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The association between tobacco burden and ''dirty chest'' is unlikely to follow a linear dose-response pattern

We read with interest the recent report by Kirchner et al [1] in BJR, which describes the results of the International Labour Office (ILO) classifications of routine digital chest radiographs as well as readings of contrast-enhanced chest CT images among a convenience-based sample of 85 tobacco smokers who were clinically referred for chest imaging, primarily for known or suspected cancer. Chest radiographs for the study were obtained using a storage phosphor digital system, and hard copies were printed from the digital image files via a laser printer. Transparencies were then displayed and classified by two board-certified radiologists. It was not described whether or not the classifications were made independently, and if so, how the readings were summarised. The data were presented as a correlation (see Figure 2) between pack-years and the ILO classification scores, which was found to be significant. Only slightly more than half of the data points were visible in this figure, leaving the reader to infer that some of the points presented represented more than one value. However, the actual distribution of the data cannot be inferred with the presentation of the results in this format. Additionally, there was no mention of how recognised confounding factors, such as age or occupational exposures, were accounted for in the correlation.

A number of previous studies have shown that, in the absence of occupational dust exposures, cigarette smoking and increasing age may lead to a one- or two-subcategory increase in the profusion of irregular type opacities. However, our reading of this report raised a number of concerns regarding study methods, including image acquisition and classification, as well as conclusions.

Recently published guidelines list a number of factors that should be considered to obtain reliable classifications of digital images for pneumoconiosis [2]. Criteria include (1) appropriate methods for image collection and viewing; (2) reader competency; (3) commitment to ethical classification; and (4) proper radiographic reading methods. To avoid bias in research studies, blinded classification is necessary, as knowledge of the objectives of the study and ancillary details specific to individuals can introduce bias into results. Unbiased methods for summarising classifications, such as use of the median, are preferable. Use of reader panels, in which a summary classification is derived through discussion of the radiograph, is not recommended. Also, to maintain reader accuracy, quality assurance is necessary, which can include procedures such as periodic reader examinations, blinded repeat readings, or inclusion of positive and negative control images. The authors should clarify what summarisation approach was used, and describe the type of reader blinding and the study approaches to quality assurance.

An important additional methodological concern was the use of laser-printed digital hard copies, which are not considered optimal for classification of worker chest radiographs [2]. Franzblau et al [3] reported that ILO classifications from laser-printed transparencies showed a significantly higher profusion of small opacities than either ''soft copy'' readings or traditional film-based radiographs taken on the same day in the same individuals, a finding of relevance to the severity and extent of abnormalities found in the Kirchner study.

We also had concerns regarding a number of the conclusions indicated in the report. An extensive number of scientific studies addressing the issue of smoking in relation to small opacity profusion using the ILO classification system have been previously reported [4–14]. Taken together, these prior studies demonstrate that in the absence of dust exposure, smoking and age are factors that tend to lead to a one- or two-subcategory increase in the profusion of irregular type opacities. This is perhaps most clearly demonstrated in a large study of 4112 china clay workers, where there was a significant increase in radiographs classified as major Category 1 among smokers compared with non-smokers but there was no difference between smokers and non-smokers with respect to the number of films classified in the higher profusion categories [15]. Taking into account the multiple methodological issues raised above, the extensive prior literature on this topic, the small and highly selected study population, the apparent failure to include age in the exposure–response correlation, and the lack of a specific accounting of occupational exposure histories, we do not believe the results can support a conclusion that there is a linear correlation between the extent of cigarette consumption and ILO classification scores.

Another conclusion of the study does not appear to follow from the analysis presented ''Bronchial wall thickening and intralobular opacities as seen in CT showed a positive linear correlation with the increase of overall lung markings in chest X-ray''. In fact, the article does not present any comparative analyses of CT and chest X-ray. The report states that ''only a small number of smokers show normal lung parenchyma'', but this is not a generalisable finding based on the highly selected group of subjects examined. In summary, we cannot accept the conclusions drawn from this particular study population in light of the multiple methodological

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concerns, and in the absence of an appropriate age-matched non-smoking control group.

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