

PERIOD OF SERVICE BEFORE CERTIFICATION FOR PNEUMOCONIOSIS ON SOUTH AFRICAN GOLD MINES

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This paper concerns the mean service of White persons on the large and deep gold mines of South Africa. The results concern certifications for the years 1918 to 1968. During this 50-year period certifications were made in terms of 6 different definitions of pneumoconiosis. The 6 definitions came into force during the years 1912, 1919, 1925, 1946, 1956 and 1962. These 6 definitions may be summarized briefly as follows:

Under the 1912 Act, certification was for 'silicosis of the lung'¹ where cases of 'incipient and commencing silicosis were left until they developed those definite physical signs which denote(d) the established disease in its Primary Stage'.² Under the 1919 Act, persons became certified for 'silicosis' in the 'ante-primary' stage³ instead of the 'primary' stage.

Under the 1925 Act persons were certified at 'the earliest detectable specific physical signs of silicosis . . . whether or not capacity for work . . . was . . . impaired. . . .'⁴

In the 1946 Act 'silicosis' was defined as 'any form of pneumoconiosis due to the inhalation of mineral dust. . . .'

In the 1956 Act 'pneumoconiosis' was defined as 'disease of the cardio-respiratory organs (by whatever means discovered) which has been caused by dust in the course of work in a dusty atmosphere. . . .'

In the 1962 Act 'pneumoconiosis' is defined as 'permanent disease of the cardio-respiratory organs (by whatever means diagnosed) which has been caused by the inhalation of mineral dust'⁵ and persons are in life certified for the first time 'when their cardio-respiratory functions have been impaired by not less than 20%'.⁶

The pneumoconiosis was contracted on the large and deep gold mines in quartzites of the Witwatersrand Geological System.

The cases of pneumoconiosis arose from a group of persons the description of which was broadened in 3 main steps as follows:

(a) Up to 1946, persons at work underground only were compensated for pneumoconiosis;

(b) From 1946 up to 1962, the description of the population at work was broadened to: all per-

sons at work underground plus those at work in certain places on surface;

(c) After 1962, any person employed on the mine qualified for pneumoconiosis certification.

Cases with mixed service, i.e. with service on mines other than those defined above, were excluded for purposes of computing the mean service.

When computing the mean exposure in terms of years of service, no allowance was made for the difference in the actual time exposed to dust during a year of service between the various occupations. In this connexion, there are differences in the duration of the shift, as well as in the number of shifts per year of service.

The change in the annual mean service per case certified for the years 1918 to 1968 is depicted in Fig. 1.

The results may be subdivided into those for 3 different calendar periods, namely the period up to 1953, the period 1954-1957 and the period 1957-1968.

THE 1918-1953 PERIOD

The results recorded up to 1953 were reported to the 1959 Conference in Johannesburg, by Wiid.⁷

As calendar time proceeded, there was an increase in mean service from about 10 years around 1920 to about 22 years around 1950. Up to 1924 the increase was slow, but from about 1925 to about 1944 the increase was rapid. After 1944, the increase slowed down and came to a stop during about 1950. In fact, the period of exposure decreased after 1950.

During 1952 an Amendment Act came into force which provided for compensation for 'pulmonary disability'⁸ (which resulted from exposure to dust) as distinct from 'silicosis' (as defined in the 1946 Act).

Although the 1952 Amendment Act did not change the definition of 'silicosis' as defined in the 1946 Act, it did in fact have a profound effect on the mean years of service before certification for pneumoconiosis (Fig. 1).

THE 1954-1956 PERIOD

The mean service of the cases certified during the years 1954 to 1956 is, unfortunately, not available.

THE 1957-1968 PERIOD

The results for the period 1957-1968 are given in Table 1. From 1962 onwards, the figures refer to the number of White persons certified in life (for '20 to 50% impairment' of the cardio-respiratory functions).

From Fig. 1 it is seen that the results recorded between 1958 and 1963 suggest a rapid increase, from a mean service of about 20 years to one of almost 25 years, followed by a gradual increase after 1963. The 1962 change (in the definition of pneumoconiosis) occurred during this period and it may be partially responsible for the increase. An additional explanation may be short service cases caused by high dust exposures received during the drive for rapid shaft sinking and rapid development for some years after 1945.

The impression of a gradual increase after 1963 is confirmed by an independent investi-

gation of the cases certified in terms of the 1962 Act during the period 1 April 1963 to 25 March 1968. Those cases in whose service there was a gap of 10 or more years and those cases who were certified 10 or more years after the last shift worked were excluded. The cases involved are 1,086 in number.

TABLE 1:

Period (1 April to 31 March)	Number of Cases	Mean Service in Years
1956/57 . . .	356	20.8
1957/58 . . .	190	20.5
1958/59 . . .	55	19.8
1959/60 . . .	78	20.2
1960/61 . . .	103	22.5
1961/62 . . .	215	22.6
1962/63 . . .	236	24.9
1963/64 . . .	522	23.8
1964/65 . . .	213	24.4
1965/66 . . .	130	24.0
1966/67 . . .	143	24.6
1967/68 . . .	163	24.7
1968/69 (First 8 months) . . .	161	24.4

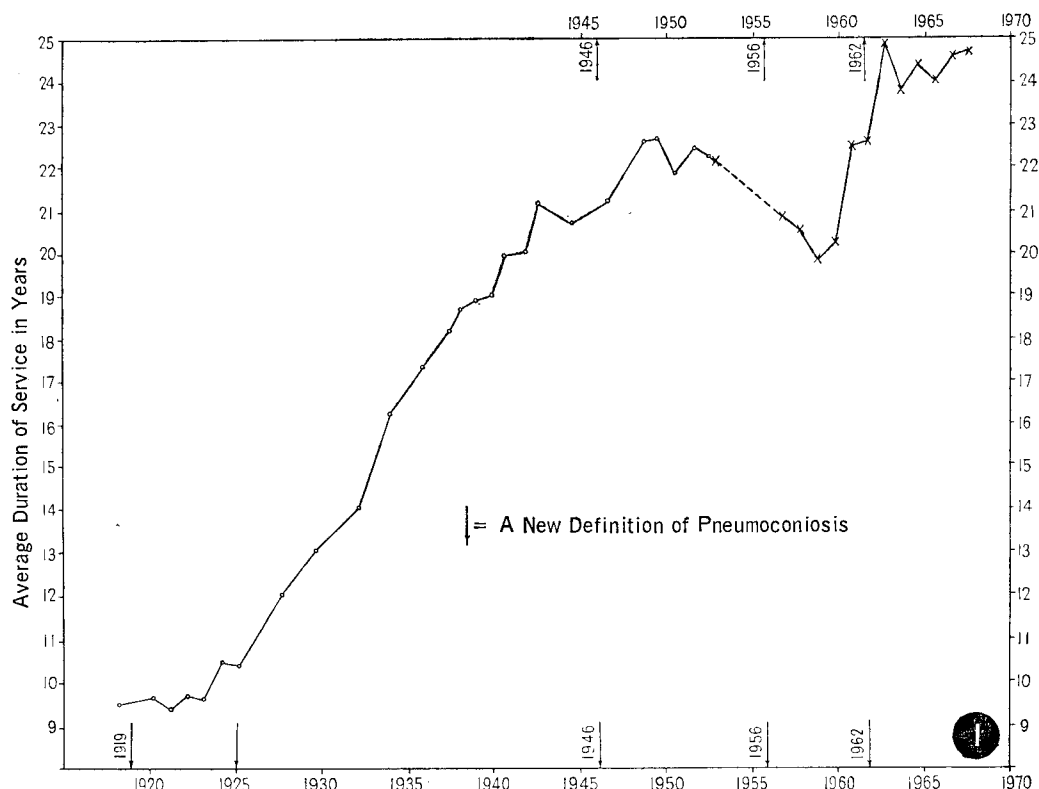


Fig. 1. Years of service on large gold mines before certification for pneumoconiosis.

The regression between service period and time was estimated by the method of least squares. For the purpose of estimating this regression line, the year 1964-65 was called $x = 0$ and the years 1963-64 and 1965-66 were transformed as $x = -1$ and $x = +1$ respectively, etc.

The estimated regression equation came to: $y = 302.704 + 3.26x$ where y = average service period (in months) and x = year,

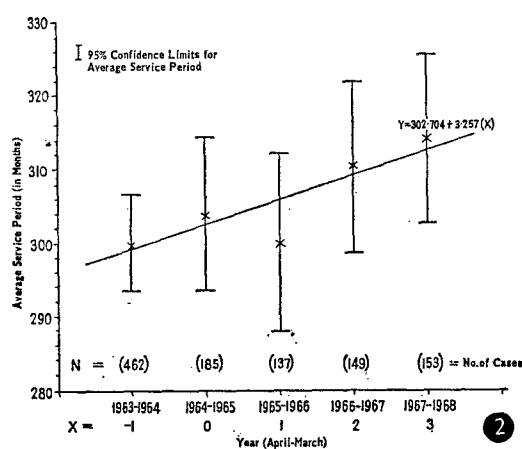


Fig. 2. Relationship between average service period (in months) and time (in years) for large gold mines in South Africa.

given in terms of the transformed variables described above.

This relationship is represented graphically in Fig. 2.

The observed relationship suggests an increase in the mean service of approximately 3 months per year.

It will be noticed that the period of service in Fig. 2 is somewhat longer than that in Fig. 1 for the same calendar year. An explanation for this difference could be the exclusion of cases with service breaks of more than 10 years from the results on which Fig. 2 is based and not from those on which Fig. 1 is based, if it is true that persons are certified for smaller dust dosages the longer the resident time of the dust in the lungs. In other words, a difference in the direction observed is expected in the case of a type of dust which produces a progressive pneumoconiosis.

As silicosis is believed to form a substantial proportion of the cases of pneumoconiosis on South African gold mines and as silicosis is believed to be progressive, the observed difference is in the right direction.

REFERENCES

1. Section 2 of Act No. 18 of 1912 of the Union of South Africa.
2. Report of the Miners' Phthisis Board for the year ending 31 July 1920, p. 35.
3. Section 25 of Act No. 40 of 1919 of the Union of South Africa.
4. Section 76 (2) of Act No. 35 of 1925 of the Union of South Africa.
5. Act No. 64 of 1962 of the Republic of South Africa, Section 1 (1) (XLIII).
6. *Vide* 5, Section 71 (1).
7. Orenstein (1959): *Proceedings of the Pneumoconiosis Conference*, Johannesburg, p. 361.
8. Act No. 63 of 1952 of the Union of South Africa, Section 2 (3).