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Before asbestos, silicosis. Death from occupational disease in twentieth century France

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Occupational diseases cause more deaths than the statistics would have us believe. Taking the example of silicosis, Paul-André Rosental explains the many reasons behind this statistical under-estimation. It stems in part from the very notion of occupational disease, which is based on negotiations between employers and trades unions. Combining both medical and legal criteria, the definition is narrow, so many cases go unrecognized.

At first sight, only a tiny proportion of deaths occurring in France each year are due to occupational diseases: 493 out of 528,000 in 2005, i.e. fewer than one in a thousand [1]. Their impact on health is more visible however. Out of 41,347 recognized cases in 2005 (a steadily increasing figure), 21,507 involved permanent disability. The fact that the statistics do not reflect reality is nonetheless officially acknowledged. Over the last century, under-reporting of these diseases has been central to the difficulties facing occupational health policy in France [2].

The example of silicosis provides a striking illustration of this problem. Silicosis is an incurable lung disease caused by inhaled silica dust, affecting not only miners, but also workers in quarries, foundries, glass and porcelain factories, in construction and in public works [3]. Though the disease is now disappearing from national memory, it was the twentieth century's most deadly occupational disease in France. According to the International Labour Organization (ILO), millions of workers are still exposed in emerging industrialized countries, and for the World Health Organization (WHO), its eradication is a key priority. In rich countries, silicosis is still one of the most lethal occupational diseases, and a resumption of coal mining in response to rising oil prices could bring a renewed epidemic.

The history of silicosis foretells that of asbestos-related diseases. From a legal viewpoint, the two kinds of pathology have only been officially distinct since 1950. It was largely in relation to silicosis that the notion of "occupational exposure limits" was developed in the twentieth century to indicate the maximum concentration of a toxic product thought to be compatible with safe usage. This notion was applied to asbestos until it was banned in 1997 and is partly responsible for the high expected death toll from asbestos-related diseases (50,000 to 100,000 deaths by 2030 [4]). And with around 2.4 million workers exposed to carcinogenic substances, according to the Sumer 2003 survey (Box 1) [5], the notion of "exposure limits" is once again bringing death in its wake.

Occupational disease: a negotiated illness

The notion of "occupational disease" is both medical and legal. It dates back in France to a law of 1898 on occupational injuries, which establishes the legal principle of a compromise: all employees injured in the workplace are entitled to a fixed amount of compensation which releases both employee and employer from

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any further liability. Occupational injury thus became a mere corollary of industrialization. This same approach was applied to occupational diseases from 1919. It was acknowledged that certain pathologies are associated with particular working conditions and that "compensation" is therefore due.

But which diseases were covered by this new law? As explained by one of the pioneers of occupational medicine, the law of 1919 does away with "never-ending discussions about this or that case, but results in some diseases being qualified as occupational when perhaps they are not, while others that should probably be so are discounted" [6]. In other words, occupational diseases are negotiated diseases. Since the 1920s, their definition has been a topic of constant controversy between employers and trades unions, with no ready solution from the government or the medical community. Employees affected by diseases in the official list are entitled to a fixed amount of compensation. Since 1993, they have also been entitled to claim for unlisted diseases, provided they can prove that the illness is linked to their occupation.

Official reports recognize that the incidence of occupational disease is severely under-estimated under the current system [7]. As occupational physicians are paid by the employer, employees are reluctant to consult them for problems that might justify a certificate of unfitness for work and subsequent dismissal [8]. Rather than all too meagre financial compensation, a direct arrangement is sometimes preferred. In other words, the employee does not report his/her illness as an occupational disease and is covered by the standard Social Security health insurance, so the employer avoids paying higher contributions to the Social Security's occupational injuries and diseases branch. In return, the employee receives a range of perks and benefits.

Alongside under-reporting, under-recognition is another major factor, often tinged with arbitrariness. For mesothelioma and pleural cancers (asbestos-related diseases), for example, (Box 2), the proportion of unrecognized cases varies in a range of one to twelve between regions [9]. Almost 70% of all occupational diseases are thus thought to be "invisible", and regional variations are substantial. The law itself acknowledges these irregularities. Since 1997, the occupational diseases branch of the Social Security has received a fixed annual sum from the health insurance branch to cover the costs of occupational illnesses not covered by employers.

Silicosis, a magnifying mirror of occupational health problems in France

Silicosis provides an extreme illustration of these problems. Like asbestos, and for comparable reasons, the disease was not recognized until very late (1945), and compensation for victims was meagre. Because of the wide range of sectors concerned and the persistence of old medical traditions, it was not recognized as a separate disease for decades. Its causes are complex. Even within a given sector, conditions of exposure are very varied, with large differences in silica content, particle size and diameter, presence of other dust particles, levels of humidity, temperature and ventilation. The level of risk also depends on working conditions: strenuousness, and hence the amount of dust inhaled, continuous

Box 1

Occupational cancers*

According to the Sumer 2003 survey, 2,370,000 employees are exposed to one or more carcinogenic substances, of whom 70% are manual workers and 20% hold intermediate occupations in the industrial and health sectors.

A full half of all exposed employees work in construction, vehicle repair, metallurgy, and operational health services. The most exposed workers are young people on apprenticeship or training contracts, with 19% exposed to risk, compared with 15% of temporary workers, 10% of employees on permanent contracts, and 14% of employees on fixed-term contracts. Men are four times more exposed to carcinogens than women, though this difference is not simply an employment sector effect.

For all the products covered in the survey, it is difficult or even impossible to define an exposure limit below which the risk is zero. The decree of 1 February 2001 on the use of products that are carcinogenic, mutagenic and toxic to reproduction requires employers to switch to safer alternative substances whenever technically possible. Failing that, they must take all necessary precautions to limit exposure. In practice, for more than a quarter of the persons exposed to carcinogenic substances, exposure is severe, either because of long exposure periods, or because collective protection is inadequate.

** Source : [5] (extracts).*

Box 2

Asbestos-related cancers*

Cancers caused by asbestos exposure generally remain latent for twenty years or more. There are two main types:

- mesothelioma is a malignant tumour of the mesothelium. Its most common site is the pleura, but it may also occur in the peritoneum or more rarely in the pericardium. It is often referred to as "asbestos cancer" since the asbestos fibre is the only recognized risk factor, though the risk of developing the disease is not linked to the level of exposure. Existing treatments have little impact on life expectancy, which is generally between 12 and 18 months. Surveys indicate that the number of mesothelioma deaths in France could reach around 1,000 per year by 2030.
- bronchial and lung cancers are the leading cause of asbestos-related death. There are no clinical or radiological signs distinguishing them from other bronchial and lung cancers and they are not associated with pulmonary fibrosis. There is a dose-effect relationship between the level of asbestos exposure and the bronchial cancer risk, though it is impossible to give a safe exposure limit. Recent epidemiological assessments by INSERM and InVS suggest that the annual incidence of asbestos-related bronchial and lung cancers in France is between 1,800 and 4,000 cases.

** Source : [4] (extracts).*

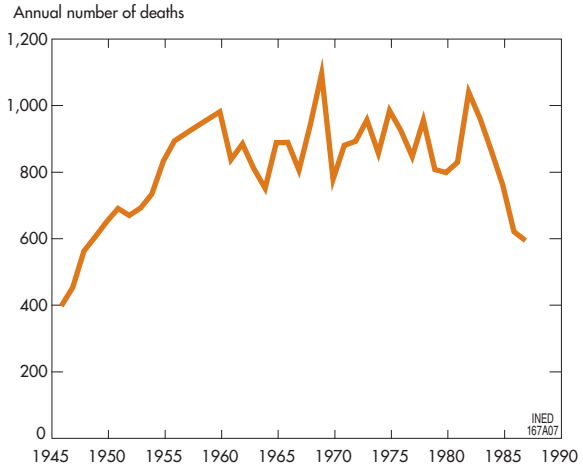
Legend - Left: *Asbestosis*. Right: *Silicosis*.
Cartoon published in *Le travail* (Quebec) in September 1948.
Source: Le Bilan du Siècle.

exposure time and work-shift length, not to mention the degree of mechanization and the presence or absence of preventive measures (ventilation or humidification for example).

Moreover, the disease presents in many different ways, and this represents a further difficulty. The first clinical signs do not develop for many years, and are non-specific. When the first symptoms appear, often after decades of exposure, the disease is already incurable. Yet chest X-rays, for long the most effective screening method, did not become widespread in France until the 1950s, at the end of the major coal-mining era. Further, silicosis is often associated with other lung pathologies. In France, experts called in by employers often used this argument to attribute symptoms to a tubercular superinfection, thereby releasing the company from liability.

The third negative factor is economic. Obliging coal producers to compensate miners with silicosis would have pushed up the price of coal. Yet up until the 1960s, coal was both a strategic raw material for industry and a major component of household expenses. Due to pressure from the mining lobbies, the disease was not legally recognized until 1945, fifteen years later than in certain other industrialized countries. This obstruction strategy had long-lasting consequences. For miners to be officially recognized as silicosis victims, they were required to have worked for at least five years in a relevant industrial sector before the first symptoms appeared. For employers wishing to cut compensation costs, these negotiated criteria – unprecedented for an occupational disease – provide opportunities to question epidemiological data, to make counter-diagnoses, to evoke "private" pulmonary diseases, to shorten the estimated exposure period, to place the burden of proof upon employees and to transfer liability for compensation to the health insurance schemes. Deployed in the case of silicosis by nationalized companies since 1945, these strategies are still widely adopted in other sectors today.

Figure - Official number of silicosis deaths among miners from 1946 to 1987



(P.-A. Rosental, *Population & Societies*, no. 437, INED, September 2007)
Source: [1].

A system of statistical opacity

What are the factors behind the under-estimation of silicosis deaths? For the period 1946-1987, during which legislation remained unchanged, the independent miners' social security fund (Caisse autonome nationale de la sécurité sociale dans les mines, CANSSM) reported an aggregate total of 34,000 silicosis deaths among miners or former miners (Figure).

But this is just a baseline figure. These estimates are based not on medical data, but on forensic records, whose content is limited to an administrative minimum. There is no official scale to measure the degree of incapacity for work of silicosis victims. From one annual medical examination to the next, miners who have contracted silicosis must wait to find out if their condition is officially recognized (1), then reach at least 50% incapacity before their death can, in practice, be attributed to the disease.

(1) In practice, five years of risk exposure recognized as such amount to twenty or thirty years of employment in the pit [10].

The mortality statistics only count victims whose dependants have lodged a successful silicosis claim to obtain a survivor's pension. This discounts the many families who do not go ahead with such claims, not to mention the victims who have no heirs. The procedure is lengthy – two years according to CANSSM – but often takes even longer: in 1993, 190 claims submitted in 1990 and 188 submitted in 1989 were still outstanding, for a total of 551 recognized silicosis deaths in the year. Many families refuse to authorize a delayed autopsy, often requested more than a year after death. And the outcome is by no means certain. From 30% in the 1950s, the refusal rate of the pensions committee (Comité d'avis sur rente, CAR) increased steadily, reaching two-thirds by 1991. Several obstacles prevented dependants from establishing a link between silicosis and death: the often long interval between risk exposure and disease onset, the combined presence of other pathologies and the wide range of possible complications. According to the coal producers, around 20% of victims' families did not submit a claim [11]. This raises the number of silicosis deaths between 1946 and 1987 from 34,000 to more than 40,000. Moreover, in addition to the miners whose silicosis was not recognized, and those whose incapacity level was too low, this estimate also excludes those who moved into a different industrial sector after the pits closed.

Immigration is yet another factor of statistical under-estimation. Despite the existence of bilateral agreements, it was very difficult for Polish mine workers who returned home in the Great Depression of the 1930s or after the Liberation in 1945 to make successful silicosis claims. The same was true for Moroccan miners from the 1960s. Hired during the period of progressive pit closure, they were employed under fixed-term contracts (generally eighteen months) which were not renewed if suspicious symptoms were detected at their medical examination. So for Moroccans, exposure was rarely long enough to qualify for recognition. This structural link between immigration and occupational health is very strong: from the 1920s, as was the case in many industrialized countries, poorly protected immigrant workers in France were assigned to the most dangerous jobs, sometimes with little support from trades unions. This over-assignment of high-risk jobs to foreign workers affected occupational health in general, since there was little pressure on employers to invest in risk prevention. Combined with the effects of fixed-term contracts and of return emigration, it led to further statistical under-estimation of silicosis and other occupational diseases.

All in all, the figure of 40,000 deaths is a low – perhaps very low – estimate of the number of silicosis victims among miners in France from 1946 to 1987. In view of all these factors – non-recognition of the disease, deaths attributed to other causes, miners leaving the pit, over-exposure to risk and tens of thousands of poorly protected immigrants since the 1920s – it will probably never be possible to measure the devastating human, demographic and health consequences of silicosis. It is with great discretion that this killer disease, still present in France today, continues to reap a terrible harvest, probably comparable in size to that of asbestos-related diseases.

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ABSTRACT

At first glance, only a tiny proportion of deaths occurring in France each year – fewer than one in a thousand – can be attributed to occupational diseases. It is acknowledged, however, that the statistics do not reflect reality. For example, in the coal mining industry alone, an estimated 34,000 deaths were officially attributed to silicosis, the most deadly occupational disease of the twentieth century, from 1946 to 1987. But the true figure is probably two to three times higher. This under-estimation has a combination of causes, including non-recognition of the disease, attribution of deaths to other causes, the departure of miners to other sectors and the omission of many cases among immigrants who worked in French mines.

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