Burying the Evidence:

How Great Britain is Prolonging the Occupational Cancer Epidemic

RORY O'NEILL, SIMON PICKVANCE, ANDREW WATTERSON, PHD

The U.K. authorities are failing to acknowledge or deal effectively with an epidemic of work-related cancers. The government's Health and Safety Executive (HSE) underestimates the exposed population, the risks faced as a result of those exposures, and the potential for prevention. The HSE fails to acknowledge the social inequality in occupational cancer risk, which is concentrated in manual workers and lower employment grades, or the greater likelihood these groups will experience multiple exposures to work-related carcinogens. It continues to neglect the largely uninvestigated and unprioritized risk to women and currently has neither a requirement nor a strategy for reducing the numbers and volumes of cancer-causing substances, processes, and environments at work. The result is that the U.K. faces at least 20,000 and possibly in excess of 40,000 new cases of work-related cancer every year, leading to thousands of deaths and an annual cost to the economy of between £29.5bn and £59bn. This paper outlines flaws in the HSE's approach and makes recommendations to address effectively the U.K.'s occupational cancer crisis. *Key words*: occupational cancer; Health and Safety Executive; United Kingdom; public health; policy.

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The U.K. government's workplace safety agency, the Health and Safety Executive, greatly underestimates the numbers of workers exposed to workplace cancer risks and the numbers developing occupational cancers, and seriously underestimates the fractions of cancers attributable to occupational exposures when compared with other countries such as France.[1] Although HSE has organized closed seminars and workshops recently on occupational cancer and is exploring policy options, it still presents findings of a 1981 US study as "the best overall estimate available."[2] This is the basis of its estimate of just 6,000 occupational cancer deaths in the United Kingdom each year. Yet the cost of one occupational cancer death has been put at £2.46m (US$5million). Even with the HSE estimate of just 6,000 occupational cancer deaths a year, this amounts to a total annual cost of almost £16bn (approximately US$30bn). Estimates included in this paper suggest the real toll and financial cost in Great Britain could be at least double this.[3] Preventing just 100 of these occupational cancer deaths each year would more than offset the entire HSE annual budget.

The findings of HSE's preferred source, the 1981 Doll/Peto report,[4] have been disputed[5] and described as "discredited," with authors criticizing both methodologic errors that led to a substantial underestimation of the true incidence[6] and the pro-industry leanings of the lead author.[7] Recent analyses suggest the real number of work-related cancer deaths in Great Britain each year is at least 12,000 and could be as high as 24,000.[8] New figures from the International Labor Organization support claims that the occupational cancer rate in developed nations is substantially higher than HSE's estimate.[9] Basing official policies on Doll/Peto estimates has resulted in a chronic failure to secure either the resources or the priority required for meaningful preventive action.

Exposure to a workplace cancer risk is not a minor concern affecting few people. The European Union's CAREX database of occupational exposures to carcinogens concludes: "According to the preliminary estimates, there were circa 5 million workers (22 per cent of the employed) exposed to the agents covered by CAREX in Great Britain in 1990–93. The number of exposures was circa 7 million."[10] Other recent studies suggest the number of workers at risk may in fact be increasing. Even by the CAREX estimate, over a fifth of the U.K. workforce has been exposed to possible human carcinogens, and for these workers most of the resultant cancers will emerge only after a couple of decades or more.

Where HSE acknowledges there is a risk, its new estimates of the at-risk working population seem designed to downplay the problem. In the case of cancer-causing beryllium, for example, HSE in 2003 said 250 workers in the United Kingdom were estimated to be continuously exposed and 1,000 workers occasionally exposed to "very low concentrations of beryllium or beryllium oxide." Its 2007 estimate says there are fewer than 1,000 exposed in fewer than 100 workplaces, yet acknowledges that beryllium use is increasing. HSE also ignores

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Address correspondence and reprint requests to: Andrew Watterson, PhD, Occupational and Environmental Health Research Group, University of Stirling, University of Stirling, Stirling, Scotland FK9 4LA; e-mail: <aew1@stir.ac.uk>.

exposures to beryllium in the scrap-metal and recycling industries. Even collectors of old radio sets take a more concerned stance, flagging up risks of beryllium exposures when dismantling radio sets.

HEALTH AND SAFETY OVERSIGHT

The Health and Safety Executive's under-resourced inspectorate is not capable of ensuring adequate safety oversight of Britain's workplaces. This was highlighted by the recent "world's largest" outbreak of extrinsic allergic alveolitis and occupational asthma, in which over 100 workers at Powertrain in Birmingham developed serious and chronic occupational lung diseases, despite the risks having been well established over a decade earlier.[11] The poorly controlled agent responsible, metalworking fluid, is also an occupational cancer risk.[12]

Under-reporting of conditions, such as chrome ulcers, a warning sign of exposures that can lead to chromium-related lung cancers, indicates HSE's intelligence on many occupational carcinogen exposures is lacking. The proliferation of small firms means more workers are likely now to be working in firms with inadequate systems to recognize and deal with risks, and will remain almost entirely off HSE's radar. Workplaces regulated by HSE can expect an inspection only once every 13 years, or three times in a person's working lifetime. This is about half the inspection frequency seven years ago.[13] At the same time that the HSE claims to be making great progress in protecting occupational health,[14] the occupational health staff employed by HSE has shrunk to such a small number that former employees seriously doubt whether the group can function properly at all,[15] and its capacity to address the challenges of occupational cancer looks very restricted.

The HSE initiatives to address occupational cancers are a small component of an HSE disease-reduction program, which is a small part of the HSE illness-reduction program, which is a small part of the HSE Fit3 program. This is not enough. HSE plans to inspect only where there are cancer "exposures." This assumes knowledge of where carcinogens are, yet there is no basis for that assumption within HSE and its inspections will not normally be sufficient to identify all carcinogens, especially if deficient material safety data sheets are used. In a HSE presentation posted in 2007 on an online HSE silica forum, HSE said findings from its surveys conducted in 2006 and 2007 in the stonemasonry, brickmaking, construction, and quarrying sectors showed it had grossly underestimated the size of the overexposed population and the levels of crystalline silica encountered in the workplace. In stonemasonry, for example, both HSE and the industry had estimated no workers were exposed to more than 0.1 mg/m^3. In fact, the survey findings suggest 3,150 workers could have been exposed above this level, and 1,425 were potentially exposed to 0.3 mg/m^3 or more of respirable crystalline silica. The HSC consultative document on the silica standard belatedly resulted in the U.K. standard's being tightened from 0.3 mg/m^3 to 0.1 mg/m^3 in 2006—still twice the level recommended by a European Community panel. Germany now has a greatly more protective approach to silica risks—they abandoned a 0.15 mg/m^3 standard, and their standards board, MAK, indicates that an effective standard should be well below 0.05 mg/m^3.

ESTIMATES OF CHEMICAL USE

Estimates by HSE of those at risk of developing occupational cancers fail to take adequate account of the rapid increase in the numbers and volumes of substances used in the workplace. Up to 100,000 chemicals are in industrial use, an estimated 30,000 used in the European Union in high volumes (manufactured or imported in volumes over 1 ton).

The U.K. Chemical Industries Association in 2006 reported that over the last decade the chemical industry had grown more than five times faster than the average for all industries. It noted:

> the chemical industry accounts for 2 per cent of UK GDP and 11 per cent of manufacturing industry's gross value added. Turnover, which includes the sales of merchandized goods, e.g., chemicals imported and then re-sold, was estimated at £50 billion in 2003. Over the same period sales of domestically produced chemicals were £34 billion.

The industry's own figures show that in 2004, while almost 50% of chemical industry sites had implemented environmental management systems, fewer than 15% had equivalent health and safety management systems.[16] The U.K. industry employs directly about 230,000 workers.

VULNERABLE POPULATIONS

Chemical usage is not just an issue for those in primary manufacturing or processing. Vulnerable workers, for example, hairdressers and cleaners, use highly toxic chemicals routinely and work largely unseen by statutory safety authorities and without occupational health guidance or access to health and safety expertise.

When assessing the impact of occupational cancers on the working population, it is also important to take into account that almost all the risk is concentrated in a relatively small segment of the workforce. Work-related cancer is far more common in blue-collar workers—there is an undeniable correlation between employment in lower-status jobs and increased risk.[17] Studies have found, for example, that 40% of the lung and bladder cancer cases in certain industrial groups are caused by occupational exposures.[18] French records published in 2005 found one in eight workers were exposed to

carcinogens at work, but that the figure was 25% for manual workers and just 3% for managers.[8]

The 1998 CAREX report for Great Britain[10] concluded that workplace exposures to carcinogens were restricted to about one fifth of the working population. If the occupational cancer risk were to be equal across the population, based on HSE's figure of 6,000 deaths a year, this would equate to 1% of all deaths being caused by occupational cancers in any given year. However, the responsible exposures are limited to a much smaller group whose members bear most of the risk, suggesting that 5% or more of deaths in this group could be caused by occupational cancers.

Nor are all the exposed workers in big firms with occupational health facilities, health and safety professionals, and sophisticated control systems. Each year members of the U.K. Chemical Business Association (CBA) distribute more than 2.5 million tons of chemicals. CBA estimates that small and medium-sized enterprises comprise 95% of Europe's chemical industry.

Cancers in workers in small firms are unlikely to be attributed to work unless they are otherwise rare cancers, and the workers are unlikely to have access to informed occupational safety or medical advice. Research on small firms has shown that they have very limited understanding of the risks of hazardous substances and relevant legislation, and that HSE guidance often does not reach them.[19] A 2006 U.K. Federation of Small Businesses (FSB) report, "Health Matters: A Small Business Perspective," reported barely one in 20 survey respondents (6.5%) provided access to occupational health services. The FSB report concluded small businesses "need incentives to enable them to promote healthy workplaces and provide occupational health support to their staff."[20] So, health and safety management in small and medium sized enterprises is still ineffective, staffs in local authorities and HSE are insufficient to check such workplaces, and there is no possibility that effective cancer-prevention policies and practices can be introduced under the current system.

COMPLEX EXPOSURES

The U.K. strategy fails to take adequate account of complex workplace exposures—multiple exposures at one time, and multiple changing exposures through a working lifetime. The use of more substances in higher volumes in a greatly increased number of products and processes creates the potential for highly complex working environments with complex, combined exposures to workplace carcinogens or substances that could increase vulnerability to carcinogens. A general dusty environment, for example, can overwhelm the body's mucociliary clearance system, allowing easier passage of airborne substances into the body. Existing exposure standards and control policies do not reflect this total carcinogen dose or the complexity of some mixed workplace exposures, which could create gross exposures greatly in excess of the exposure limits for single substances.

The number of jobs per working lifetime has increased markedly in the last 30 years, with most workers now having ten or more jobs in the period between joining the workforce and retirement. New technologies and processes mean workplace exposures will in many instances change markedly throughout a working lifetime.

As Great Britain has no occupational cancer registry or systematic measures to ascertain or register exposures, HSE does not know who has been exposed, to what, where, or when. This means only a minority of cancers—generally otherwise rare and work-specific—stand any chance of being recognized. This has implications both for prevention and for workers' welfare. Potentially hazardous conditions will not be recognized or addressed and a victim of occupational cancer is unlikely to be compensated or to receive a timely diagnosis and treatment.

INACTION ON KNOWN RISKS

Even where the HSE recognizes that a workplace exposure may cause cancer, this is frequently overlooked in its practical guidance. HSE's metalworking fluid Web pages[21] omit any mention of the occupational cancer risk from the general health risks section and guidance for occupational health advisers, and treat exposure as a general hazard "to be prevented where reasonably practicable" rather than a cancer hazard where far more stringent stipulations should apply. Recent evidence suggests there is even more reason for HSE to issue an explicit cancer warning. A Harvard University report noted that existing studies substantially under-estimate the metalworking-fluids cancer risk.[22]

When medium-density fiberboard (MDF)—a composite creating potential for exposures to two recognized carcinogens during manufacture or machining—became the subject of a recent safety controversy, HSE backed entirely the industry line on potential health problems, failing to acknowledge the cancer risk.[23] It did not modify this position when formaldehyde was upgraded in 2004[24] to the International Agency for Research on Cancer's (IARC's) top cancer-risk category, Group 1.[25] Wood dust was already rated as an IARC group 1 carcinogen.

With respect to other substances, HSE has trailed behind other national regulatory agencies in recognizing workplace cancer risks, in at least one instance actively promoting the use of a cancer-causing substance. In February 2000, the chemical manufacturer Dow failed in a bid to stop Australia's chemical standards body NICNAS from labeling the common industrial solvent trichloroethylene as a carcinogen and

mutagen. It was two years before HSE issued an equivalent warning. HSE's 2002 alert said employers should consider using an alternative solvent or cleaning process or, if this was not possible, enclosing the degreasing process as far as possible. Prior to this, HSE had for a decade—including the two years in which Australian workers had been warned of the cancer risks—been explicitly recommending trichloroethylene use as an "ozone friendly" alternative to the more worker-friendly trichloroethane. U.K. unions in the 1970s had run successful campaigns to get rid of trichloroethylene, in some cases negotiating trichloroethane as a safer alternative. Alternative processes, friendly both to the environment and to the workforce, had been available when HSE was recommending trichloroethylene use.

In 1988, NIOSH recommended that perchloroethyelene be labeled a potential occupational carcinogen,[26] yet into 2000, HSE produced leaflets that did not mention any cancer link with exposure to this substance in drycleaning.[27]

FAILURE TO RECOGNIZE WORK CANCERS

Many important workplace cancers are entirely overlooked by HSE. Breast cancers are not treated as a serious work-related risk to be addressed in HSE's strategy, despite evidence that large numbers could be at risk.[28] The HSE also misses entire categories of workers known to have elevated cancer risks. Its list of targeted work cancer risks does not include "painting." However, painters comprise a large occupational group classified by IARC as facing a Group 1 cancer risk, the top risk rating.[29]

Relative to wood dust, another Group 1 IARC carcinogen, HSE says this about the cancer risk: "Established for cancer of the nasal cavity or sinuses in cabinet makers and machinists exposed to wood dust." In fact, exposure to wood dust is a nasopharyngeal cancer and possibly lung cancer risk,[30] and has been identified in almost all woodworking occupations, not just cabinet making and machining.

Other occupational groups recognized elsewhere and in the literature as facing elevated risks for a range of cancers are also ignored. This includes the increased risks for non-Hodgkin's lymphoma and other cancers in farm workers and a range of cancers in firefighters, including primary-site brain cancer, primary-site bladder cancer, primary-site kidney cancer, primary non-Hodgkin's lymphoma, primary-site ureter cancer, primary-site colorectal cancer, and primary leukemia.[8] Firefighters in Canadian provinces such as Manitoba, Alberta, Saskatchewan, British Columbia, and Nova Scotia are already entitled to compensation for work-related cancers (TUC Risks May 2007; Ontario Ministry of Labour News release May 4, 2007). No such measures are on the horizon in the United Kingdom, and there is little or no evidence that HSE is actively working to address the risks of this occupational group and recognize such cancers.

Even for substances such as asbestos, HSE limits its analysis primarily to the risk of lung cancer and mesothelioma, despite known associations with many other cancers. Cancers including gliomas, head and neck cancers,[31] breast and hematopoietic cancers, all linked to work exposures, are among those largely or entirely ignored.

OUTDATED AND COMPLACENT DATA

The Health and Safety Executive is overly reliant on data from the European Union and IARC. For example, its briefings on benzene, cadmium, and diesel exhaust are dangerously outdated, and greatly under-estimate the potential cancer risks. Nor has HSE practical systems to review and act on new information in a timely manner, or to revise assessments.[32,33] For instance, Germany and Denmark recognize bladder cancer in the metal industries where exposures to cadmium and epoxy resins may occur. Denmark officially notes the use of azo dyes by painters: a link not made in the United Kingdom, despite recognizing the hazards to printers. The Sheffield Occupational Health Project (now SOHAS) identified a series of bladder cancer cases where exposures to cadmium had occurred in situations ranging from smelters to TV repairs and cutlery work.

On a rare occasion when HSE has revisited occupational cancer estimates, they have been revised down. The ratio of asbestos-related lung cancers to mesotheliomas is now lower than 1 to 1—a 2005 HSE paper[34] puts the ratio of asbestos lung cancers to mesotheliomas at between 2/3 and 1 to 1—much lower than many other estimates. The authors acknowledge their figure will miss some cancers because it underestimates the effects of chrysotile (white asbestos), which has been the dominant exposure since 1970. And their analysis includes cancer deaths up to the age of 74 only, whereas many asbestos-related lung cancer deaths occur in older ex- workers. While many observers believe the ratio of asbestos-related lung cancers to mesothelioma may be closing as fewer workers are experiencing the very high exposures that were linked to much higher numbers of lung cancers, and a drop in smoking will reduce those caused by the synergy between smoking and asbestos exposure, HSE's new estimate is significantly lower than generally cited figures.

The data sources used by HSE are also inadequate. Its chemical-by-chemical approach relies on the limited work already done. Yet relatively few chemicals in use in the workplace have been thoroughly assessed for chronic health risks, fewer still providing sufficient satisfactory data sufficient for listing as a human cancer risk by either IARC or the European Union. Many workplaces and substances likely to present substantial

cancer risks are assumed safe as a result of HSE's approach, whereas lack of data means no adequate assessment of the cancer risk has been undertaken. This is not a basis for a protective approach, and leaves workers facing relatively uncontrolled exposures to substances that may, as data accumulate, be proven to be cancer-causing.

FAILURE TO REDUCE RISKS

The Health and Safety Executive's approach is entirely about limited controls on a limited number of carcinogens in a limited number of circumstances. It does nothing to reduce the overall numbers or volumes of carcinogens at use in workplaces.

A more responsible approach would be to set targets for "sunsetting" the most potent carcinogens, and to introduce a toxics-use-reduction approach to ensure safer methods and processes are used where they are effective.[35] Toxics use reduction is an approach that not only has been used effectively, but also has received strong support from industry.[36] Such forward-thinking strategies are supported elsewhere. The Canadian Strategy for Cancer Control (CSCC), a coalition of cancer-prevention, health service, and other bodies, has taken a public stand in favor of this "primary prevention" of occupational cancer.[37]

Many researchers have warned that failure to act promptly on early warnings has in the past led to entirely avoidable epidemics of occupational diseases, including workplace asbestos-, benzene-, and radiation-induced cancers.[38]

LOW-LEVEL EXPOSURES

Large groups running small risks from exposures to workplace carcinogens still amount to a large number of affected workers, a public health burden entirely missed by HSE. For example, a report this year identified a fivefold increase in breast cancer in developed industrial regions that was in part due to exposure to industrial chemicals.[39]

Equally unlikely to be classified as occupational are the many lung cancers caused by exposures to "nuisance" dusts, for example, general building or foundry dusts. Lung cancer is the standout cancer killer, but is overwhelmingly attributed to smoking . Latest evidence suggest that not all these "smoking-related" lung cancer deaths are actually caused by smoking. As smoking levels decline in developed nations, a much larger than expected number of "never-smoked" lung cancers are being seen. Occupation is a clear contributory factor to these cancers.

A *Journal of Oncology* paper in 2007, for example, concluded that one in five lung cancers in females and almost one in ten in men occur in people who have never smoked.[40] That would equate to approaching 3,000 non-smoking lung cancer deaths in U.K. women each year, and 2,000 deaths in men. Obviously, workplace exposures would be a co-factor in the lung cancers experienced by the smoking group, too—smoking does not make you immune to occupational lung carcinogens. The evidence suggests it does in fact greatly increase the likelihood of getting a work-related cancer.

EXPOSED WORKERS UNASSISTED

In the great majority of cases HSE is failing to provide workers and former workers information about the cancer risks posed by their past and current exposures to workplace carcinogens. This has three main detrimental effects.

First, these workers are not in a position to make informed decisions about their working environments and seek improvements. Second, they are not in a position to seek the health surveillance necessary to improve the chances of an early cancer diagnosis and therefore cure. Survival rates in the United Kingdom for some of the major cancer killers, for example lung cancer, are low compared with those in other developed nations. This is in large part due to late diagnosis.

Finally, lack of awareness and support means most workers developing occupational cancers receive no compensation or related benefits, even when work-relatedness is extremely well known, as in cases caused by asbestos exposures. For example, in 2002, 1,862 people died from the asbestos-induced cancer mesothelioma, but only 54% of those people received the Industrial Injuries Disablement Benefit. However, far fewer still receive this benefit for asbestos-related lung cancer. Despite its being generally considered that there is at least one lung cancer death for each mesothelioma death—and this is a conservative estimate—only 60 lung cancer payments were made in 2001 in the United Kingdom. Contrast this with Germany, where 767 benefit payments were made for asbestos-related lung cancer and 665 benefits for mesothelioma in 2001.[41] Only some 20 people per year received the Industrial Injuries Disablement Benefit for occupational bladder cancer, despite this being a condition which, even by HSE's conservative estimates, affects several hundred workers every year.

Most occupational cancers occur in older workers, so there is also a compelling case for health agencies other than HSE to greatly increase the resources available to provide advice, screening, and support for retired workers at risk of developing work-related cancers.

MISTAKES ON SHORT LATENCIES

The Health and Safety Executive makes the assumption that occupational cancers have long latency periods, with today's cancers the result of exposures a working generation ago. This has two damaging effects. It allows

TABLE 1 Minimal Latencies for Occupational Cancers in the German Compensation System*

Agent	Site	Minimum Exposure Time (Years)	Minimum Latency (Years)
Chromium	Lung, nasal, upper respiratory tract	2	4
Arsenic	Lung, nasal, upper respiratory tract	0.5	3
Aromatic amines	Bladder, urinary tract	0.25	1
Halogenated hydrocarbons (VCM, etc.)	Liver, bladder, urinary tract	5	11
Benzene, benzene homologs, styrene	Leukemia	0.5	2
Halogenated alkyl, aryl or alkyl aryl oxides	Lung, urinary tract, skin, nasal, larynx, stomach, etc.	2	8
Ionizing radiation	Lung, leukemia, skin, mesothelioma	<1	10
Asbestos	Lung	<0.25	8
Asbestos	Mesothelioma	1 day	15
Nickel	Lung, nasal, upper respiratory tract	1	6
Wood dust	Nasal adenocarcinoma	5	8
Soot, crude paraffin, tar, anthracene, pitch, and related compounds	Skin cancer	3	4

*Source: Popp et al.[42]

HSE to assume today's cancers are the result of historic working conditions, much worse than those in workplaces today. It also allows it to downplay the risks facing the current working generation.

For example, relative to wood dust, HSE says: "There is a latency of 20 years between exposure and tumor development." However, many cancers, including those caused by wood dust, can have much shorter latency periods. For wood dust, latency can be under ten years. HSE also says the mode of action is "uncertain." In fact, the occupational cancer risk from wood dust results from inhalation, and is therefore easily preventable.

In Germany and at the Sheffield Occupational Health Advisory Service within the United Kingdom, there is a recognition that minimum latency and exposure times for occupational cancers may sometimes be much shorter than the U.K. system recognizes (Table 1).[42]

LACK OF EMPLOYER KNOWLEDGE

The Health and Safety Executive makes unprovable assumptions about improved occupational hygiene standards and risk reduction, and about the willingness and capability of firms to recognize and control risks. HSE's own studies have shown many chemical companies had, at least until the mid- to late-1990s, little or no knowledge of their duties under the chemical-control regulations, and most were unaware of relevant occupational exposure limits. At the time, research suggested many products, including potentially carcinogenic dyes were being imported without adequate warnings.[43]

EXPOSURES INSIDE AND OUT OF WORK

Assumptions about exposure levels and risks based solely on exposures in the workplace underestimate the total toxic loads many workers experience. Workers can be exposed at work and in the general environment. Women exposed to cancer-causing endocrine-disrupting chemicals at work, for example, will frequently have additional exposures to substances acting in the same way outside work. Again, there is little evidence that such exposures are yet built into HSE assessments

Likewise, farm workers exposed to pesticides may face household, environmental and dietary exposures to the same or related chemicals. A 2007 study found agricultural workers exposed to high levels of pesticides have an increased risk of brain tumors. All agricultural workers exposed to pesticides had a slightly elevated brain tumor risk, but the paper reported the risk was more than doubled for those exposed to the highest levels. The study, published online in the journal *Occupational and Environmental Medicine* in May 2007, also found a significant risk among people who used pesticides on houseplants.[44]

CHANGING INDUSTRY

The chemical-by-chemical approach adopted by HSE fails to take account of the rapid evolution of industry and industrial processes. Evidence of an emerging cancer problem in the microelectronics industry[45] has not elicited prompt, precautionary action from HSE, a failing that has attracted international criticism.[46] Similarly, while HSE at least theoretically advocates a precautionary approach in the fast-emerging nanotechnology industry, in practice there is little understanding of the hazards posed or how they might be controlled. The industry, meanwhile, largely free from the attention of the resource-depleted enforcement agency, is growing at a startling pace.[47]

The problem is not limited to those employed in new industries, but also afflicts the much greater number affected by the changing natures of existing jobs or job functions. More workers performing routine tasks are exposed to chemicals as a result of the tendency to opt for quick chemical fixes applied by

poorly skilled workers as an alternative to labor- and resource-intensive skilled labor. For example, many municipal authorities are opting to use pesticides for routine weed control as an alternative to employing skilled parks and garden staff.

CHANGING WORK PATTERNS

Over three million workers in the United Kingdom work in excess of 48 hours per week, with the potential for work-time exposures considerably in excess of those assumed under existing occupational exposure limits, based on the standard working week.

In addition, new age-discrimination regulations and government moves to raise the retirement age mean many workers are likely to have more years of exposures to potential risks. The United Kingdom already has one of Europe's highest proportions of older workers in work.[48] The changing nature of employment—long hours, frequent changes of job, frequent changes of job task, irregular hours, and shift work all impact occupational cancer risks. Breast and other cancers have been linked to shift work, something that HSE staff are aware of, but, to date, no significant relevant policies or practice recommendations have emerged from the organization.

RISKS TO WOMEN

Women are now better represented in the workforce, are likely to spend longer in the workforce, and do a much wider range of jobs. Since 1975 men's employment has declined from around nine of ten to eight of ten (79%) for men of working age (16–64). At the same time women's employment has increased from around six of ten to seven of ten (70%) for women of working age (16–59).

The approach taken by HSE fails to take adequate account of the increasing participation of women in the labor market, or of the risks to women, or of risks in women-dominated employment areas. For example, HSE's estimates of risks in the health sector include far fewer jobs, cancers, and exposures than the equivalent guidance from the U.S. National Institute for Occupational Safety and Health. HSE cannot present any credible assessment of the occupational cancer risks faced by women, or the numbers of cancers in women related to workplace exposures. For example, breast cancer is the most common cancer in the United Kingdom and one of the top cancer killers. However, it does not appear on HSE's priority action list or in its estimates of the numbers affected by occupational cancers, despite clear evidence associating industrial exposures with elevated cancer risk. An October 2005 report, "Breast Cancer—An Environmental Disease: The Case for Primary Prevention," concluded there was "incontrovertible evidence" that many industrial chemicals and radiation are major contributors to overall breast cancer rates.[28]

WORK AND LIFESTYLE INTERACTIONS

The U.K. approach to occupational cancers fails to take account of the workplace contributions to supposedly "lifestyle" cancers. For example, work stress is associated with poor behavior patterns, including smoking and other substance-abuse behaviors.[49]

Workplace exposures can also "potentiate" the effect of tobacco smoke. For example, the synergy between asbestos exposure and tobacco smoke is well reported, the combination creating a massively increased risk compared with exposure to either carcinogen alone. And a 2005 paper concluded exposure to wood dust increased the chances of developing not only nasal cancer but also lung cancer, finding the risk of lung cancer was increased by 57% with wood dust exposure in the absence of smoking, by 71% for smoking in the absence of wood dust exposure, and by 187% for individuals who were exposed to both smoking and wood dust.[30]

PARENTAL EXPOSURES AND CHILDREN

The impact of work exposures can also be intergenerational, with the impact of work on workers' children wholly ignored in HSE's analysis. For example, a 2003 University of Massachusetts Lowell report noted "evidence increasingly indicates that parental and childhood exposures to certain toxic chemicals including solvents, pesticides, petrochemicals and certain industrial by-products (dioxins and polycyclic aromatic hydrocarbons) can result in childhood cancer."[50] Recent research has reinforced this evidence.[51]

And paraoccupational cancers—cancers in those incidentally exposed to carcinogens via exposures to asbestos on the clothing of parents or spouses, for example—are being seen with increasing frequency.[52]

FUTURE PROBLEM

The increase in overall life expectancy and declining death rates from other causes, means for the current working generation cancer will have longer to develop and less competition as a cause of death. And while mortality from cancer is falling as a result of improved diagnosis and treatment, the incidence of cancer is not, supporting the case for greater preventive efforts.

KEY RECOMMENDATIONS

- Occupational cancer prevention should be recognized by the government as a major public health priority and should be allocated resources accordingly.
- A national occupational cancer and carcinogens awareness campaign should be launched as a matter of urgency.
- The Health and Safety Executive should convene a tripartite working party, including representatives of

unions, health and safety campaign organizations, and occupational disease victims' and advocacy organizations, to review its occupational cancer strategy.

- Wherever possible, IARC Group 1 and Group 2A carcinogens should be targeted for "sunsetting," a phase-out within a designated time frame, to be replaced by safer alternatives.
- Toxics use reduction legislation, already used successful in some U.S. jurisdictions, should be introduced to encourage the use of the safest suitable substances and processes. The precautionary principle should be applied to substances suspected of causing cancer in humans.
- A national system of occupational health records should be developed to ensure adequate recording of workplace exposures and other occupational cancer risk factors. Employers must have a duty to inform any workers of their exposures to known or suspected workplace cancer risks and carcinogens.
- A national exposure database should be created.
- The Health and Safety Executive should provide resources for training of union safety reps in "lay epidemioloy", techniques for the early recognition of work-related diseases, including cancer, and training in lay exposure-reporting systems, because trade union reps, lawyers, and individual workers will be critical to finding carcinogens and, through REACH-type mechanisms, feeding back information to other users, suppliers, and HSE on their locations.
- The United Kingdom should implement properly the European Union law requiring workers to have access to occupational health services.
- The government Industrial Injuries Benefit Scheme should be revised and extended to include a wider range of occupational cancers in its scope. There should be a consideration of the introduction of a "rebuttal presumption" of work causation for cancers with established associations with work. Compensation should also ensure that those exposed to carcinogens are covered. Exposures, not specific and narrow occupational categories, should determine compensation.

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