Increasing incidence of asbestosis worldwide, 1990–2017: results from the Global Burden of Disease study 2017

Meng Yang,[1,2] Dongming Wang,[1,2] Shiming Gan,[1,2] Lieyang Fan,[1,2] Man Cheng,[1,2] Linling Yu,[1,2] Bin Wang,[1,2] Wei Li,[1,2] Jixuan Ma,[1,2] Min Zhou,[1,2] Weihong Chen [1,2]

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[1]Department of Occupational and Environmental Health, School of Public Health, Tongji Medical College, Huazhong University of Science and Technology, Wuhan, Hubei, China
[2]Key Laboratory of Environment and Health, Ministry of Education & Ministry of Environmental Protection, and State Key Laboratory of Environmental Health (Incubating), School of Public Health, Tongji Medical College, Huazhong University of Science and Technology, Wuhan, Hubei, China

Correspondence to
Professor Weihong Chen, Department of Occupational and Environmental Health, School of Public Health, Tongji Medical College, Huazhong University of Science and Technology, Wuhan, Hubei, China;
wchen@mails.tjmu.edu.cn

MY and DW contributed equally.

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ABSTRACT

Global incidence and temporal trends of asbestosis are rarely explored. Using the detailed information on asbestosis from the Global Burden of Disease (GBD) 2017, we described the age-standardised incidence rate (ASIR) and its average annual percentage change. A Joinpoint Regression model was applied to identify varying temporal trends over time. Although the use of asbestos has been completely banned in many countries, the ASIR of asbestosis increased globally from 1990 to 2017. Furthermore, the most pronounced increases in ASIR of asbestosis were detected in high-income North America and Australasia. These findings indicate that efforts to change the asbestos regulation policy are urgently needed.

INTRODUCTION

Asbestosis is an important type of pneumoconiosis that could be developed through long-term occupational exposure to asbestos in workplaces.[1] Even with strict management of the asbestos industry, it is reported that approximately 3400 people still died from asbestosis worldwide in 2017.[2] Furthermore, the latest data from the Western Australian Asbestos Review Programme indicated that one-quarter of asbestos-exposed individuals (a total of 906 subjects) had CT evidence of asbestosis.[3] However, global incidence and temporal trends of asbestosis are rarely explored. In this study, we sought to describe the epidemiological trends of asbestosis incidence with prevention and management goals.

METHODS

Data of incident cases and age-standardised incidence rates (ASIRs) come from the Global Health Data Exchange query tool. First, we categorised 195 countries and territories into five regions (low, low-middle, middle, high-middle and high) according to the Sociodemographic Index (SDI), and then all countries were divided into 21 areas based on geography. The geographical patterns and the incidence rates of asbestosis were estimated. Second, we examined the average annual percentage changes (AAPCs) of incidence trends for the overall period and measured the secular and current temporal trends using the Joinpoint Regression programme. R V.3.4.3 was used for all data analyses. For full details, see online supplementary document S1.

RESULTS

Globally, the absolute number of asbestosis cases increased by 116.6% (111.8%–119.1%) during the overall period from 1990 to 2017, with the most significant increase detected in Qatar (761.8%, 738.6%–759.6%), followed by United Arab Emirates (691.5%, 634.2%–720.5%) (figure 1A and online supplementary figure S1). The ASIR of asbestosis was significantly heterogeneous worldwide, with the highest ASIR observed in South Africa, followed by Swaziland and the USA (figure 1B). As for geographical areas, the most pronounced increase in ASIR of asbestosis was detected in Australasia, followed by high-income North America and the high-income Asia Pacific. (figure 1C and table 1). The ASIR displayed an increasing trend from 1990 to 2017, with an AAPC of 0.57 (0.52–0.62), and the highest AAPC was observed in Australia (3.76, 3.50–4.02), followed by Spain (3.19, 2.40–3.98) and Italy (2.93, 1.90–3.96) (online supplementary figure S2). The ASIR increased in low-middle SDI and high-SDI regions and remained stable in low-SDI regions, while it decreased in middle and middle-high SDI regions in the overall period (online supplementary table S1). Especially, all SDI regions displayed an increasing trend over the most recent years in Joinpoint analyses (online supplementary table S2).

In 2017, asbestosis accounted for 15.7% (9400) of total pneumoconiosis cases in the worldwide, and this proportion even exceeded 80% in Denmark (87.9%) and Malta (87.7%). Moreover, during the overall period, the proportion of asbestosis increased by 31.7% (26.4%–36.7%), 20.0% (17.7%–21.4%) and 16.8% (15.0%–17.6%) in Australasia, high-income North America and Western Europe, respectively (figure 1D).

DISCUSSION

To date, global efforts have been undertaken to eliminate pneumoconiosis for several decades, and the corresponding effects of control system have gradually emerged.[4] The latest Global Burden of Disease (GBD) study has demonstrated that the ASIR of pneumoconiosis decreased worldwide from 1990 to 2017.[2] However, present efforts to eliminate asbestosis might be insufficient in most countries in the world. The absolute number and ASIR of asbestosis increased globally between 1990 and 2017, especially in high-SDI regions. Moreover, the ASIR increased in all SDI regions in most recent years. One explanation is the historical

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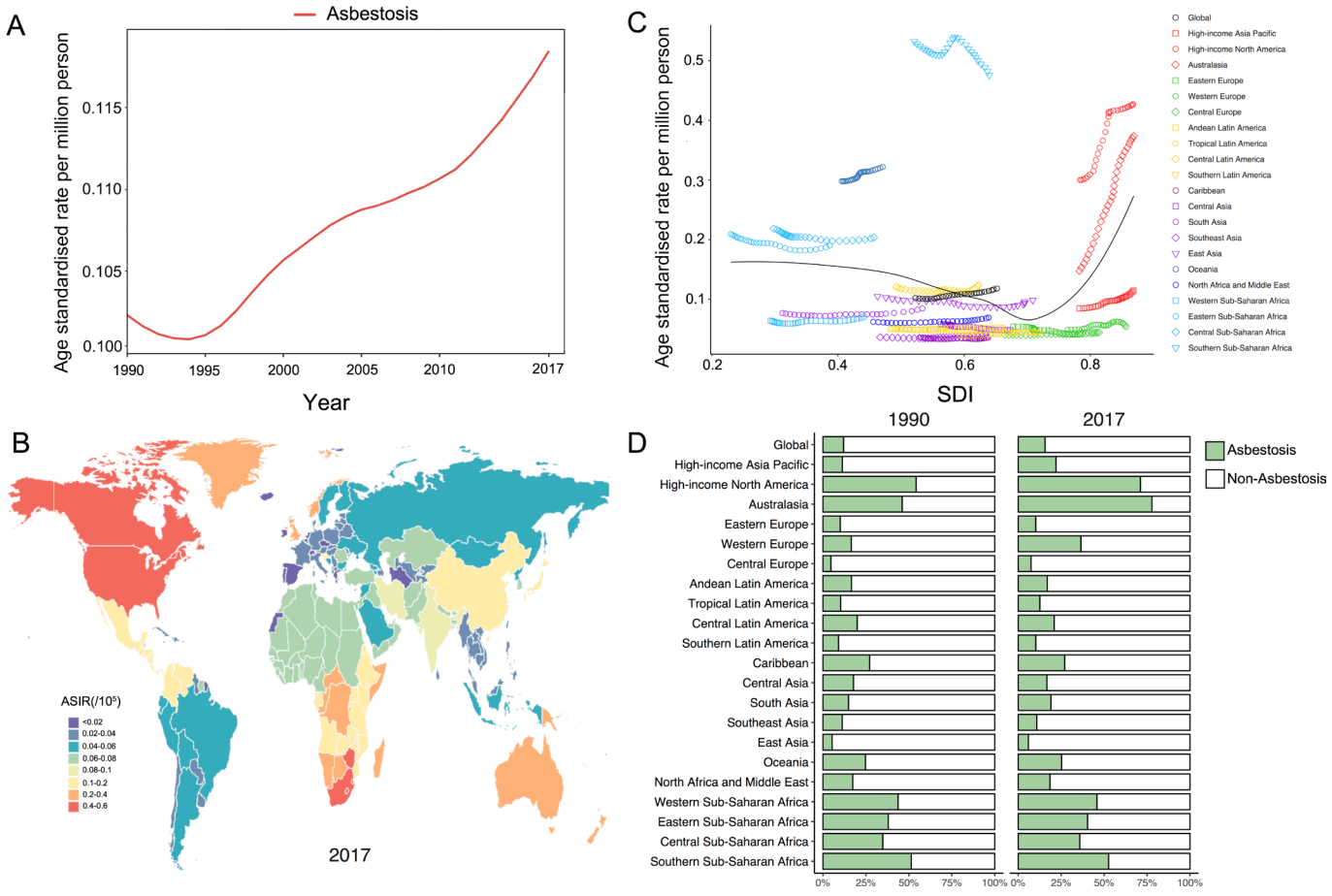

Figure 1 (A) Change of incidence trends of asbestosis from 1990 to 2017. (B) ASIR of asbestosis in 195 countries and territories in 2017. (C) ASIRs in 21 GBD world regions for asbestosis by SDI, from 1990 to 2017. The black line represents expected values of ASIRs for each value of SDI. (D) Contribution of asbestosis to absolute pneumoconiosis incident cases, globally and by regions, in 1990 and 2017. ASIR, age-standardised incidence rate; GBD, Global Burden of Disease; SDI, Sociodemographic Index.

legacy of extensive use of asbestos in industry, as well as the very long latency of asbestosis.[5] According to a report from WHO, approximately 125 million people globally are currently exposed to asbestos in the workplace, and more than 90 000 workers die from asbestos-related diseases each year.[6] So far, the use of asbestos has been completely banned in more than 50 countries, such as the European Union, South Africa and Australia, and the use has been restricted in some countries, including the USA, Canada and New Zealand.[4] However, the asbestos is still widely used in some other countries, and the burden of asbestosis is still rising. A study in Canada found that the number of new asbestosis cases has increased by about 30% during the surveillance period from 1992 to 2004.[5] Using data from the UK General Practice Research Database (a representative sample of the general population), we found that an overall increase was documented in asbestosis incidence in the UK between 1997 and 2008.[7] Additionally, from 2001 to 2015, 17 220 asbestosis cases (1148 annually on average) were reported in Italy, and the overall adjusted hospitalisation rate was 25.2 per 1 000 000 residents.[8] Consistent with previous studies, our results showed that the increasing ASIR and proportion of asbestosis occurred mainly in the developed regions, including high-income North America, Australasia and Western Europe. Another important reason for asbestosis elevation is that historical asbestos exposure limits in high-income countries may be not sufficient to protect workers from asbestosis.[9] Based on the current situation, an international ban on asbestos mining and use is imminent and the International Labour Organization/WHO Joint Programmes for the Elimination of Asbestos-related Diseases should be revitalized.[10] Given that most of the high-incidence countries listed here now have very effective asbestos control, and the high rates of asbestosis reported here reflect heavy and inadequately controlled exposures in the past, these results should be presented as a warning for the rest of the world.

This is the first study to systematically describe the characteristics of asbestosis incidence and the temporal trends. Several limitations of our study should be noted. First, we obtained the conclusion based on the data of GBD 2017; some patients who were not included in the data may have biased the results. However, GBD 2017 data sources cover a wide range and could provide clues for the incidence of asbestosis worldwide. Second, the quality of different primary data sources and assumptions are imperfect. However, the GBD estimates are updated each year with improvements in the modelling strategy and complementation of data sources. Taking the aforementioned into consideration, we found that integrating multiple health data sources could give a more accurate and complete picture of incidence trends of pneumoconiosis. Taken together, our findings, based on GBD 2017, could provide clues to the incident rates of asbestosis and warnings against complacency with respect to exposure control of asbestos.

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Table 1 Incidence and temporal trends of asbestosis by geographical areas, from 1990 to 2017

	1990		2017		1990–2017
Geographical areas	Incident cases n×10^3 (95% UI)	ASIR per 100 000 n (95% UI)	Incident cases n×10^3 (95%UI)	ASIR per 100 000 n (95%UI)	AAPC n (95% CI)
Asia Pacific, high-income	1.52 (1.35 to 1.71)	0.74 (0.66 to 0.82)	2.51 (2.18 to 2.87)	0.54 (0.47 to 0.61)	−1.31 (−1.37 to −1.24)
Central Asia	0.17 (0.14 to 0.19)	0.34 (0.29 to 0.39)	0.23 (0.20 to 0.27)	0.31 (0.26 to 0.35)	−0.49 (−0.52 to −0.50)
East Asia	20.2 (17.6 to 22.8)	2.12 (1.86 to 2.41)	34.0 (29.1 to 39.1)	1.66 (1.43 to 1.91)	−0.92 (−0.98 to −0.87)
South Asia	3.47 (3.08 to 3.89)	0.60 (0.53 to 0.66)	6.31 (5.46 to 7.29)	0.48 (0.42 to 0.55)	−1.00 (−1.08 to −0.91)
Southeast Asia	0.99 (0.85 to 1.14)	0.36 (0.31 to 0.42)	2.36 (2.02 to 2.74)	0.39 (0.34 to 0.46)	0.33 (0.22 to 0.43)
Australasia	0.08 (0.07 to 0.09)	0.32 (0.28 to 0.37)	0.25 (0.22 to 0.28)	0.48 (0.42 to 0.54)	1.42 (1.35 to 1.50)
Caribbean	0.037 (0.032 to 0.044)	0.14 (0.12 to 0.16)	0.07 (0.06 to 0.08)	0.13 (0.11 to 0.16)	−0.19 (−0.26 to −0.13)
Central Europe	1.28 (1.17 to 1.40)	0.85 (0.78 to 0.93)	0.12 (0.10 to 0.13)	0.59 (0.52 to 0.66)	−1.48 (−1.56 to −1.40)
Eastern Europe	1.41 (1.27 to 1.58)	0.50 (0.45 to 0.55)	1.21 (1.05 to 1.41)	0.37 (0.32 to 0.43)	−1.20 (−1.31 to −1.09)
Western Europe	1.74 (1.53 to 1.93)	0.28 (0.25 to 0.32)	1.40 (1.22 to 1.60)	0.14 (0.13 to 0.16)	−2.49 (−2.73 to −2.26)
Andean Latin America	0.08 (0.07 to 0.09)	0.37 (0.34 to 0.41)	0.17 (0.14 to 0.21)	0.31 (0.26 to 0.38)	−0.67 (−0.82 to −0.51)
Central Latin America	0.75 (0.67 to 0.84)	0.79 (0.70 to 0.88)	1.50 (1.3.0 to 1.72)	0.63 (0.54 to 0.72)	−0.89 (−0.98 to −0.81)
Southern Latin America	0.20 (0.18 to 0.22)	0.43 (0.39 to 0.48)	0.35 (0.30 to 0.40)	0.42 (0.36 to 0.49)	−0.13 (−0.12 to −0.07)
Tropical Latin America	0.51 (0.45 to 0.57)	0.53 (0.47 to 0.60)	0.97 (0.86 to 1.08)	0.42 (0.37 to 0.47)	−0.59 (−0.67 to −0.50)
North Africa and Middle East	0.71 (0.62 to 0.81)	0.34 (0.30 to 0.38)	1.71 (1.50 to 1.97)	0.36 (0.32 to 0.41)	0.23 (0.17 to 0.30)
North America, high-income	1.97 (1.74 to 2.22)	0.55 (0.49 to 0.63)	3.72 (3.29 to 4.19)	0.62 (0.55 to 0.69)	0.51 (0.42 to 0.59)
Oceania	0.041 (0.036 to 0.047)	1.39 (1.24 to 1.57)	0.10 (0.08 to 0.11)	1.50 (1.24 to 1.69)	0.18 (0.12 to 0.24)
Central sub-Saharan Africa	0.15 (0.14 to 0.17)	0.68 (0.62 to 0.75)	0.33 (0.29 to 0.38)	0.62 (0.55 to 0.70)	−0.36 (−0.39 to −0.33)
Eastern sub-Saharan Africa	0.47 (0.42 to 0.52)	0.60 (0.54 to 0.66)	0.89 (0.78 to 1.01)	0.51 (0.45 to 0.59)	−0.69 (−0.74 to −0.63)
Southern sub-Saharan Africa	0.31 (0.28 to 0.34)	1.03 (0.92 to 1.14)	0.51 (0.44 to 0.59)	0.89 (0.77 to 1.02)	−0.37 (−0.47 to −0.0.27)
Western sub-Saharan Africa	0.17 (0.14 to 0.20)	0.16 (0.13 to 0.19)	0.38 (0.30 to 0.47)	0.17 (0.14 to 0.21)	0.24 (0.12 to 0.36)

AAPC, average annual percentage change; ASIR, age-standardised incidence rate; UI, uncertainty interval.

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ORCID iD
Weihong Chen http://orcid.org/0000-0001-8689-7311

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