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## Editorial

# **Real World Occupational Epidemiology: Irving Selikoff, Odds Ratios and Asbestos\***

Epidemiology represents what is perhaps one of the most important and historically significant sub disciplines of *Environmental and Occupational Health* (EOH). While the discipline itself can be traced to antiquity, it was not until the 18<sup>th</sup> Century that some of the more well-known examples of this field were elucidated and recorded. Lind's intervention with citrus fruits to prevent scurvy looms large as one of history's first clinical trials,<sup>1</sup> while Percival Pott's study on cancer among British chimney sweeps is often regarded as an archetypal cohort study and the first to link malignancy with a defined environmental exposure.<sup>2</sup> Although it was still evolving, by the early 20<sup>th</sup> Century occupational epidemiology had risen in importance as increasing scholarly attention was turned towards the elucidation of diseases with a suspected occupational aetiology.<sup>3</sup> Many intuitive links evolved from individual case studies and anecdotal reports by treating physicians, which often led to medical publications on various topics of interest. In some sense these early investigations were relatively straightforward as occupational exposures were often uncomplicated in nature and relatively high in intensity.<sup>4</sup> Asbestos, and more particularly, the study of industrial exposure to asbestos and its relationship with subsequent disease, represents an excellent example in this regard.

\*Published as 'Occupational Epidemiology in the Real World: Irving Selikoff, Odds Ratios, and Asbestosis'

In modern occupational epidemiology, asbestos ranks among the most heavily studied occupational and environmental hazards of human history.<sup>5</sup> Although the cellular mechanisms may not have been understood at the time, health issues relating to its use were recognised as far back as Pliny the Elder (23-79 AD), who cautioned against the purchase of asbestos weavers as they 'died young'. By the 20<sup>th</sup> Century, knowledge on disease causation had progressed sufficiently to allow scientists to more accurately postulate mechanisms by which asbestos may affect the human body. Medical progress had also increased understanding on the underlying cellular mechanisms associated with human lung function. Between 1906 and 1928 for example, various case reports of pulmonary fibrosis among asbestos workers began appearing in the medical literature, cases that were increasingly being referred to as *asbestosis*.<sup>6</sup> In 1924 Cooke<sup>7</sup> reported a case of fibrosis of the lungs due to the inhalation of asbestos dust, and in 1935 Lynch and Smith<sup>8</sup> described an unusual case of lung carcinoma with asbestosis, including the suggestion of a link between the two. The latter case was all the more striking as lung cancer was a very rare disease at the time.<sup>9</sup> By the mid 20<sup>th</sup> Century another previously rare condition, malignancies within the mesothelial lining of the chest or *mesothelioma*, was also being reported in greater numbers among individuals with a history of asbestos exposure. A few such cases attended a lung clinic in Patterson, New Jersey and were seen by a middle-aged clinician whose name would later become synonymous with this disease.

Irving J Selikoff (1915-1992) was an American chest physician who had made a name for himself in the 1950s after receiving the American *Lasker Award* for his investigation of Isoniazid as a treatment for tuberculosis.<sup>10</sup> Following medical training

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in Scotland and Australia during the 1940s, Selikoff had studied chest diseases before opening a lung clinic in New Jersey during 1953.<sup>11</sup> A series of workers from the local asbestos factory had presented with some unusual illnesses, prompting Selikoff to contact their employer seeking access to earlier medical records. When the company refused, he contacted their labour union and after some negotiation was able to access clinical records of the affected workers.<sup>11</sup> Selikoff then assembled a multidisciplinary team to investigate the issue using new epidemiological techniques recently learned in the *American Cancer Society's* (ACS) cohort studies of smoking. He recruited notable scholars such as E. Cuyler Hammond (1912-1986), an epidemiologist who had recently published landmark studies using ACS data which linked smoking with lung cancer in the US population.<sup>12, 13</sup>

Although Selikoff's first study was relatively small, examining only 632 men who had been on the union's rolls between 1943 and 1962,<sup>14</sup> the method was sound and the findings indisputable – working with asbestos was deadly. An excess mortality rate of 25% was demonstrated in the first study,<sup>11</sup> and this was followed four years later when a *90-fold increased risk* was identified among asbestos workers who also smoked.<sup>15</sup> Selikoff would go on to devote the rest of his professional life to the study and control of this fibre, becoming America's, if not the world's, foremost medical expert on asbestos-related disease between the 1960s and his death in the early 1990s.<sup>11</sup> Selikoff would leave a profound legacy in EOH, having been instrumental in reducing workplace exposure limits (for asbestos) by approximately 100-fold, when compared to earlier years.<sup>16</sup> Although he went on to found both a university department and a journal in EOH,<sup>17</sup> it was Selikoff's pioneering asbestos studies that would occupy a significant place in the evolution of modern occupational

epidemiology – representing what is perhaps the archetype occupational exposure versus risk mortality study.

For these reasons, in the current issue of the Archives we take a closer look at one of Selikoff's pioneering asbestos studies<sup>18</sup> – the raw data of which was published in the *Bulletin of the New York Academy of Sciences* during 1981.<sup>19</sup> A classic example of 'Real World' occupational epidemiology that is as relevant today as when it was first published.

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