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What makes a disease "Occupational"?

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The paper by Jones, in this issue, addresses an important challenge in understanding occupational risk and estimating the burden of occupational disease (Jones, R. Ann Work Environ Hlth 61:xxx). Although the paper focuses on infectious disease among health care workers, and occupationally acquired tuberculosis in particular, the issues addressed and the methodology used is pertinent to a wide range of acute and chronic health conditions caused or exacerbated by exposures at work. The question is, what makes a particular disease (or health condition) be labelled as "occupational?"

Relatively few conditions are pathognomonically defined as occupational. While coal workers' pneumoconiosis can only arise from occupational levels of exposure to airborne coal dust, the closely associated chronic obstructive lung disease has myriad causes (Balmes, 2005). Asthma (Malo, 1996) and dermatitis (de Groot, 2015) are common diseases which are only labeled occupational once a specific occupational agent is linked, either immunologically or temporally, to the individual's condition. Estimating the occupational contribution to population cancer burdens has been a long-running challenge (Espina et al., 2016). Even ascribing acute injury to work is not as obvious as identifying the location at which the injury occurs; an injury at work may be partially due to non work-related stressors (e.g., personal stressors affecting attention or vigilance) while injuries off the job may commonly have work-related contributions (e.g., neurologic toxins, long hours, shift work, or other stressors causing fatigue, etc.). In part, this problem describes the difference between assigning a work-related cause of an individual's health condition to a work exposure in contrast to estimating the population attributable fraction of a particular disease among a population (Steenland et al. 2003). However, this distinction allows for underestimation of the health impacts of working conditions when there aren't well-established measures of exposure or exposure-response relationships for a particular health outcome. Thus, for both acute and chronic injuries and illnesses, we need to improve our definition of work relatedness, and refine our methods for characterizing the contribution of work to a wide range of health conditions.

The paper of Jones takes a step in this direction by showing that it is possible to estimate the burden of occupationally-acquired pulmonary tuberculosis among healthcare workers in the USA and to separate it from the community burden. By using an innovative tool based on a risk analysis applied in conjunction with a mathematical model of exposure (dose-response function and compartmental model of bacteria transport and fate), the author shows that between 3300 and 6500 cases of occupationally-acquired pulmonary tuberculosis infection occur annually. However, if we take into account that about 50% of those infected workers receive effective chemoprophylaxis and that only 5% of non-treated infections progress to disease , the number of healthcare workers who develop the disease due to workplace exposure is estimated to be between 82 and 161. The methodology described could be adapted and applied to other work sectors (correctional facility, homless and migrants shelter, funeral director… see OHSA 1997) and other countries, in particular, in high-incidence and low–income geographical areas where HCWs are likely to be more exposed and less well protected from infected patients. Indeed, according to the WHO, in 2015 tuberculosis remains one of the top 10 causes of death, and six countries (India, Indonesia, China, Nigeria, Pakistan and South-Africa) accounted for 60% of the 10.4 million of new tuberculosis cases worldwide, while USA accounted for only 0.1% (WHO, 2016). What portion of this burden has occupational antecedents,

and is therefore amenable to workplace-based prevention efforts, is currently unknown. In addition, this novel approach could be also used to estimate the burden of other occupational infectious diseases such as pandemic influenza or other viral contagious diseases among healthcare workers, animal farmers or everybody working in close contact with the public in different work sector (public transport, tourism, retail, etc…).

Moreover, and perhaps most importantly, this analytical framework could be applied to other agents such as noise, chemical exposures, psychosocial stressors, etc, which have both occupational and non-occupational contributions. Further studies may be able to make good use this methodology since, provided that one has basic information on level and frequency of both occupational and domestic exposure to a specific hazard, and an understanding of the pathways of exposure and disease mechanisms, estimation of the contribution of work to the total burden of a disease or health impairment could be estimated. For this new challenge, risk assessment models need to be developed to address a wide range of conditions affecting population health.

Ultimately, application of such methods would support better understanding of the potential contribution of occupational factors to the burden of disease, and thus improved targeting of risk management efforts. In addition, appropriate estimation of the contribution of work to health, disease and disability would support relevant cost attribution between employers, and the wider community.

Reference

Balmes JR. Occupational contribution to the burden of chronic obstructive pulmonary disease. J Occup Environ Med. 2005 Feb;47(2):154-60.

de Groot AC. New Contact Allergens: 2008 to 2015. Dermatitis. 2015 Sep-Oct;26(5):199-215.

Espina C, Straif K, Friis S *et al.* (2016) 4th European code against cancer: Environment, occupation and cancer. *Psycho-Oncol*; 10:150-64.

Malo JL. Cartier A. Occupational Asthma. (1996) In Harber P, Schenker MB, Balmes JR, eds. Occupational and Environmental Respiratory Disease. Mosby, St. Louis.

Steenland K, Burnett C, Lalich N *et al.* (2003). Dying for work: The magnitude of US mortality from selected causes of death associated with occupation. *Am Ind Med*; 43:461–82.

OSHA. (1997). Occupational exposure to tuberculosis; proposed rule. Federal Register 54160 – 54308.

WHO, Global tuberculosis report (2016) ISBN 978 92 4 156539 4