

Dust to dust

In December, 2018, the US radio network National Public Radio (NPR) broadcast the results of their Frontline investigation into the rise of so-called black lung disease affecting coal miners in Appalachia. Black lung (or progressive massive fibrosis) is an industrial disease associated with respiration of dust. The incidence of black lung in the USA is now higher than it was in the 1960s and is allegedly affecting men aged as young as 30 years. At one point in the programme, reporter Howard Berkes ambushed former coal company executive David Zatezalo after he had given a speech linking the rise of black lung to so-called silica problems. When pressed by Berkes to expand on the link between silica and respiratory disease, he hedged, muttering “I don’t think that the science of the causation is that well defined”.

This strategy—appealing to science to cast doubt on black lung causation—has been used before. Indeed, the Frontline programme (and a great deal of the media coverage of it) repeatedly referenced the historical nature of black lung, an old disease relegated to the domain of the history book. But can historical research tell us anything new about this old disease?

The risk to miners’ lungs from coal dust was recognised in the early 19th century. However, in the early 20th century, prominent physiologist J S Haldane fuelled the notion that coal dust functioned as a prophylactic—“a little dust was good for you”. One miner working in Ffaldau colliery in Wales in 1930 even described inhalation of coal dust being used as a treatment for silicosis. Even when the presence of illness was not disputed, causation was highly contested. Local doctors and miners were convinced of the existence of a disease due to coal dust, but their belief did not correlate with diagnostic criteria, and there was increasing concern that coal miners were suffering from respiratory disability unrelated to silica exposure.

Therefore, in 1936, the British Home Office and the Mines Department charged the Medical Research Council (MRC) to solve the problem of the discrepancy between visible tissue damage and subjective reports of illness. The MRC medical surveys (1936–42) were led by Dr Phillip D’Arcy Hart and Dr Edward Aslett, alongside a team of engineers, inspectors, and pathologists. They selected an anthracite colliery in south Wales for detailed investigation and examined the men radiologically and with clinical tests involving examination of the sputum, tuberculin tests, and spirometric measurements of lung volume. Their resulting report was conclusive. It showed a link between exposure to coal dust and respiratory disability, and ushered in widespread recognition of a disease due to coal dust that was distinct from silicosis.

Still, adjudicating disability was complex and required new sets of standardised classifications for what changes

constituted disability in relation to respiratory disease. X-ray techniques and interpretations were not standardised until nearer 1950, and there was widespread scepticism about their utility. Because new X-ray technology was not fully trusted, the spirometer represented reliable evidence of respiratory disease in numerical terms that could be employed in the complex compensation network. As Lundy Braun has shown in her book, the spirometer provided an objective indicator of disability.

However, using spirometry to diagnose pneumoconiosis necessitated a clear definition of normalcy. Attempts to accurately measure and scale respiratory disability with the spirometer had long been complicated by the need to first define a measure of normalcy—there can be no abnormal without an initial definition of normal. However, recurring questions about whether the parameters of normal breathing were universal or varied between groups marked all such attempts: normal breathing for whom?

As John Gilson and Philip Hugh-Jones’ report on coalworkers’ lung function explained, “The assessment of the effect of silicosis or pneumoconiosis on lung function implies a definition of normal with which to make the comparison. This is far more difficult than the scant reference [sic] in the literature would suggest.” The MRC’s original clinical investigation used separately determined lung function values. However, the normal participants used in these determinations were “the normal members of the working population of an anthracite colliery in Carmarthenshire”. That is, they used a standard of normalcy set by apparently healthy miners rather than a non-mining control group. Miners were in a reference class of their own, so the spirometry test took its measure of normalcy from the very population in which abnormality was already apparent.



Lowne’s patent spirometer (circa 1906). Courtesy of Thackray Medical Museum, Leeds, UK



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For more on the **NPR Frontline**

investigation see <https://www.npr.org/2018/12/18/675253856/an-epidemic-is-killing-thousands-of-coal-miners-regulators-could-have-stopped-it>

For more on the **historical**

evolution of the causes of black lung see *Soc Stud Sci* 2000;

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For more on **J S Haldane’s**

comments see *Occup Med* 2000;

50: 440–49

For more on **silicosis** see **Editorial**

Lancet Respir Med 2019; 7: 283

For more on the **MRC medical**

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For more on **X-ray scepticism**,

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For more on **Lundy Braun’s**

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Breathlessness, like pain, is both intimate and invisible. To make the invisible visible and eligible for compensation, instrumentation is used. Yet such tools can be flawed. Miners' claims of breathlessness were dismissed by the superior objective evidence offered by the spirometer, but the normal baseline for spirometric data was configured not to healthy controls, but to the miners themselves. It is hard enough to assert the lived experience of the body against medical opinion, but

harder still to dispute the authority of such instruments. NPRs programme provided a damning indictment of our ability to learn from history. If we are to do better in the future, we need less focus on debating illness causation and greater focus on the past and present voices of those affected. Greater integration between humanities and science will provide a first step.

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The true scale of artisanal mining

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In 1936, George Orwell was asked to write an extended essay on the conditions of poverty in northern England. He visited a succession of ramshackle industrial towns in Lancashire and Yorkshire, where he stayed in filthy boarding houses. The old Etonian shared bedrooms with the working poor and the unemployed: commercial travellers, newspaper canvassers, hire-purchase touts, and those who picked up casual work at the local mines. "All the windows were kept tight shut, with a red sandbag jammed in the bottom", he wrote of one hovel. "In the morning the room stank like a ferret's cage. You did not notice it when you got up, but if you went out of the room and came back, the smell hit you in the face with a smack." The owner of the establishment, one Mr Brooker, had hands permanently encrusted with dirt. "If he gave you a slice of bread and butter there was always a black thumb-print on it", sighed Orwell.

This was mining country. The landscape was scarred with slag heaps and abandoned pits. Industrial chimneys spewed acrid smoke skywards. As his train passed a slum on the outskirts of a nameless northern town, Orwell glimpsed a young lady apparently attending to a blocked waste pipe. "She had a round pale face, the usual exhausted face of the slum girl who is twenty-five and looks forty, thanks to miscarriages and drudgery; and it wore, for the second in which I saw it, the most desolate, hopeless expression I have ever seen", he wrote. "She knew well enough what was happening to her—understood as well as I did how dreadful a destiny it was to be kneeling there in the bitter cold, on the slimy stones of a slum backyard, poking a stick up a foul drain-pipe".

Those who laboured underground hardly had it any better. "Most of the things one imagines in hell are there—heat, noise, confusion, darkness, foul air, and, above all, unbearably cramped space", Orwell wrote of the coalface. The dust filled your nose and throat and accumulated on your eyelids. The conveyor belt on which the coal was transported, tonnes of the stuff every day, rattled ceaselessly, sounding something like a machine gun. But it was the travelling that really surprised Orwell, who had quit his job as a bookseller in the salubrious London suburb

of Hampstead to take on the commission that eventually became *The Road to Wigan Pier*.

In order to arrive at the seam of coal to be worked, it was not uncommon for miners to travel several miles underground. And this travelling had to be done in a crouch, since the subterranean passageways were only a few feet high. "You not only have to bend double, you have also got to keep your head up all the while so as to see the beams and girders and dodge them when they come", explained Orwell. "You have, therefore, a constant crick in the neck, but this is nothing to the pain in your knees and thighs. After half a mile it becomes (I am not exaggerating) an unbearable agony." He likened the experience to climbing a mountain at the start and finish of each day's work. "By no conceivable amount of effort or training could I become a coal-miner, the work would kill me in a few weeks", Orwell admitted.

Although Orwell did not realise it, the UK coal industry was already in decline. Production peaked before World War 1. By the 1960s, more and more coal mines were shutting down. The National Union of Mineworkers lost their defining battle with the Thatcher Government when the miners' strike ended in 1985. The industry limped on until 2015, when the last British colliery stopped its operations. *The Road to Wigan Pier* evokes a bygone era, one of chamberpots, half-crowns, bread and dripping, corporation housing, and the expectation of a socialist revolution. But Orwell also talked of progress, citing the fact that pregnant women no longer undertook hazardous work around the mine. Miners could expect a fixed wage, there were pensions for those injured in the course of duty, and a union to lobby for their interests. They may have returned home caked in grime, but their families were not endangered by their work.

An estimated 40 million people, slightly more than the entire population of England when Orwell wrote *The Road to Wigan Pier*, currently work in artisanal and small-scale mining. For comparison, large-scale industrial mining operations employ roughly 7 million people. Small-scale mining goes on in at least 80 countries around the world. It accounts for between a fifth and a quarter of global