in the shantytowns where most of the workers reside. This may explain the particularly favourable health outcomes of the electronics workers.

Subjective factors beyond the working environment were found to be of great relevance to the health and wellbeing of poor Mexican women. Issues of self-esteem and lack of personal control seem particularly important to health outcome. Future studies should take account of feelings, attitudes and beliefs in order to fully understand disease patterns. These subjective or social measures do not compete with conventional indicators, but rather complement them.

Summary of the work of:

Guendelman S, Jasis Silberg M. Health consequences of maquiladora work: women on the US-Mexican border. *American journal of public health*, 1993, 83(1)37B44.

Repetitive strain injury and occupational tasks

Repetitive strain injury (RSI) is the term commonly used to describe a set of musculoskeletal symptoms affecting large numbers of people, often women, in many countries. It occurs in workers who perform repetitive tasks over a prolonged period, most commonly in the hands, wrists, and arms, although other areas may be affected depending on the type of work performed. RSI causes considerable pain and discomfort in the affected areas, including loss of grip strength in the hand. Over time, disability can become so severe that temporary or permanent cessation of employment results.

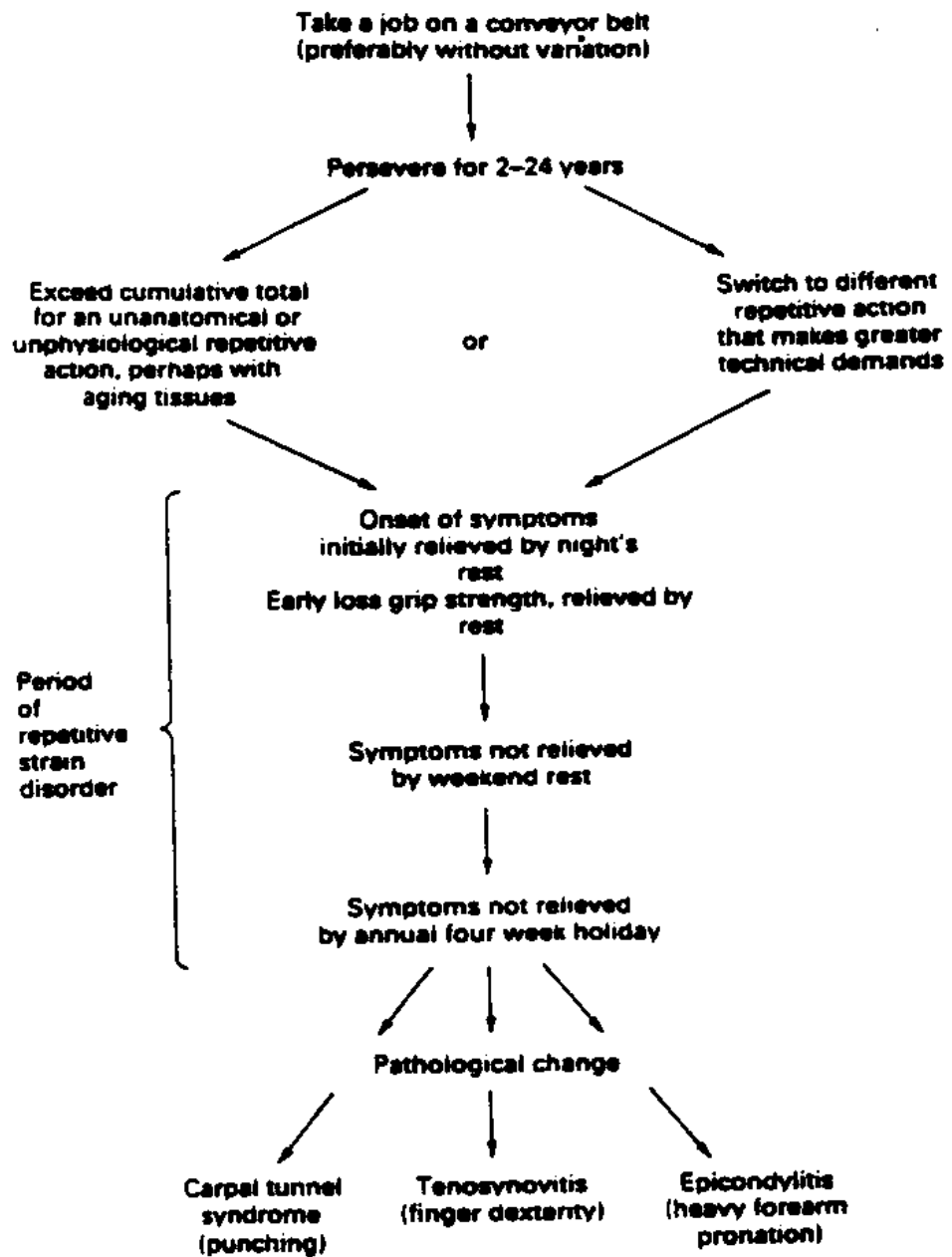
When 12 women patients involved in highly repetitive occupational tasks were referred by their trade unions= solicitors for medical and legal adjudication on their cases, an opportunity arose to document symptoms and physical signs that could be of diagnostic value. An attempt was also made to clarify the natural history of the disorder and to estimate its prevalence in conveyor belt workers.

The mean age of the group was 48.2 years (range 25-60 years) and duration in employment ranged from six to 26 years. There was no consistent type of activity after which symptoms invariably occurred, although most women attributed the onset of symptoms to a change in technique or, more frequently, a move to a different conveyor line. Two women worked in an electrical factory, and 10 in the packing department of a biscuit factory. Six women had been operated on; in each of these cases, the particular pathology had always been preceded by a period of symptoms typical of those described in repetitive strain disorder.

In the biscuit factory, all staff worked an eight-hour shift, packing at a rate predetermined by management, with two 10-minute tea-breaks and one half-hour meal-break. Once present, symptoms were not relieved by the 10-minute or 30-minute breaks, although in the early stages a night's rest provided relief. After a period of three to four months, symptoms were not relieved by the weekend break from work. Ultimately, one or two years after the onset of symptoms, there was no relief following two or four weeks= vacation. This progressive resistance to relief by rest appeared characteristic.

The particular task performed by each worker was invariably correlated with the site of symptoms. Lifting heavy boxes caused shoulder symptoms, twisting heavy packs caused forearm symptoms, and repeated use of the fingers caused symptoms in

Natural history of repetitive strain injury



wrists and fingers. Specific pathologies later emerged: tendon inflammation for those using fingers or twisting the forearm, and frozen shoulder for those lifting the heaviest weights.

The work of the two women employed in the electrical accessories factory involved a repetitive punching action with a stapler. Both experienced the same preliminary symptoms as the biscuit workers but these later developed into carpal tunnel syndrome. These women were ostensibly working at their own speed; however, they were paid a low basic wage with a high supplement for performance. In practice this meant that adequate wages could only be earned by maintaining a fast work speed.

Symptoms in all patients in the preliminary phase invariably included weakness and pain in the affected areas. Reduced grip strength was a consistent clinical finding once symptoms were present. Compared with a control group of women matched for age and without RSI symptoms, the grip strength in both hands of the study group was significantly weaker ($p < 0.001$). Even the two women with the fewest clinical signs showed the characteristic reduced grip strength that appeared consistently throughout the group. On this basis it was judged that most if not all the women suffered from repetitive strain injury. This allowed delineation of the natural history of the disease as shown in the figure.

Social and economic factors also contribute to the disease. The biscuit factory was a monopoly employer in an area where there was little other work for women. Their choice of employment was therefore restricted. Moreover, women worked exclusively on the conveyor belts, while men employed in the factory tended to perform only cleaning and maintenance tasks.

In an effort to assist women with painful symptoms, the factory management invariably moved them to a production line where the weights were lighter. Ergonomic comparison of the two tasks suggested that the speed of the packing cycle was faster on this line, however, and this move simply tended to transfer the strain from the forearm to the fingers.

It has been estimated that approximately 2% of the biscuit factory workers experienced symptoms of repetitive strain injury at any one time. However, accurate estimates are difficult to arrive at, given that the symptoms tend to fluctuate, and the tolerance of individuals differs. In the women studied here, the strong association between their occupational activities and the location of their symptoms tends to support a causal effect. Further well-designed studies are needed to identify which women are more likely to develop this painful and handicapping condition. These findings are representative of the situation of many women in occupations where repetitive tasks are carried out at a particularly fast or predetermined speed, outside the control of the worker. Several occupations covered in this *Anthology* meet these criteria. The diagnosis of this condition in a wide variety of occupations, countries and conditions would assist in negating claims that the symptoms of this disorder are imaginary, or a wilful attempt to acquire disability compensation.

Summary of the work of:

Bird HA., & Hill, J. Repetitive strain disorder: towards diagnostic criteria. *Annals of the Rheumatic Diseases*, 1992, 51:974-977.

Silicosis in Swedish women

Silicosis remains primarily a "male disease", and hence pneumoconiosis in women has received little attention in the literature. In Sweden, only about 1% of registered cases are women, employed mainly in potteries. Indeed, most silicosis in women, in Sweden and elsewhere, is contracted in the ceramic industry. Two earlier studies noted that the duration of exposure to pottery dust in the women studied was appreciably shorter than that of a comparable male group. Since the issue of greater sensitivity (or otherwise) of women to inhaled silica dust was not demonstrated in previous research, an analysis of silicotic women observed over a long period was considered useful in clarifying the incidence, course and evidence of progression of this disease. The effects on this small group may be relevant to many women in other parts of the world who are engaged in pottery work or employed in the ceramics industry.

The study used data from the Swedish Pneumoconiosis Register for the period 1931-1980. The register comprises details of all cases of the disease reported to insurance authorities during this time. It contains 4,700 records; 53 are of women with silicosis, the last of which was reported in 1975. According to normal practice, three stages of the disease were distinguished: Stage 1, up to pinhead-sized opacities; Stage 2, up to pea-sized lesions; and Stage 3, coalescence of these lesions into massive shadows.

Of the 53 silicotic women in the register, 42 had contracted the disease while working in the ceramic industry. Four others had worked in iron ore mines, and five in small factories producing scouring powder which contained silica. To facilitate comparison with silicosis in men, a group was selected for whom essential uniformity of dust exposure could be assumed. The 38 women who had contracted silicosis while working in potteries. Their data were compared with 128 silicotic male pottery workers.

An important factor in assessing silicosis risk and the course of the disease is the length of time during which quartz-bearing dust has been inhaled before the disease is diagnosed. As a rule, the shorter this time is, the more intense the dust exposure has been, and the more severe the course of the disease. Conversely, if there has been a very long period of prediagnosis exposure to dust, the intensity of exposure has usually been less and a proportionately mild course of silicosis can be anticipated.

For the total group of 53 women, the prediagnosis duration of dust exposure fell

from a previous mean level of about 20 years to about 13 years in the period 1961-1975. This decrease was attributable in part to the five cases of silicosis in workers who manufactured scouring powder, and for whom silicosis was diagnosed after only 5-10 years of exposure. Among the women employed in pottery shops, the average duration of exposure to dust in the period 1931-1975 was significantly shorter than for men.

In examining progression of the disease, it was found that the tendency to advance from Stage 1 to Stage 2 or 3 was strong among the affected women, and was particularly marked after cessation of exposure. The disease progression for men performing similar work was considerably slower. The difference was most striking during the first 15 years of the study period.

Approximately half the total group of 53 women died during the study period; 45% of deaths were due solely to silicosis, while silicotuberculosis accounted for about 10%. Similar death rates and causes of death were found among both men and women pottery workers.

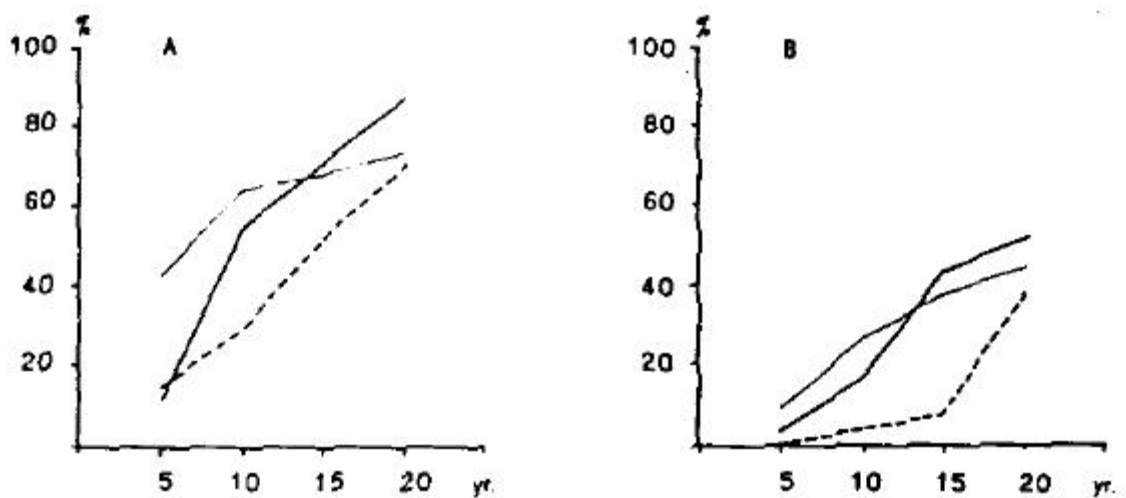
In terms of age, calendar time of diagnosis, initially detected stage of silicosis, and mortality from the disease, there were similarities between both sexes of pottery workers. Incidence of tuberculosis was somewhat higher among the men up to 1950, declining sharply thereafter as a result of the general use of anti-tubercular drugs. Average duration of exposure to the causal dust before detection of silicosis in these workers was significantly shorter among women than men.

Comparison with male quartz workers

In accordance with the principle that short-term prediagnosis exposure is associated with greater intensity of dust and more serious symptoms, the progression of silicosis in female pottery workers in this study was more rapid and severe than in male potters. The female group was therefore compared with male quartz workers - an industrial group usually regarded as at special risk because of its heavy exposure to quartz. After 15 years of observation slightly more progression of silicosis was seen in the female potter group than in the male quartz workers. This was despite an indication that the quartz content of airborne dust is much higher in cutting and processing quartz (74%) than in pottery work (15%). Small particles were more numerous in potteries - 30% as compared with 24% in quartz works.

Silicosis contracted by women working in potteries has thus shown a more pronounced progression than silicosis in other Swedish occupational groups. Several explanations may be considered. Women could have been exposed to higher concentrations of dust than men at the same work sites, although no separate measurements of dust concentrations inhaled by men and women are available to support this assumption. Many of the silicotic women were employed as finishers of

fired wares^C dry work which generates large amounts of dust. It is therefore possible that they were exposed to more quartz in dust than the silicotic men, who worked mainly with moist materials, and that the dust inhaled by women had a somewhat higher content of small particles. It is also possible that the men were on average in better physical condition than their female colleagues, who thus had to ventilate more for the same occupational performance, thereby receiving a higher dust load in the lungs. However, as the women's work was relatively light, this explanation does not seem adequate, although poorer physical condition may have been a contributory factor.



Cumulative percentage of known radiographic progression of silicosis after five-year intervals. Baseline starts at intersect of x and y axis and not at year 5. (Calculated according to technique that states cumulative percentage of progression, including progression in subjects who died during five-year interval and in nonattenders). Thick solid line indicates female pottery-forming shop workers; dashed line, male pottery-forming shop workers; and thin solid line, male quartz workers. A indicates progression from stage I to II or III; B, progression from stage I to III.

This study raises a number of significant issues despite the small numbers affected in Sweden. Many women in developing countries make their own pots or are engaged in ceramics work and pottery industries. The relationship to other contributions in this *Anthology* addressing illness from particle-laden dusts or smoke should also be noted. The designation of silicosis as a "male" disease, coupled with its long latency period, enhances the risks of its remaining undiagnosed and untreated in women. Similar issues are raised in the study on Hut Lung in South Africa, which addresses problems of pneumoconiosis in rural women. Women acquiring pneumoconiosis or silicosis in developing countries risk doing so in circumstances where the possibility of diagnosis and treatment are small.

Summary of the work of:

Gerhardsson L, Ahlmark A. Silicosis in women: experience from the Swedish pneumoconiosis register. *Journal occupational medicine*, 1985, 27(5):347-50.

Cassava processing and cyanide poisoning

Cassava is the third most important food crop in the tropical world, following rice and maize. Although it is low in protein, production is increasing because it grows well in poor soils and tolerates drought. But it has a major disadvantage in that its preparation as a food liberates hydrogen cyanide, a deadly poison. Careful preparation is therefore needed to initiate the various chemical interactions needed to eliminate this poison. Cassava is largely grown and processed by women.

Now the major food crop throughout tropical Africa, cassava is also widely grown in many Pacific countries. It is produced commercially in many countries, since it is easy to grow and reliable. In Nigeria, cassava is a major food staple and the production of processed cassava known as gari is carried out on a large scale. Like all traditional cassava processing, gari production is labour intensive. It is usually undertaken by a small group of people on behalf of a larger community, either at village level, or in large gari kitchens in towns, with many people working together in one unit. This tedious and potentially dangerous work is carried out mainly by women.

To make gari, women peel, wash and grate the tubers. Then they put the grated pulp in cloth bags and leave it to ferment for several days. If the bags are placed under weights or put in a press, water containing some of the hydrogen cyanide is squeezed out. After three days or so the pulp is removed and heated in shallow, open pans to expel residual water and cyanide. Finally, the relatively dry gari is stored, during which time any remaining cyanide disappears. Prepared in this way, or by an assortment of traditional methods in Latin America, Africa and the Pacific, cassava becomes quite safe to eat.

The health risks related to cassava

Several problems remain, however. Firstly, in times of famine, starving consumers do not wait for the cassava to lose all its cyanide properties before eating it, and may suffer serious health problems as a result. Death is rare, but sublethal effects of cyanide inhalation are common. These include spastic paraparesis, a condition which afflicts the motor nervous system and leaves the victim permanently crippled. Problems of goitre, where this is endemic, may also be exacerbated. Secondly, the

women in the gari kitchens or elsewhere who process the cassava may be exposed to hydrogen cyanide fumes during their work and experience related health effects. Thirdly, farm animals may also suffer toxic effects if they are fed with cassava scraps and peelings.

Various solutions are being sought for these problems. For example, cassava varieties are being screened to identify those naturally low in cyanide content. Simple testing methods to determine cyanide content are also being developed. One difficulty in measuring and comparing the cyanide content of different cassava varieties is that this varies in different parts of the plant. Drought conditions tend to have the effect of increasing cyanide content, as do mechanical damage and pest attack. The effects of environmental factors may be so great that an inherently low cyanide variety grown under drought conditions may have a higher cyanide content than a high cyanide variety grown under favourable conditions. A range of varieties are therefore being grown in Nigeria to measure in detail the effects of various environmental factors.

Exposure monitoring and protective measures

To help protect the women in the gari industry, a simple means of monitoring their exposure to hydrogen cyanide fumes has been developed. This consists of a treated test-paper which is colourless, but which turns blue when exposed to hydrogen cyanide gas. It is proposed to introduce this for use by women and children gari workers so that they will realize when they are being exposed to dangerous fumes. The personal monitoring badges of radiation workers perform a similar function.

A typical gari preparation area consists of a large, open-sided shed, often poorly ventilated. Many women work in these sheds, often with children around them. Hydrogen cyanide is generated at various stages of preparation, particularly when the fermented gari is fried in open pans. Better ventilation systems for gari kitchens, and improved processing equipment to ensure that women and children are successfully isolated from the source of cyanide, are therefore required.

Given the ubiquity of cassava as a staple food, and women's responsibility for its processing on a domestic and commercial basis, the implications for women's health are important. Aside from the effects of eating toxic cassava, women are exposed to the air pollution connected with its processing. The potential synergistic effects with goitre (which afflicts mainly women) need further investigation. This is only one of many dangerous agricultural processes to which women are exposed.

Summary of the work of:

Ferrar P. Food laced with cyanide. *Partners in research for development* (Australia), 1992, 5: 29-33.

Plantation workers and ethnicity in Sri Lanka

Despite Sri Lanka's status as a low-income country, the physical quality of life of its citizens is fairly high; the gender gap in terms of physical well-being is narrowing. Yet minorities such as Indian Tamil plantation workers continue to form a disadvantaged group. A combination of minority status and patriarchal social norms pose particular risks to Tamil women.

Indian Tamils were first brought to the island in the middle of the 19th century by the British, to work as labourers on newly-established tea, rubber and coconut plantations. As the plantations were clustered together in the central highlands, the immigrants were spatially segregated. Separated also by ethnicity, religion, language and economy from the native Sinhalese, they became a separate "enclave". Their food rations, wages and health care facilities were very poor, and education non-existent.

Following independence in 1948, education and health services were made freely available to all citizens with voting rights. Tamils were disenfranchised, however. Bypassed by the major welfare schemes, they remained dependent on their employers for basic needs. But plantation managers made no real effort to match state welfare measures, and the physical well-being of the Tamil population deteriorated further.

Plantation estates were nationalized in 1975. But although employment is high in the plantation sector and the state heavily involved in its management, low wages keep Tamil plantation workers trapped in the poverty cycle.

Poor diet, poor education, poor health

For Tamil women, patriarchal cultural norms further limit opportunities for meeting basic needs. Their physical quality of life is well below the national average. The maternal and infant mortality rates for 1972-1980 for the Nuwara Eliya district (where many of Sri Lanka's tea plantations are found) were consistently higher than the national norm. In addition, life expectancy in Nuwara Eliya was also lower than that of other districts for 1971 and 1980, and lower among women than men.

Poor diet is probably related to these findings. Although per capita calorie intake on plantations has been recorded as around 2,000 per day, one of the highest among all population groups in Sri Lanka, the rate of chronic undernutrition in the plantation sector was also high (60%). Three interlinked factors are relevant here. Most importantly, Tamil women lack time due to their outside wage employment. Secondly, in plantation households food preparation is regarded as women's work. And thirdly, the educational levels of these women tends to be low.

For a female tea plucker with a home and family to attend to, the daily schedule is long and arduous. Starting as early as 4 a.m., and often not finishing until 10.30pm, she is usually the last to go to bed and generally sleeps on a mat or gunny bag (unlike her husband who will probably use the one string cot of the household). Her paid work involves climbing steep slopes, exposure to rain, cold winds and hot sun, and carrying a weight of up to 20^B25 kilos on her back. Preparing food in the traditional manner is time-consuming, and the household technology and food supplies available to her are limited. Fish or meat are rarely included in the diet.

Tamil women's lack of time also affects their access to health care. Plantations usually have health facilities, but often women will not visit them for fear of losing working time. Illnesses among these women are frequently respiratory or bowel related. Exposure to bad weather, overcrowded dwellings and poor diet contribute to the incidence of respiratory illness, while polluted water, inadequate sanitation facilities and poor personal hygiene lead to diarrhoea and abdominal complaints.

Only rudimentary educational facilities are provided for plantation workers. Even then, girls may be discouraged from going to school, or kept at home to look after younger siblings while parents are working. The expectation that daughters will be employed as tea pluckers by the time they are 14 years of age also discourages education. Better education would improve the decision making ability of Tamil women not only in relation to nutrition but also on issues such as fertility control, and maternal and child care. It might also lead them to question patriarchal norms, such as the collection of a woman's wages by her husband or another male relative, and so reduce the conflicts which arise when husbands' spend their wives' hard-earned wages on gambling and alcohol.

In common with plantation areas in other countries, a concerted effort on several fronts (for example education, redistribution of household labour, further state intervention, and improved access to health services) will be necessary to secure any lasting improvements in the health of female plantation workers.

Summary of the work of:

Samarsinghe V. *Access of female plantation workers in Sri Lanka to basic needs provisions.* Unpublished paper presented at Commonwealth Geographical Bureau Workshop on Gender and Development, UK, 1989. (See Appendix for contact address)

Fetal protection policies

In March 1991 the US Supreme Court ruled that personnel practices limiting the employment of fertile women in jobs posing reproductive health hazards constitute illegal sex discrimination. The ruling has important implications for public policy in other situations in which vulnerability to the health effects of toxic substances is associated with real or perceived biological differences between the sexes.

The fetal protection policy of Johnson Controls, the largest producer of batteries in the US, excluded women from jobs involving significant exposure to lead. As lead is a basic raw material in battery manufacture, this effectively excludes women from all production jobs. The only exceptions permitted were women whose sterility was medically documented. In 1984 the Union of Automobile Workers (UAW) sued Johnson Controls, arguing that the corporation's fetal protection policy constituted explicit gender-based discrimination, rather than a gender-neutral policy to protect fetuses that happened to exclude women rather than men. Initial hearings upheld the Johnson Controls policy, and the case came to the US Supreme Court.

This "gender-neutral with disparate impact upon women" argument had been successfully used by employers in past cases concerning fetal protection policies. The plaintiffs presented scientific evidence that lead harms male reproductive capacity, possibly produces defects in fetuses by damaging male germ cells, and produces non-reproductive health damage at low-exposure levels in both men and women. The plaintiffs examined the processes by which employers arrive at exclusionary hiring policies, contrasting the large number of jobs which actually pose fetal hazards (speculated at up to 20 million) with the relatively small number covered by fetal protection policies. If employers were as concerned for fetal safety as they claimed, why were gender-specific policies found only in male-dominated, high-wage industries and not in equally hazardous female-dominated-low-wage industries? Employers could easily, according to the plaintiffs, claim moral and ethical justifications for essentially economic, profit-oriented decisions.

A tool to maintain high wages for men?

Gender-specific fetal protection policies reflect a balancing of advantages and disadvantages for employers, but not for employees or society at large. The supply of male workers is a key factor. In industries where profit rates are high enough to permit high wages, and unions strong enough to obtain them, there is an ample

supply of both male and female job applicants. But implicit and explicit gender-based discrimination in these industries has historically reserved the jobs available in them for men. Where profits are too low to permit high wages and/or unions too weak to obtain them, applicants are often female workers who are excluded from the highly paid jobs in profitable, unionized industries.

It is possible that exclusionary policies are counterproductive even when evaluated solely in terms of fetal safety. Women excluded from male-dominated industries are virtually certain to earn lower wages and have less generous (if any) health insurance, both of which are linked to nutritional status, use of prenatal medical services, and other important determinants of fetal outcomes. The direct fetal risks from toxic substances may be even higher in some female-dominated industries, precisely because of the relative absence of labour unions and other economic incentives to improve working conditions. There was, the plaintiffs emphasized, no basis for treating health hazards to fetuses as socially more significant than health hazards to adult men and women.

The Supreme Court ruling in favour of the plaintiffs was unanimous. The Court noted evidence concerning the debilitating effects of lead exposure on the male reproductive system, but based its decision on the invalidity of policies ostensibly designed to protect the interests of female workers against their own volition. This anti-paternalistic approach essentially closed the door on fetal protection policies, leaving decisions about the welfare of future children to their parents, rather than to the employers who hire those parents.

Many toxic substances which harm the developing fetus in the workplace also harm the reproductive capacity of adult workers and impose non-reproductive health burdens on both men and women. For these substances, policies designed solely to protect the developing fetus not only impair the employment opportunities of female workers, but also leave male workers unprotected and limit the pressure to reduce exposures for all members of the population. However, the argument against fetal protection policies can be made solely on the basis of the damaging effects of labour restriction and segregation for women referred to above. Occupational segregation reinforces gender stereotypes that have traditionally restricted women's efforts to gain economic independence and take on prominent public roles.

Summary of the work of:

Robinson JC, Giacomini MK. A reallocation of rights in industries with reproductive health hazards. *Milbank quarterly*, 1992, 70(4):587-603.

Environmental and occupational health problems in rural Nigeria

Akwa Ibom State in south-east Nigeria is a traditional society with a population of over 2 million; 35% of the population is urban-based, while 65% lives in rural or riverine areas. Women of child-bearing age (15-49 years) comprise 20% of the population (471,947). All women confront myriad problems which affect their health, development and economic participation in society. Women's roles, including reproduction, farming, and home management, are perceived as secondary, although they are often major breadwinners and responsible for their children's education, food, clothing, and general family upbringing, and receive little or no assistance from their male counterparts.

Environment

There are three types of environmental settlement in Akwa Ibom State: riverine, rural on-shore, and urban. Environmental health hazards occur in each.

Riverine settlements

Forty percent of all women of child-bearing age live in riverine areas, where they compete with men in the principal occupation for both sexes, namely fishing. Women live in swamps in thatch and bamboo houses raised above the water. There is no sanitation so the river water, used for all purposes, is highly contaminated. Typical diseases suffered by women in these areas include malaria, diarrhoea, dysentery, cholera, typhoid, guinea worm, and onchocerciasis. Musculoskeletal disorders such as rheumatism and arthritis due to prolonged cold and damp are common. Families in these areas tend to be large and poor with an unbalanced diet, prone to malnourishment and debilitating diseases. With settlements concentrated on river banks, overcrowding is inevitable and rates of respiratory illness such as coughs, catarrh, pneumonia, and tuberculosis are highly prevalent. In the dry season, fire risk is very high due to the practice of smoking fish. Loss of life and property is common.

Women's daily fishing activities consist of paddling their canoes in all weathers, with nursing infants strapped to their backs. Even women in advanced stages of pregnancy continue fishing to support their families. During the rainy season,

canoes may capsize and river banks overflow, causing loss of life and property, and sometimes destroying homes.

Rural on-shore settlements

Approximately 50% of women of child-bearing age live in rural environments. Their main occupations are farming and petty trading, sometimes through barter if cash is lacking. To maintain the home, women must fetch water, often from distant sources, and cut and collect firewood.

In years of drought and famine, malnutrition is widespread. A case study carried out on the nutritional status of women in low-income groups in this area showed that their staple foods—cocoyams, cassava, garri from cassava, and yams—consist mainly of carbohydrates and lack protein. Peptic ulcer is a frequent complaint in women, induced by overlong intervals between meals.

Housing in rural areas tends to be overcrowded and poorly ventilated, and the local environment is often malarial. Respiratory diseases are rife.

Urban settlements

Only 10% of women of childbearing age are urban-based. Of these, 4% are waged or salaried workers, while 6% are petty traders. Husbands tend to control the incomes of their working wives, who may retain little for the upkeep of the family. Petty traders in salt, vegetables, fruits, rice, yams, and garri, rise very early to get to the market and purchase their stocks, and return home late. Medical care is limited due to low income, although traditional healers and prayer houses are used for treatment.

Occupational hazards and health effects

Employment statistics show that 44% of women are farmers, 40% fisherwomen, 8% petty traders, 5% salaried workers, and 3% housewives. The 3% who depend solely on husbands for their upkeep are poorly nourished as they receive insufficient money to feed each member of their family. Women who undertake income generating activities face long and hard days which expose them to a variety of occupational hazards. Some of these are examined below.

Farming

This remains one of the most arduous and tedious jobs for women. It entails manual clearing of bushes, burning, planting, weeding, harvesting and sale of crops. Women rise as early as 4 am to trek to the farmlands, work under the scorching sun with little food, and return home late where they then perform domestic chores. Men may do

a little agricultural work, but then return home to relax, or visit palmwine bars where they drink away money which would be better spent on family upkeep. The health problems for women include peptic ulcer, anaemia due to protein malnutrition, accidents and injuries, body pains and hypertension, arthritis and rheumatism, and premature and still-births attributed to lack of rest.

Palm oil processing

Palm oil processing, exclusively the work of women, involves obtaining palm fruits from thick bush or plantations, fetching water and firewood, boiling and pounding of palm fruits, and squeezing the hot pounded mixture to produce oil. Potential health risks associated with this work include accidents and injuries in the bush when collecting the fruits, water and fuel; hypertension; burns; dermatitis; and chest, back, and other body pains. If pregnant, women risk premature labour or accidental haemorrhage.

Illicit gin processing

Illicit gin processing, usually done by women, entails boiling fermented palm wine. It involves collecting wood from the bush and forest, which exposes them to accidents and injuries. Associated risks include burns, dermatitis, and eye problems such as pain and watery discharge due to exposure to heat and the smoke from the fires. The women may also develop ulcers and heartburn if they drink the gin on empty stomachs. Some become alcoholics.

Garri processing

Garri processing is also women's work and involves peeling, grating, extracting water, and finally frying cassava. The frying requires a big fire and a large open container for the cassava. Associated health problems include chest pains from grating the cassava, and dermatitis and eye problems due to exposure to excessive heat. (See also Section 9, this chapter concerning toxic effects of cassava processing.)

Labouring

Women labour on plantations and construction sites. On construction sites they are often required to carry mixed concrete from ground level to upper storeys via scaffolding or inclined planks. Falls from faulty scaffolding occur frequently. Pregnant women also engage in this work, which can lead to miscarriage, premature delivery and death. Women also carry blocks for brick-layers and off-load cement from trucks. Chest pains occur from excessive lifting and carrying, and respiratory and lung diseases result from inhalation of brick and cement dusts.

Women's social status

Women are regarded as second class citizens whose primary purposes are to reproduce and generate income on behalf of men. This applies to all women, regardless of whether or not they are educated. Women's secondary status is reflected in their nutritional status and deprives them of control over food sources. For example, if a woman has a goat or hen which produces male young, these young automatically belong to the husband. Certain foods may not be eaten by women on pain of punishment as severe as banishment from the home. Women are, in fact, treated as slaves. In this condition they are vulnerable to disease and death arising from low resistance. Moreover, harmful practices such as female circumcision, forced marriage, and widowhood doom, further undermine women's health.

Food taboos for pregnant women abound, particularly in connection with high protein items. Women accordingly suffer from anaemia, malnutrition and lowered resistance to infection.

The community believes that uncircumcised women are promiscuous and women are therefore circumcised between the ages of 10 and 18 years. Efforts are currently being made to counteract this practice since it is highly dangerous, exposing the woman to multiple risks during the difficult childbirth which follows. Obstructed labour, recto-vaginal fistulae and uterine prolapse are frequent effects of female circumcision.

Large families are the norm, the average mother producing between six and ten children. Approximately 60% of families are polygamous, and 40% monogamous. Women are exposed to high morbidity and mortality rates from gynaecological disorders following multiple and closely-spaced births, as well as the above-mentioned problems due to female genital mutilation. They have little or no knowledge of family planning procedures, and religious or cultural beliefs may inhibit the use of contraceptives. Pressure to produce male children to inherit the father's property is strong, and women who fail to produce male children risk being driven out of their marital homes. To avoid this, they undergo successive pregnancies.

Young girls are often compelled to marry men considerably older than themselves, and undergo pregnancy when they are too young for such responsibility. Obstetrical complications and death are frequent as young girls' pelvic bones are usually insufficiently developed for delivery.

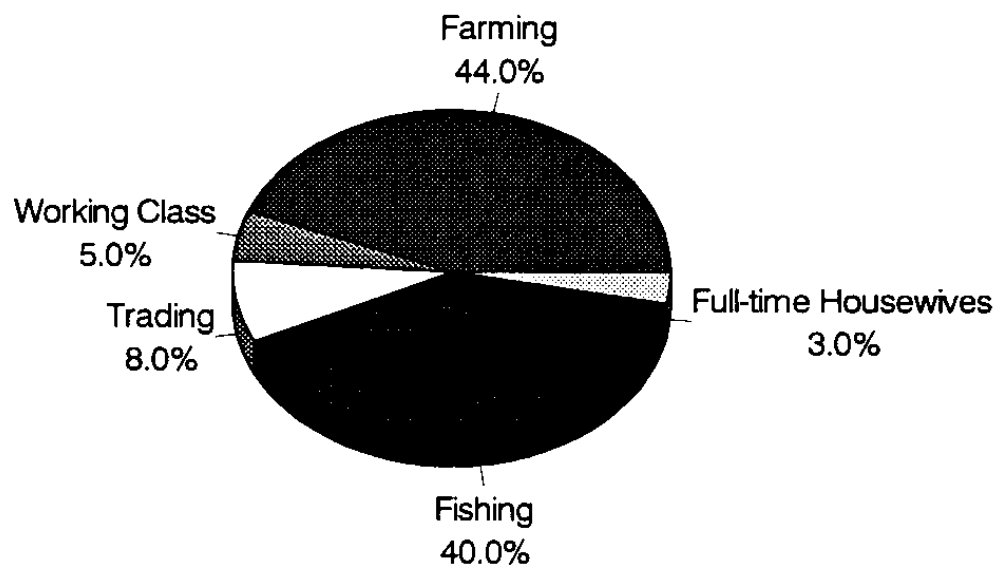
Widows are often forced to marry a man from their late husband's family, regardless of the number of his existing wives and children, or of the number of children the widow already has from her first marriage. This practice compels widows to bear children for the new husband in order to receive a share of the family resources, even if further childbearing is dangerous. The widow's own property and that of her late

husband is always seized on his death, exacerbating her grief, frustrating her and generally impairing her physical and mental wellbeing. Measures are needed to save widows from the risks and humiliations they are forced to undergo.

The social structure of Akwa Ibom State, coupled with environmental conditions, creates levels of suffering for women which exceed those of men. Women experience high morbidity and mortality rates due to their exposure to numerous hazards in their daily activities and specific environments. The biological functions of women also expose them to risk. Provision of modern equipment to reduce manual labour, training to enable women to manufacture such equipment, training in crafts, provision of community health activities, creation of self-development programmes, and the provision of credit for small-scale trading and farming, could all help to improve the health status of women in this region.

Taken in conjunction with evidence from other traditional societies in Africa and elsewhere, it can be assumed that the conditions outlined here are relevant to the position of women in many other areas and regions. This contribution supports the implicit and explicit message that poor women everywhere struggle to discharge major responsibilities in relation to their social and occupational environments with minimal resources and the added burden of powerlessness. The effect on their health needs no clarification.

Women of reproductive age by occupation



Summary of the work of:

Nkanga JA. *Environmental and occupational health problems and societal norms affecting women of Akwa Ibom State, Nigeria*. Unpublished paper prepared for this Anthology, 1993. (See Appendix for contact address).

APPENDIX

Authors' List

Amadi IR. Women and widowhood practices in Imo State, Nigeria. 1993. Unpublished paper prepared for this Anthology. (Available from Ms Irene R Amadi, Head of Department of Health and Social Welfare, Ikeduru Local Government of Nigeria, PMB 2, IHO, Imo State, Nigeria.)

Anyangwe S, Njikam OM, Kouemeri L. Urinary schistosomiasis in women: an anthropological and descriptive study of a holo-endemic focus in Cameroon. Unpublished paper produced for WHO meeting on Gender and Tropical Diseases, Oslo, 1992. (Available from Dr S C Anyangwe, Department of Public Health, University of Cameroon, CUSS, Yaounde, Cameroon.)

Batliwala S. Women's access to food. *Indian journal of social work*, 1987, 48:(3):255B271.

Behera D, Dash S, Yadav SP. Carboxyhaemoglobin in women exposed to different cooking fuels. *Thorax*, 1991, 46:344B346.

Bird HA, & Hill J. Repetitive strain disorder; towards diagnostic criteria. *Annals of the Rheumatic Diseases*, 1992, 51:974-977.

Bowler RM et al. Stability of psychological impairment: two-year follow-up of former microelectronics workers' affective and personality disturbance. *Women and health*, 1992, 18(3):27B48.

Brieger R, Watts S, Yacoob M. Guinea worm: an in-depth study of what happens to mothers, families and communities. *Social science and medicine*, 1989, 29(9):1043B1049.

Brieger R, Watts S, Yacoob M. Guineaworm, maternal morbidity, and child health. *Journal of tropical pediatrics*, 1989, 35(Dec):285B288.

Brisson C, Vézina M, Vinet, A. Health problems of women employed in jobs involving psychological and ergonomic stressors: the case of garment workers in Quebec. *Women and health*, 1992, 18(3):49B65.

Cecelski E. Energy and rural women's work: crisis, response and policy alternatives. *International labour review*, 1987, 126(1):41B64.

Chatterjee M, Lambert J. Women and nutrition: reflections from India and Pakistan. *Food and Nutrition Bulletin*, 1989, 4:13B28.

Chen BH et al. Indoor air pollution in developing countries. *World health statistics quarterly*, 1990, 43(3):127B138.

Dalsimer M, Nisonoff L. Implications for Chinese rural women of new agrarian and family planning policies. *Feminist studies 13*, 1987, 3:583B607.

Edmundson WC, Edmundson SA. Food intake and work allocation of male and female farmers in an impoverished Indian village. *British journal of nutrition*, 1988, 60:433B439.

Ettling M. Malaria and mobility. *World health magazine*, 1990, AprilBMay.

Falu A, Curutchet M. Rehousing the urban poor: looking at women first. *Environment and urbanization*, 1991, 3(2):23B38.

Ferguson A. Women's health in a marginal area of Kenya. *Social science and medicine*, 1986, 23(1):17B29.

- Ferrar P. Food laced with cyanide. *Partners in research for development* (Australia), 1992, 5:29B33.
- Ferro-Luzzi A. Seasonal energy stress in marginally nourished rural women: interpretation and integrated conclusions of a multicentre study in three developing countries. *European journal of clinical nutrition*, 1990, 44(1):41B46.
- Gerhardsson L, Ahlmark A. Silicosis in women: experience from the Swedish pneumoconiosis register. *Journal of occupational medicine*, 1985, 27(5):347B50.
- Gittelsohn J. Opening the box: intrahousehold food allocation in rural Nepal. *Social science and medicine*, 1991, 33(10):1141B1154.
- Grobbelaar JP, Bateman ED. Hut lung: a domestically acquired pneumoconiosis of mixed aetiology in rural women. *Thorax*, 1991, 46:334B340.
- Guendelman S, Jasis Silberg M. Health consequences of maquiladora work: women on the US-Mexican border. *American journal of public health*, 1993, 83(1):37-44.
- Holmboe-Ottesen G, Wandel M. Men's contribution to the food and nutritional situation in the Tanzanian household. *Ecology of food and nutrition*, 1991, 26:83B96.
- IPCS, *Environmental Health Criteria 123; Cadmium*. WHO, Geneva, 1992.
- Jeffery R, Jeffery P, Lyon A. Cattle-dung and dung-work. An aspect of the value of women's work in rural North India. *Internationales asienforum*, 1989, 20(1B2):21B42.
- Kendie SB. Survey of water use behaviour in Rural North Ghana. *Natural resources forum*, 1992, 16(2):126B131.
- Lado C. Female labour participation in agricultural production and the implications for nutrition and health in rural Africa. *Social science and medicine*, 1992, 34(7):789B807.
- Leslie J. Women's nutrition: the key to improving family health in developing countries? *Health policy and planning*, 1991, 6(1):1B9.
- Lindbohm M-L et al. Effects of parental occupational exposure to solvents and lead on spontaneous abortion. *Scandinavian journal of work, environment and health*, 1992, 18(Suppl. 2):37B39.
- McCauley AP, West S, Lynch M. Household decisions among the Gogo people of Tanzania: determining the roles of men, women and the community in implementing a trachoma prevention programme. *Social science and medicine*, 1992, 34(7):817B824.
- Mehretu A, Mutambirwa C. Time and energy costs of distance in rural life space of Zimbabwe: case study in the Chiduku communal area. *Social science and medicine*, 1992, 34(1):17B24.
- Messing K, Reveret, J-P. Are women in female jobs for their health? A study of working conditions and health effects in the fish-processing industry in Quebec. *International journal of health services*, 1983, 13(4):635B648.
- Mishra VN, Malhotra M, Gupta S. Chronic respiratory disorders in females of Delhi. *Journal of Indian medical association*, 1990, 88(3): 77B80.
- Mumford JL et al. Lung cancer and indoor air pollution in Xuan Wei, China. *Science*, 1987, 235:217B220.

Nkanga JA. 1993. Environmental and occupational health problems and societal norms affecting women of Akwa Ibom State, Nigeria. 1993. Unpublished paper prepared for this Anthology. (Available from Mrs Jessie A. Nkanga, Ministry of Health and Social Welfare, Family Planning Division, Secretariat Complex, UYO, Akwa Ibom State, Nigeria.)

Nwaorgu OC. Schistosomiasis and women in Amagunze, South-East Nigeria. Unpublished paper prepared for WHO meeting on gender and tropical diseases, Oslo, 1992. (Available from Dr O Nwaorgu, Department of Parasitology and Entomology, Department of Sociology, Anambra State University of Technology, Anambra, Nigeria.)

Ouwari, Y. The changing role of women in families and their housing needs: a case study of Port Harcourt, Nigeria. *Environment and urbanization*, 1991, 3(2):6B12.

Pandey MR, Basnyat B, Neupane RP. *Chronic bronchitis and cor pulmonale in Nepal*. Kathmandu, Mrigendra Medical Trust, 1988.

Parker M. Reassessing disability: the impact of schistosomal infection on daily activities among women in Gezira province, Sudan. *Social science and medicine*, 1992, 35(7):877B890.

Pope III CA, XU XP (1993). Passive cigarette smoke, coal heating, and respiratory symptoms of non-smoking women in China. *Environmental Health Perspectives*, Vol.101, No.4, 314-316.

Ramalingaswami V, Purcell RH. Waterborne non-A, non-B hepatitis. *Lancet*, 1988, March 12, 571B573.

Rao B. Women and water in rural Maharashtra. *Environment and urbanization*, 1991, 3(2):57B65.

Rasanayagam Y. Women as agents and beneficiaries of rural housing programmes in Sri Lanka. 1989. (Unpublished paper, available from University of Colombo, College House, 94 Kumaratunge, Munedisa MW, Colombo 3, Sri Lanka.)

Restrepo M et al. Prevalence of adverse reproductive outcomes in a population occupationally exposed to pesticides in Colombia. *Scandinavian journal of work, environment and health*, 1990, 16:232B38.

Robinson JC, Giacomini MK. A reallocation of rights in industries with reproductive health hazards. *Milbank Quarterly*, 1992, 70(4): 587B603.

Rowshan R. Women in disaster. *Journal of social studies*, 1992, 57:81B88.

Samarsinghe, V. *Access of female plantation workers in Sri Lanka to basic needs provisions*. Unpublished paper presented at Commonwealth Geographical Bureau Workshop on Gender and Development, UK, 1989.

Sarin M. Improved stoves, women, and domestic energy. *Environment and urbanization*. 1991, 3(2):51B56.

Steketee, RW et al. Malaria prevention in pregnancy: the effects of treatment and chemoprophylaxis on placental malaria infection, low birth weight, and fetal, infant and child survival. USAID/US Dept. of Health and Human Services, 1994. Available from Centers for Disease Control and Prevention, International Health Program Office, Atlanta, GA 30333, USA.

Smith KR. *Biofuels, air pollution, and health: a global review*. New York, Plenum Press, 1987.

Watts S, Brieger R, Yacoob M. Guinea worm: an in-depth study of what happens to mothers, families and communities. *Social science and medicine*, 1989, 29(9):1043B1049.

Zajac A. Clinicopathologic and socioeconomic impact of Chagas disease on women: a review. In: Wijeyaratne P, Rathgeber E, St-Onge E, eds. *Women and tropical diseases* (IDRC-MR314e). Ottawa, International Development Research Centre, 1992:134B148.