

Reports

# An Ubuntu-based reflection on the public health impact of silica dust exposure in the South African mining industry

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Issuing fitness certificates to South African mine workers with early and mild silicosis to continue risk work underground is a public health concern. This article draws on the view of solidarity to contend this practice. We employed a normative ethics approach and the concept of solidarity in African ‘Ubuntu’ philosophy to report and reflect on the public health implications of silica dust exposure among South African miners. We argued that since silicosis is irreversible, incurable, and could be progressive, leading to death, thus, issuing certificates of fitness to individuals who have early and mild silicosis, in many ways, is inappropriate and the practice ought to be rejected. We recommend more studies to reflect on the ethical management of silica dust exposure in the South African gold mining industry.

The South African (SA) gold mining industry is an inherently risky working environment, with frequent accidents and crystalline silica dust exposure that causes silicosis and other cardiorespiratory/autoimmune complications. Silicosis is a major public health issue in SA’s mining industry. It is an incurable and irreversible disease-causing lung impairment. In 1996, silica was classified by the International Agency for Research on Cancer (IARC) as a human carcinogen (class I).<sup>1</sup> Churchyard and colleagues once reported an average 18-20% frequency of silicosis in South African gold miners, with a mean age of 46,7 years and an average length of risk-exposure service of 21,8 years.<sup>2</sup>

In SA, tuberculosis (TB) is miners’ most important silicosis complication. Silicosis and TB can considerably impact the mining industry and potentially lead to public health disasters.<sup>3</sup> For instance, pulmonary tuberculosis is a highly contagious disease. Overcrowding and compact living conditions of mineworkers can increase tuberculosis spread and exacerbate the existing TB burden in communities, negatively impacting the country’s health infrastructure. Thus, preventing silicosis and/or lowering the current Occupational Exposure Levels (OEL) in the gold mining industry to below 0.1m<sup>3</sup>/mg<sup>1</sup> ought to be of paramount importance to improve public health in SA.

To realize this, the SA mining tripartite stakeholders – the government, industry employers, and the mineworkers’ unions – convened a health summit in 2003. A resolution was made to reduce occupational exposure levels to 95% of the current levels of 0,1m<sup>3</sup>/mg by December 2008 and eliminate new silicosis cases in miners entering the industry after 2008,<sup>4</sup> and 0,05 m<sup>3</sup> / mg by 2024.<sup>5</sup> The SA government has undertaken many actions to realize this vision like promulgating Acts to address occupational health in the SA mining industry. Examples include the

Mine Health and Safety Act (MHSA), Occupational Health and Safety Act (OHSA), and the Occupational Diseases of Mine and Works Act (ODMWA). MHSA is the preventive Act for occupational lung disease. OHSA covers all other hazards. ODMWA is now mainly concerned with the compensation of disease. In the gold mining industry, silicosis is compensable under ODMWA, depending on the disease grading. First and second-degree silicosis are compensable according to the Act. Early/mild silicosis are not compensable. Affected individuals with non-compensable diseases are expected to continue risk work underground, where they are further exposed to silica dust. Alternative accommodation, if available, would be offered to first-degree silicotics. Miners with second-degree silicosis are fully compensated and prohibited from continuing risk work underground.

Occupational Medical Practitioners (OMPs) are crucial in limiting risks to already affected mineworkers and workers’ fitness to continue risk work underground. They do this by issuing a certificate of fitness after medical surveillance. Miners with early and mild silicosis are often issued fitness certificates to continue risk work underground. Many miners with early silicosis (ILO 0/1) and mild silicosis (ILO 1/1) also prefer returning to work for several reasons. High unemployment rates, unavailability of reasonable accommodation on the surface, poverty, and poor social grant services in SA are the main drivers for mineworkers opting to return to risky work underground, where the progression of silicosis is accelerated. This is problematic.

This article articulates how ethics can be engaged to limit miners’ further exposure to silica dust to improve public and miners’ health. We are unaware of an ethical reflection that draws on an approach in the Global South to interrogate the morality of issuing a certificate of fitness

to affected miners within the SA gold mining context. This significant gap should be filled since studies continue to demonstrate that individuals will likely accept policies/guidelines aligning with their values.<sup>6</sup> This article contributes to filling this gap by drawing on the moral norms that can arise from the thinking about solidarity grounded in an African Ubuntu philosophy to argue that mineworkers with early/mild silicosis, and especially those who have been diagnosed with TB, ought not to be certified to continue risk work underground where they are further exposed to silica dust. Our article has implications for public health and for engaging miners diagnosed with silicosis but physically fit to work, i.e. do not have TB that complicates silicosis or the degree of disability that inhibits risk work underground.

## APPROACH

This article is a normative ethics article. Normative articles' methodologies are often philosophical argumentations that enquire about whether practices are right, and in what ways. The thesis is the claim we make about a practice's rightness or wrongness. They (normative articles) are often considered research articles since they are not merely interested in summarizing knowledge but often adopt *philosophical analytical methods* to push the boundary of knowledge on an issue.<sup>7,8</sup> These approaches are not uncommon and have been adopted by various scholars,<sup>9-11</sup> and often consists of Introduction, Research Design/Methods (or approach), Discussion and Conclusion.<sup>12</sup> The approach consists of drawing on norms articulated in published resources and deposited in different databases, to answer a question. Sources used in defense of our thesis include journal articles, reports, government legislation and web-based articles. The primary engines used to access them were Google Scholar, Web of Science and PubMed. To retrieve relevant articles from these databases, we used phrases like, "silicosis AND South Africa" "ethical issues in risk work", "solidarity AND Africa", "African solidarity view", etc. These searches yielded about 200 articles in total. Relevant articles were retrieved for this article's purpose and are contained in the reference section. The relevant literature on African views of solidarity were rigorously analysed to derive norms which were then used to defend our position.

Evidently, there are many ways to answer whether it is justified to issue fitness certificates to affected mineworkers to continue risk work underground. A critic could point out that this question requires an empirical method that assesses the perspectives not limited to mineworkers and mine owners in South Africa since the answer has serious implications for them and any industry with a silicosis risk. Their view makes it possible to mount a persuasive argument. In response, we do not imagine that a single approach can comprehensively address all the issues relevant to mining underground. Hence, while we encourage such empirical exercises; nonetheless, normative perspectives are also required since norms are critical to how individuals experience and relate with the world. Importantly, norma-

tive perspectives, particularly those grounded in individuals' cultures, can provide insights into how these individuals are likely to feel about various issues.

## UNDERSTANDING AFRICAN 'UBUNTU' PHILOSOPHY

The 'Ubuntu' philosophy this article draws on has been significantly described by others.<sup>13-17</sup> This article advances these descriptions by demonstrating how such descriptions may be applied to think critically about the morality of issuing fitness certificates to mine workers.

Ubuntu is an alternative moral theory to dominant theories in the West. It is a philosophical approach by which many populations in Global South reflect/act towards each other.<sup>15</sup> Notice how ubuntu is said to be *Afro-communitarian*, because it is informed by intuitions that are more dominant in Africa, and have not come to the continent from elsewhere. As a normative theory, Ubuntu generally considers acts wrong when they do not constitute a regard for others.<sup>15</sup> Conversely, right actions promote communal relationships construed as caring for others well being and engaging in beneficial public projects.<sup>15</sup> Specifically, communal relationships are those in which people identify with one another and demonstrate solidarity towards others.<sup>18</sup> In Ubuntu, typical human beings have dignity by virtue of their capacity for communal relationships. This way, this African thinking about communal relationships shares common features with, particularly Nel Noddings Care Ethics. But they are also different. Both approaches agree that acting for others' good is a core feature of relationships. However, in Care Ethics, one is not required to identify with others. Conversely, a combination of sharing a way of life and exhibiting solidarity is necessary for relationships in Ubuntu. There are other ways, Ubuntu also differs from Care Ethics. For example, in Noddings<sup>19,20</sup> conception of moral status, entities that cannot commune lack moral status, whereas in Ubuntu version, the absence of capacity to commune back does not necessarily imply that the entity lacks a moral status.

Given the above, we emphasize here that although the African Ubuntu philosophy is often said to emphasize communal relationships, a moral theory does not need to be African to be communitarian or that there are no communitarian theories outside of the continent. In this regard, it is worth acknowledging other scholars like Alasdair MacIntyre, Amitai Etzioni and Care Ethicists who have developed a corpus of work on communitarianism.

## SOLIDARITY AND AFRO-COMMUNITARIAN 'UBUNTU' PHILOSOPHY

Solidarity is a key value in Ubuntu, and it enjoins compassion, empathy, respect for others, dignity, harmony, caring for one another in a way that promotes the flourishing and wellbeing of all community members.<sup>13</sup> The Ubuntu view of solidarity thus implies that pursuing the common good is far better than pursuing the individual good. The public health implications of solidarity has been defended by other scholars like Nancy Jecker,<sup>21</sup> and is not worth repeating here.

Different formulations of solidarity in Ubuntu exist.<sup>22</sup> Nonetheless, we focus on Thaddeus Metz's formulation. In his view, solidarity entails engaging in mutual aid, where actions are reasonably directed at outcomes that benefit others *for their sake*.<sup>18</sup> Solidarity is also an attitude, implying that emotions and motives drive individuals in a genuinely solidary group to act positively towards others for their own sake. Nancy Jecker and Caesar Atuire echo the preceding motivational factor by conceptualizing African solidarity as a principle that includes both aspirational and normative elements.<sup>23</sup> The aspirational element is the component that compels individuals to uphold ideal human values of kindness, compassion, respect and concern for others, whilst the normative aspect is prescriptive, requiring individuals to conduct themselves in ways that promote the common good.<sup>23</sup> African thinking about solidarity informs some common practices on the African continent such as assisting others without cost calculations,<sup>24</sup> or *letsema*, which is a cultural practice whereby individuals in the community assume responsibility for helping each other harvest their farm produce and share in the profits.

Evidently, many other things can be said about solidarity. Nonetheless, this is a mostly evaluative study that draws on a norm to interrogate an ethical question rather than a purely descriptive one. One normative principle that arises from the thinking about solidarity in Ubuntu, is that we ought to act in ways that limit harm to individuals and improve their overall or public health. In the next section, we demonstrate how this principle for our thesis.

## CASE REPORT

### SILICOSIS: DISEASE AND PROGRESSION

Vani Mamillapalli and colleagues describe silicosis as the commonest occupational lung disease in the world. The disease is also known as phthisis – though this is an archaic term – and is a form of pneumoconiosis caused by inhalation of respirable crystalline silica dust.<sup>25</sup> The disease is found in many industries, most commonly in gold mining. Prognosis is problematic, given that no known cure for silicosis exists, and silicosis is an irreversible condition that *may be* progressive, leading to potentially fatal fibrotic or lung disease that develops following the inhalation of large amounts of silica dust more than 0,05m<sup>3</sup>/mg over time.<sup>26</sup> The lung function deterioration increases with disease progression even after the affected individual is no longer exposed to silica dust (Leung et al., 2012). A clarification is required here. While silicosis is irreversible, there is a wide spectrum of presentation under current conditions. In some cases of early silicosis, the disease progresses slowly or not at all. Progression of silicosis to disabling or advanced disease is not inevitable. Equally, notice that death from silicosis (without tuberculosis) is rare today. The argument for requiring miners with early silicosis to be removed from exposure is widely accepted by medical commentators on the grounds of limiting progression. Continuous exposure to silica dust could facilitate this progression. But this is not the most important trigger. One very important determinant of the progression of disease in miners with sil-

icosis and death from respiratory disease is TB. Hence, we focus primarily on miners diagnosed with TB while in employment. Suppose that silicosis is a powerful determinant of TB. In that case, our argument also has implications for miners who have silicosis but have not been diagnosed with TB. Hence, what ethical implications can be drawn from the principle we articulated in the previous section for continuously exposing miners to silica dust, assuming that continuous exposure could trigger TB and further progression that could result in death?

Simple chronic silicosis is a common form of progressed silicosis and occurs after about 10 years of consistent exposure to crystalline silica dust. It is usually asymptomatic, meaning that the affected individual may display no symptoms or symptoms like cough, dyspnoea, fatigue and sweating, especially where nodules coalesce to form PMF (Progressive Massive Fibrosis). PMF may be associated with the deterioration of lung function capacity. Accelerated silicosis may appear sooner than the latency period of 10 years, where silica dust exposure levels are higher than 0,1m<sup>3</sup>/mg.<sup>26</sup> It usually occurs within 5-10 years of first exposure to high levels of crystalline silica dust. The clinical presentation and radiological pictures are similar to the simple chronic silicosis with more rapid progression to PMF and lung function impairment. Acute silicosis occurs when one is exposed to even much higher levels of 3m<sup>3</sup>/mg or more silica dust within a short time.<sup>26</sup> In acute silicosis, exposure is usually very high with very early onset and high mortality. Finally, complicated silicosis is associated with gradual severe lung scarring and PMF. The complicated form of silicosis is more common in accelerated silicosis than in simple chronic form. It is more associated with complications like Cancer, TB infections, severe lung impairment, cor pulmonale and death.

According to the international labour organization, silicosis is further graded into different degrees according to its severity. These grades are based on radiological findings as per ILO (International Labour Organization) and are directly proportional to the degree of disease progression and not to forms of silicosis. The reader should notice that early and mild silicosis are more complex than they imply. First, most silicosis is sub radiological, i.e. would be found in the lung at autopsy or biopsy but does not appear on the chest X-ray (CXR). In this regard, the ILO classification of 0/1 should not be interpreted as the presence of "early" silicosis but as the absence of silicosis. A classification of 1/0 is variously referred to for example, as "early" or "borderline", and may be subject accordingly to diagnostic (radiological) uncertainty. CT scans can reduce this uncertainty, but are considered unnecessary and expensive for screening. Uncertainty leaves room for false positive diagnosis. However, given that our main approach is normative, that is, to justify why a certificate of fitness ought not to be issued to those with early and mild silicosis, we focus on validated cases of early silicosis. This excludes instances of false positive diagnoses.

Similarly, the descriptor "mild" silicosis is also not straightforward and cannot be based on the CXR alone. ODMWA does not use these terms but rather an arbitrary

“permanent disability” scale of 0-10%, 10-40% and > 40%-100%. CXR, lung function and comorbidity are used to classify claimants by the MBOD Certifying Committee, using a code of practice that has not to our knowledge been published. Without lung function evidence, an ILO CXR finding of at least 2/2 or above is needed to be certified first-degree. Although ILO 2/2 may imply the involvement of the upper and middle lung lobes bilaterally and 3/3 may imply a larger profusion with many nodules involving all the lung fields but with minimal lung deterioration (FEV1 between 65% and 52%), this is not a given. Precisely, it is important to clarify that there is a lack of correlation between lung function loss and CXR ILO profusion. Miners with ILO 1/0 may have significant lung function loss, while others with advanced CXR changes, e.g. ILO 3/3, have surprisingly few symptoms. The profusion in second-degree or severe silicosis and its radiological readings are like those described in first-degree silicosis. However, in second-degree silicosis, there is the presence of marked lung function deterioration with an FEV1 measuring less than 52%. This could be due to the coalescence of nodules, as in PMF described above or lung fibrosis in the absence of PMF. Second-degree is said to have more than 40% impairment.<sup>27</sup>

#### AFRICAN SOLIDARITY AND ISSUING CERTIFICATE OF FITNESS

Silicosis generates an ethical dilemma for SA mining industry. Miners are the most vulnerable to developing different forms of silicosis, yet the livelihood of miners often depends on this job. Suppose miners have silicosis and are now diagnosed with TB that triggers progression, and excluded from working underground on this account. In that case, the economy will also be negatively affected.

Both the industry and the government have taken important steps to limit silica dust exposure and/or risk to miners. In addition to previously mentioned Acts, other measures include health risk assessment (HRA) and employment of control measures to mitigate exposure levels. Notwithstanding the best effort to limit silicosis, studies continue to demonstrate that miners are at a high risk of exposure to silica dust. Gavin Churchyard and colleagues have allegedly reported an average risk rate of 18-20% of silicosis in South African gold mineworkers. An increased rate was later *suggested* to be 24% by Girder-Brown and colleagues in 2008.<sup>28</sup> Notice that the impact of silicosis is not only limited to the affected individuals, but has public health significance. The negative impacts extend to the mining industry and may potentially lead to public health disasters.<sup>3</sup> For example, in Lesotho, Brendan V. Gilder-Brown and colleagues found that miners repatriated to the country from South Africa significantly increased the country's disease burden.<sup>28</sup> Healthcare facilities are often not easily accessible in villages where the miners return to. The public health implication is that families and societies will be burdened with caring for sick mineworkers, and often with limited resources. Also, sickness has economic implications since immobility and caring for sick people almost always translate to lost wages and income. Income is important for procuring healthcare.

Suppose, as we have demonstrated, silicosis is irreversible, incurable, and could be a progressive disease that ultimately leads to death and has grave implications for others and society. In that case, issuing certificates of fitness to individuals with early and mild silicosis undermines their wellbeing, families, and public health. In many ways, this is primarily a failure to be solidary by limiting harm and protecting the health and wellbeing of mine workers and society. The reader should notice that the norm we apply here implies that OMPs in the gold mining industry ought to act in ways that limit harm to individuals and improve their overall health and social wellbeing. In this regard, a greater degree of moral weight ought to be placed on the health and wellbeing of miners.

It is also secondarily a failure to be concerned for their families' independence and financial wellbeing. Health is central to financial wellbeing since sickness can prevent individuals from working and, thus, earning an income. To protect, promote and maximize the health and global wellbeing of miners with early and mild silicosis implies that they ought not to be issued a certificate of fitness that allows them to continue risk work underground. This will prevent further exposure to silica dust that could lead to accelerated progression of silicosis with subsequent respiratory impairment, increased risk of pulmonary tuberculosis, lung cancer, and other complications of silicosis.

#### DISCUSSION

In this section, we explore some potential objections to this report.

#### MISCHARACTERIZATION OF THE NORMATIVE PRINCIPLES

There are different ways critics may challenge the thesis we defend. One line of objection is that we have *mischaracterized* the normative principle to which Ubuntu view of solidarity gives rise. Particularly, solidarity in African Ubuntu philosophy appears not to imply that we ought to do what fosters the good of *the individual*, but of *communities*. In many formulations of Ubuntu, a common tendency is to describe the philosophy as requiring individuals to foster the good of the community. This idea is aptly articulated by Josiah Cobbah, who remarks that “the starting point is not the individual but the whole group.” The community is often described as having moral priority over the individual. The community is equally the standard by which we should access individual actions.<sup>29(p322)</sup> Regardingly, promoting the good of all citizens might entail violating or breaching the rights of some individuals. Such violations are justified – from this perspective – should they foster the overall public good or health.

The preceding has implications for how we think about whether a certificate of fitness ought to be issued to mineworkers already affected with early and mild silicosis. Specifically, it would mean that issuing a certificate of fitness to mineworkers, including mineworkers with early and mild silicosis, is justified to the extent that this is necessary

to promote the economic and wellbeing of the society. Suppose that a refusal to issue a certificate of fitness to mineworkers would plunge society into debt and misery. In that case, the normative principle arising from solidarity in Ubuntu would imply that the certificate of fitness ought to be issued, including to the mineworkers with early and mild silicosis.

In response, notice that the society is affected when the individual is not protected. Suppose the critic is correct that we ought to foster the wellbeing of the society. In that case, this ought to be considered objectively and on a broader spectrum. Issuing certificate of fitness might lead to continued economic activity but often at the peril of the affected mineworker and society at large through increased demand on the health care system. When there is no mitigation of continued exposure to silica dust's harmful effects, silicosis's inevitable progression is accelerated. This might lead to accelerated full-blown silicosis with its complications like incapacity, failure of the mineworkers to continue economic activity, health and financial burden to already impoverished and poorly resourced families and societies. However, removing affected mineworkers from underground risk work may prevent these potential burdens on society. Summarily, our response demonstrates that suppose the critic is right; we have mischaracterized the normative principle to which solidarity gives rise. In that case, on a risk/benefit calculus, it seems more beneficial to society (and to individuals) to remove mineworkers with early and mild silicosis from continuing risk work underground.

Nonetheless, we have not mischaracterized this normative principle since formulations of the African view of solidarity exist that equally emphasize the good of the individual or "think of the good of the community" as co-substantively dependent on the good of the individual, implying that the community's wellbeing can only be fostered through fostering the good of the individual.<sup>15</sup>

#### COUNTERINTUITIVE OUTCOMES

Another potential objection to the claim we advance may consider the likely consequence of the position we endorse as undesirable and on a risk-benefit calculus, to be avoided. Particularly, a critic may point out that there are currently no known practicable alternatives in place. Thus, denying a certificate of fitness might leave mineworkers in more precarious economic conditions than they already are. A norm is desirable to the extent that it can increase people's economic status and income. But our thesis statement would compromise the economic wellbeing of miners with early and mild silicosis in a way that contradicts what the principle stands for. It will compromise the main elements of the principles by failing to protect, promote and maximize the economic and social wellbeing of miners and their families, should they find themselves unemployed.

We respond to this potential criticism that not issuing a certificate of fitness to continue risk work underground need not leave miners in a more precarious situation than they already are. There are means that employers can improvise to mitigate against the economic harm that this

might give rise to. For example, employers can provide adequate alternative accommodation on surface – where there is no exposure to silica dust – and reserve this to already affected mineworkers. This group of mineworkers could be incorporated into other non-exposure mining projects on the surface and off sites like gold beneficiation.

Another critic could respond here by saying the belief that affected miners could be transferred to jobs *on the surface* in non-dust exposure areas is theoretical rather than practical. Is there a legal requirement in the Mine Health and Safety Act for this? There is none, and there are relatively few of such jobs on the surface, which are already occupied. This suggestion will face another challenge. There is a steady shrinkage of employment in the SA gold mining industry over the past 30 years. What this suggestion will inevitably lead to is medical dismissal. Similarly, given the extremely high employment rates in SA and neighbouring countries, a likely outcome for most dismissed in this way is intermittent or permanent unemployment. Hence, the argument that we ought to think of alternatives to risk work falsely assumes that such alternatives exist.

We acknowledge these practical issues, and our argument does not merely assume that these alternatives exist everywhere. Nonetheless, what is required is a more extensive discussion that would include discussions concerning how these alternatives may be created, and how individuals may reasonably be determined as qualifying to work on the surface. Our claim would also necessitate a policy change and calls for incorporating this group of mineworkers into the existing ODMWA compensation system. In addition, we have dedicated some space in this article to dust control. Although the discussion on the need to lower silica dust is not exhaustive, the need for dust control to prevent silicosis progression seems intuitive. The suggested discussions should also include more effective and efficient ways of controlling (exposure to) dust. The better the dust control the less the need for miners diagnosed with silicosis to be removed from exposure. The impact on overall public health will also lessen. Equally, the moral norm we draw on could also imply that we cap employment in the dusty work environment to limit exposure to dust and prevent radiological silicosis altogether.

Furthermore, given that silicosis is a very strong determinant of TB as stated previously, any miner with silicosis should have access to lifelong TB screening and treatment if they are diagnosed with TB. When miners leave the mines with their well-developed medical services, they lose such access, particularly on returning to remote rural areas. The likelihood of recurrent, untreated or partially treated TB is high. Therefore, the most important treatment approach to silicosis is screening and treating TB. Treatment of latent TB infection ("chemoprophylaxis") has also been recommended but is not widely practised in the mining sector and certainly not among ex-miners in SA. The moral norm we draw on implies that treatment of latent TB infection ought to be implemented. We note here that HIV-positive miners are at significantly increased risk from TB, even more so if they have silicosis. HIV by itself does not imply that miners ought to be removed from mining un-

derground. HIV-positive miners with silicosis ought to be strictly monitored and screened for TB and removed from mining underground, suppose they are diagnosed with the same.

#### COMPENSATION HISTORY AND MINERS' DIFFICULT CHOICES

A critic may also observe a long history of poor compensation for mineworkers, which ought to matter morally. But the principle we advance fails to consider this. The poor compensation system has over the years compelled already affected miners to continue risk work, irrespective of the knowledge of the health implications involved. The compensation system under ODMWA is hopelessly inadequate and inefficient. The benefit payable remains proportionally less than the magnitude of harm caused by silicosis to mineworkers and their families.<sup>30</sup> The gold mining industry had denied the impact of mining on the health of mineworkers and refused to take responsibility for the death toll and diseases caused by silicosis.<sup>31</sup> There is a dense political and legal mining compensation history going back 110 years in SA, and continuing into the democratic era. Why has "not much changed"? Ultimately, the industry was based on a low cost of labour, backed by the State. For this reason, it will take more than the tripartite alliance and stakeholder workshops to solve the problem.

In response, we acknowledge that the statutory compensation system needs to be overhauled, particularly in SA, and this will take more than a tripartite alliance to resolve this problem. We are equally not naïve to believe that stakeholder workshops can resolve the problem. This is not sufficient. However, we do believe that engagement with key stakeholders in the mining industry on these issues is a useful starting point for what, no doubt, would also require extensive deliberations and thinking that should result in policy revisions and/or developments for the mining industry. Part of the aim of this project is to provoke these critical conversations and force discussions that need to be had on how to improve the ODMWA compensation system. Additionally, we equally suggest that a body must be set up to implement and/or monitor the implementation of the Act.

#### ARE THERE SECURITY CONCERNS?

There are also security and economic concerns to consider. It might be argued that the impact of the non-issuance of a certificate of fitness could have a huge burden on affected miners, who might resort to crime to feed their families. There is already a high unemployment rate in South Africa, with values ranging from 26, 91% in 2018 to current rates being as high as 33, 56%. Mineworkers are even in a more precarious situation since they are often migrant workers from rural areas and neighbouring countries who are uneducated and cannot compete for jobs in the formal sectors. Though several factors can influence criminal behaviours, joblessness and worsened living conditions are other associated factors. Particularly, individuals may resort to crime as a measure of survival in the absence of jobs. Summarily, lack of adequate reasonable alternative accommo-

dation on surface for miners with early and mild silicosis, non-inclusion of these group of miners in the compensation system, high unemployment rate and inadequate social services system in the country are some of the drivers compelling miners to choose continuing risk work underground. This implies that a failure to issue these certificates could lead to increased crime in the society.

In response, the reader should notice that the normative principle we apply here does not ask that affected mineworkers should be fired from their jobs. This may increase crime in society. Instead, the normative principle we apply here implies that alternative arrangements ought to be made for affected mineworkers on the surface to continue non-risk work, and protect public health. In fact, the normative principle implies that employers have this moral obligation to not expose their employees to conditions that undermine these mineworkers' quality of life. Another critic may add that suppose there are no more places on the surface to accommodate more affected mineworkers. In that case, some affected mineworkers would be let go, and this may increase crime rate. In response, notice that it is not ultimately our position that affected mineworkers will not resort to violence and crime suppose they are dismissed from employment. But our argument indicates that, suppose mineworkers take up criminal activities. In these cases, it ought not to be because no alternatives were provided for them.

#### CONCLUSIONS

We conclude this article by providing some recommendations. Since silicosis is a public health problem as argued by Mar Requena-Mullor and colleagues.<sup>32</sup> Thus, we believe our recommendations will also have public health significance. Notably, we recommend that policymakers and stakeholders should draft and implement policies that consider early and mild silicosis as compensable conditions. They can draw on this article to promulgate laws prohibiting underground risk work continuity to prevent further exposure to already affected mineworkers. Equally, we recommend that mining companies create adequate alternative reasonable accommodation on the surface to cater to affected mineworkers. There should be frequent workshops and training of relevant stakeholders to monitor and improve compliance and the effectiveness of measures to mitigate Silica dust exposure and silicosis.

Evidently, the preceding is not sufficient. The mining inspectorate needs to conduct on-site inspections and continuously monitor the mines' compliance. Individual and surface dust sampling need to be frequently measured and analyzed to determine levels of silica dust exposure and monitor compliance. Continuous monitoring of processes is important as it provides information on how loopholes can be blocked to improve existing systems or how new measures may be implemented to replace ineffective ones. There is more work to be done, more reporting and more studies need to be conducted in the ethical management of silica dust exposure in the SA gold mining industry.

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