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Coal mine fires and human health: What do we know?

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ABSTRACT

Coal mine fires are insidious, persistent, and as widespread as the occurrence of coal itself, yet their potential adverse human health impacts have been poorly characterised. We aimed to summarise the existing literature regarding the health harms associated with coal mine fires and other relevant environmental exposures. We searched the literature for studies of coal mine fires, their emissions, and any aspect of human health. In the absence of health evidence specific to coal mine fires, we included studies of domestic coal combustion and outdoor air pollution from forest fire smoke, for which emission profiles are broadly similar. Coal mine fires cause physical hazards and poor air quality. Proximity to the source of pollution and smouldering combustion typical of coal mine fires increase the risk of community exposure to high concentrations of known toxins such as aerosolised particles, and products of incomplete combustion. Coal mine fire smoke is likely to have short-term adverse respiratory impacts. Adverse cardiovascular outcomes and increased mortality are also plausible depending upon the magnitude of exposure and the number of people affected. There is insufficient evidence to determine the likelihood of other health outcomes. There are major gaps in the available evidence for health outcomes associated with exposure to poor air quality for time periods of weeks to months. The incomplete evidence base hampers actions to mitigate harms in a timely, scientifically-informed manner. The need to further understand the health impacts of coal mine fires is pressing, particularly as they disproportionately affect vulnerable and disadvantaged communities and are likely to become more frequent and severe as a consequence of climate change.

Contents

Abbreviations: CO, Carbon monoxide; CO_2, Carbon dioxide; COPD, chronic obstructive pulmonary disease; JCF, Jharia Coal Fields; km, kilometre; PAH, polycyclic aromatic hydrocarbon; PM, Particulate Matter; PM_{10}, Particulate Matter with aerodynamic diameter less than 10 μm; $PM_{2.5}$, Particulate Matter with aerodynamic diameter less than 2.5 μm; PPB, parts per billion; PPM, parts per million; USA, United States of America.

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1. Introduction

Fires in subterranean coal deposits are a natural phenomenon, and many have been burning for millennia, including Australia's Burning Mountain and Powder River Basin in the United States of America (USA) (Heffern and Coates, 2004; Krajick, 2005; Stracher et al., 2011). Coal mine fires are widespread, and currently thousands are burning throughout the world, especially in India, China, and the USA (Fig. 1) (Stracher, 2007; Stracher and Taylor, 2004). The number of coal fires has increased dramatically since the Industrial Revolution as a result of human activity such as mining, land clearing, and anthropogenic climate change (Stracher, 2007). Whilst coal fires may originate distant to coal mines, the majority of the available literature, case studies and government reports focus on coal mine fires. The impacts of coal mine fires

Fig. 1. Global distribution of coal mine fires (note: the figure does not indicate the density of coal fires in affected regions and is likely to understate the distribution in developing countries where data and surveillance of coal mine fires is less robust).
Adapted from Stracher et al., 2011.