

# Effects of economic change on male morbidity in neighbouring industrial and rural municipalities in northern Sweden

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## Abstract

**Study objective**—The aim was to investigate the health effects of economic changes in a rural and industrial community.

**Design**—This was a historical cohort study with retrospective information on exposure and information on health outcome from a mailed questionnaire (response rate 82.5%).

**Setting**—An industrial and a rural community in northern Sweden.

**Participants**—Participants included all men born in a rural community and a random sample of men born in a neighbouring industrial community 1915-1924 and alive in 1984 (N = 1989).

**Main results**—Morbidity was higher in the cohort born in the rural municipality in which more profound changes in the socioeconomic structure had occurred. Even when taking such factors as childhood deprivation, migration, socioeconomic status, early retirement, unemployment, and single living into consideration, most of the differences in morbidity in the two municipalities still remained. However, the changes in employment conditions alone do not appear to explain the differences in morbidity that were found.

**Conclusion**—The higher morbidity in the rural community indicates a health effect of the profound economic changes in that community but this difference cannot be explained by crude indicators of exposure to migration, unemployment, and other indicators of economic change.

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The Swedish economy has undergone considerable change since 1940 with the proportion of the employed population working in agriculture and forestry declining from 25% to 5% by 1980, while employment in industry increased from 38% to a maximum of 45% in the 1960s, falling to 30% in the 1980s.<sup>1</sup> Policital goals of economic growth and full employment have had high priority. Technical rationalisation as well as geographical and occupational mobility has been encouraged.<sup>2</sup> While the overall goals have been achieved to a considerable degree, the effects of this process on health have been questioned, since mortality among middle aged men in industry has increased during the 1960s and 1970s.<sup>3</sup>

Technical and organisational advances have increased productivity in the agricultural, forestry, mining, and manufacturing industries

considerably during the last 50 years.<sup>4</sup> The consequences of this process on the work force differ depending on whether the dominating economic sector is industrial or agricultural. Few occupational alternatives exist in rural areas where agriculture and forestry are the dominant industries and unemployment, emigration, early retirement, and a tendency to social disintegration of the community will result when employment opportunities are lost through technological advances. However, in industrialised areas technological improvement increases production and permits a more constant level of employment. The competition for work will increase the pace and demand of the work process.

Changes in the pattern of industry and employment in an area may have widespread effects on the health of the community. The effects of changes in local conditions of employment on somatic disease, in particular on cardiovascular disease, and on mental health have been extensively studied and their effects evaluated.<sup>5-10</sup> Such studies have usually only had a relatively short follow up period and little is known about the combined effect of these factors on long term morbidity. The effects of industrialisation on general health,<sup>11</sup> hypertension and cardiovascular diseases,<sup>12</sup> mental health and alcohol consumption,<sup>13 14</sup> and on the effects on overall morbidity caused by the change to industrial employment have also been evaluated in two Mexican village populations.<sup>15</sup>

The economy in northern Sweden has been poorly differentiated and more sensitive to structural changes. Agriculture has become less profitable over the last 10-15 years and a considerable proportion of farms has been phased out in many areas. Development in the two northernmost communities in Sweden—Pajala and Kiruna—however, has differed.

Pajala is a rural community in which the dominating industries are forestry and agriculture. In these sectors, employment declined by more than 80% between 1940 and 1980 (table I). Practically no industrial investments were made to compensate for this. Employment in service and care occupations increased, especially among women, but the overall level of employment decreased by one third. Currently, the employment conditions in Pajala are characterised by high rates of unemployment, early retirement, and emigration from the municipality. Kiruna, however, is a municipality with very little agriculture and considerable social and geographical mobility. The economy has been dominated by the iron mining industry and despite the considerable fluctuations in the price and demand for iron ore the level of employment in

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men has been relatively high and stable compared to Pajala. The overall employment increased by 84% from 1940 to 1980. The mining industry was rationalised during the 1950s and 1960s, transforming the quarry into the largest iron mine in the world. These new working conditions led to conflicts on the labour market and a period of strikes in 1969–1970.<sup>16</sup>

Both municipalities had very high fertility rates that have made emigration necessary from both municipalities despite the expanding industrial sector in Kiruna. However, the possibility of remaining in Kiruna has been greater than in Pajala, where the total number of jobs for men has declined.

We have examined differences in the effects of changes in employment conditions in two cohorts of men born in neighbouring rural and industrial municipalities in which employment opportunities over the past two or three decades have differed markedly.

*Table I Distribution of population (men and women) in different economic sectors, 1940–80, in the municipalities Pajala and Kiruna in northern Sweden. Age 18–64 years. Source: Statistics Sweden, census tables.*

|                          | 1940<br>(%) | 1960<br>(%) | 1980<br>(%) |
|--------------------------|-------------|-------------|-------------|
| Rural community:         |             |             |             |
| Agriculture and forestry | 48.6        | 27.6        | 11.8        |
| Industry                 | 4.7         | 12.0        | 14.1        |
| Service, transport, care | 9.7         | 16.0        | 31.7        |
| Not employed             | 37.0        | 44.4        | 42.4        |
| Industrial community     |             |             |             |
| Agriculture and forestry | 10.7        | 2.3         | 1.9         |
| Industry                 | 27.8        | 29.2        | 24.8        |
| Service, transport, care | 22.1        | 21.2        | 44.0        |
| Not employed             | 39.4        | 47.3        | 29.3        |

### Methods

This study was a retrospective cohort study on men born between 1915 and 1924 in the municipalities of Pajala and Kiruna. The study sample included all men born between 1915 and 1924 in Pajala ( $n = 1562$ ) and a random sample of men ( $n = 1707$ ) born in Kiruna between the same years. In 1984, all subjects were traced irrespective of whether or not they still lived in Pajala or Kiruna, and 60.8% ( $n = 1989$ ) were still alive.

A postal questionnaire that included questions about medical symptoms and complaints, occupation, unemployment, social network, and minor psychiatric symptoms (using the 12 item version

*Table II Living conditions among men born 1915–24 in a rural and industrial community in northern Sweden.*

| Community                                | Rural community<br>(%)<br>( $n = 783$ ) | Industrial community<br>(%)<br>( $n = 858$ ) |
|--|---|--|
| Father's occupation:                     |   |  |
| farmer                                   | 43.1                                    | 4.7  |
| worker                                   | 38.5                                    | 68.6   |
| employee                                 | 4.1                                     | 10.5   |
| unknown                                  | 14.3                                    | 16.3   |
| Mortality before 15 years:-              |   |  |
| Father's occupation:                     |   |  |
| farmer                                   | 20.4                                    | 11.8   |
| worker                                   | 20.7                                    | 15.3   |
| employee                                 | 12.9                                    | 9.4  |
| unknown                                  | 23.6                                    | 27.3   |
| Own occupation:                          |   |  |
| farmer                                   | 4.9                                     | 1.0  |
| worker                                   | 53.8                                    | 34.0   |
| employee                                 | 41.3                                    | 65.0   |
| Experienced unemployment in last 5 years | 18.8                                    | 2.7  |
| Early retirement pension                 | 45.1                                    | 34.5   |
| Migrated from birthplace                 | 55.3                                    | 31.0   |
| Single living                            | 20.7                                    | 17.8   |

of the general health questionnaire<sup>17</sup>) was sent to each subject. The overall response rate was 82.5%. The response rate was analysed for different risk groups and was found to be slightly lower (75.6%) among those living in Kiruna and higher among those who had moved to other parts of the country. Otherwise there were no differences in response rate between those who had and those who had not received inpatient care and no differences in their parents' socioeconomic group or birthplace.

We measured health outcome as the prevalence of certain symptoms among survivors in the cohort at the age of 60–69 years but had considerable difficulty in defining "exposure". The group of subjects born in Kiruna was considered to have avoided exposure to the changes in employment conditions that occurred in the municipality of Pajala.

On the individual level, exposure may be measured by studying such factors as childhood deprivation, migration, adult occupation, unemployment, early retirement, and social networks. Some of these life changes and conditions are a result of the changes in the economy and some are not. They occurred, however, at different rates in the two municipalities. The economic change may have direct effects on health by causing social disintegration, loss of sense of control and coherence, or other social or psychological problems. Factors affecting psychological aspects of health have, however, not been measured in this study.

Data were analysed with the CATMOD procedure of the SAS/STAT computer program.

### Results

The social conditions in the two cohorts differed considerably (table II). In Pajala, the rural community, a majority had parents who had been farmers and most had become blue collar workers, while in Kiruna, the industrial community, a majority had had working class origins but a high proportion had become salaried employees. As is shown in the child mortality rates, social conditions differed considerably in the municipalities and among children, depending on parents' social status. Childhood mortality was used as a measure of childhood deprivation in the eight subgroups, depending on type of municipality and on the parents' socioeconomic group. When the occupation of the subject's father was not recorded in the register, the most common reason was found to have been that he had been brought up in a single parent family.

The bivariate analysis showed a significant positive relationship between symptoms of cardio-respiratory disease, mental problems, and pain in muscles and joints on the one hand, and rural origin, childhood deprivation, no emigration from birthplace, occupation as worker or farmer, recent unemployment, single living, and early retirement on the other, since the latter was often a result of poor health. In table III, odds ratios (OR) for these variables are shown, calculated first in the bivariate analysis with birthplace (I) and secondly by multivariate analysis (II). The prevalence of all three groups of symptoms was higher in those born in the Pajala. Childhood

Table III Odds ratios and 95% confidence intervals (CI) for mental symptoms, cardiopulmonary symptoms, and pain in muscles and joints in relation to birthplace only (I), and birthplace together with childhood deprivation, own socioeconomic group, unemployment, migration, and single living (II). Age standardised (n=1641).

|                       | Mental symptoms | 95% CI    | Cardio-pulmonary symptoms | 95% CI    | Pain | 95% CI    |
|-----------------------|-----------------|-----------|---------------------------|-----------|------|-----------|
| I. Rural community    | 1.26            | 1.08-1.46 | 1.40                      | 1.22-1.61 | 1.29 | 1.16-1.43 |
| II. Rural community   | 1.22            | 1.02-1.47 | 1.33                      | 1.12-1.58 | 1.21 | 1.04-1.41 |
| Childhood deprivation | 1.01            | 0.97-1.05 | 1.00                      | 0.96-1.04 | 1.00 | 0.97-1.04 |
| Migrated              | 1.00            | 0.86-1.18 | 0.99                      | 0.87-1.17 | 0.90 | 0.80-1.01 |
| Employee              | 1.06            | 0.85-1.33 | 0.99                      | 0.80-1.23 | 0.88 | 0.75-1.03 |
| Early retired         | 1.55            | 1.31-1.83 | 1.87                      | 1.60-2.19 | 1.49 | 1.31-1.69 |
| Unemployed            | 1.17            | 0.99-1.39 | 1.18                      | 1.01-1.39 | 1.07 | 0.94-1.21 |
| Single living         | 1.19            | 1.00-1.41 | 0.96                      | 0.81-1.13 | 0.78 | 0.69-0.89 |

deprivation as well as migration seems to have had little influence and this appears to be true for socioeconomic group when early retirement is included in the model. As expected, single living is associated with higher levels of mental symptoms, although the prevalence of pains in joints and muscles was, unexpectedly, lower. Recent unemployment was associated with higher levels of mental and cardiorespiratory symptoms. When this analysis was run separately for the two cohorts a pattern emerged in which the risk factor of unemployment had a stronger effect on cardiorespiratory symptoms and single living on mental symptoms in subjects born in Kiruna (OR = 1.3) than in those born in Pajala (OR = 1.1). Other mediating variables such as social networks and social mobility did not add to the model, neither did interaction terms between the variables analysed.

### Discussion

If alternatives in economic and regional policies are to be evaluated systematically, the long term effects of changes in employment conditions on the health of the local work force should be studied. However, an inherent problem in the design of such studies is the lack of a population unexposed to the changes. The control sample from the municipality of Kiruna had not been exposed to the same changes in conditions of employment as the men from Pajala.

We chose to study the cohort of men born in 1915-1924 because we believe that they would have been at an age when many had built a family and a house and had put down roots by the time the technical rationalisation in the agricultural, forestry, and mining industries accelerated in the 1950s. They were too old to move easily to other parts of the country or change to other occupations, and too young to retire.

This study is limited to those 60% still alive 60-69 years after birth. Selective mortality mechanisms may have influenced our results, although deaths before the age of 15 years do not seem to have done so.

We found a higher morbidity at the age of 60-69 years in the cohort born in the rural municipality.

This municipality has suffered a more profound change in its socioeconomic structure, at least when we judge from differences in unemployment, migration, early retirement, and occupational mobility among the two cohorts. But when we include indicators of these social processes in our analysis, most of the difference in morbidity between the two cohorts remains. This result tends to discourage any interpretation about the causal effects of the change in the socioeconomic structure. An alternative could be to relate the difference to adverse social conditions in childhood in the rural municipality where the child mortality was considerably higher. But when we include this measure of childhood deprivation in the model it makes no difference. So the most adequate conclusion seems to be that the dramatic changes in the economic and social structure of the rural municipality are related to a higher morbidity but that the mechanism through which this effect is working can be defined only to a limited extent in terms of unemployment, migration, early retirement, and social mobility.

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