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The history of occupational health on the African continent

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Abstract

Background The history of occupational health on the African continent is important but under-studied.

Methods We surveyed key resources related to medical history from the Ancient Egypt through the Ottoman Empire period. For the colonial era, we examined archival records, official reports, and historiographical studies, focusing on key cases from French North Africa, Belgian Congo, Italian East Africa, and British South Africa. To explore occupational health in Africa during the post-colonial period, we supplemented biomedical publications with data from governmental reports and policy documents.

Results The history of occupational health on the African continent has been characterized by poor working conditions, especially in mineral extraction. Colonial exploitation frequently worsened these underlying problems. The post-colonial record suggests that many past deficiencies continue.

Discussion An integrated approach to the history of occupational health on the African continent provides context for better understanding current problems and for anticipating future trends.

Keywords History of occupational health, Work-related, Colonial, Ancient Egypt, Maghreb, Resource exploitation hazards

Introduction

Africa is the cradle of humankind from an evolutionary perspective, but very little attention has been paid to the history of human occupational endeavors on that continent. This review of the occupational health and disease in Africa addresses this topic over a broad historical sweep, beginning with ancient Egypt, going on to consider North Africa in the context of early Islamic period through the Ottoman Empire, then taking on morbidity linked to European imperial natural resources extraction in sub-Saharan Africa under French, Belgian, Italian, and British colonial rule, and finally highlighting selected occupational health issues in the post-colonial African context, and considering the challenges posed by industrialization.

By adopting a historical perspective, this review seeks to provide a comprehensive understanding of the evolution of occupational health in Africa, tracing the development of labor conditions and associated health risks over time. Examining the historical development of occupational health provides valuable insights into how past challenges have shaped present conditions and continue

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to influence contemporary policies and interventions across the continent.

Ancient Egypt

Ancient Egypt was not predominantly a slave-based economy, and workers were often recruited from the general population to work for the kingdom on specific projects such as military expeditions, mining and quarrying, and construction [1]. For example, it was farmers (not slaves) who were conscripted for large building projects during the flooding season when they could not work their lands. Such workers were paid a wage depending on their skill level and social status [1]. Health services were also provided, including doctors dedicated to these workers' health. Written sources, along with pictorial and sculptural representations in tombs and temples, highlight the demanding labor conditions characterized by extreme temperatures, heavy physical exertion, and exposure to hazardous materials [2]. The harsh working conditions led to strikes and protests among workers, as documented by various historical records. The so-called "Strike Papyrus" (1187–1157 BCE) reveals workers' grievances over inadequate compensation and food [1].

Construction workers experienced various injuries and illnesses. In the vast necropolis of Thebes, the foreman's logbook meticulously recorded workers' absences due to sickness or accidents, reflecting a principle of allowing sick workers to rest and not lift stones [3, 4]. The presence of a doctor accompanying workers at Thebes' necropolis, akin to a modern occupational physician, illustrates the relatively advanced state of Egyptian occupational medicine. These doctors not only treated injuries but also advised on diet (wheat, barley, and onions) and work organization (shifts not exceeding 8 h), ensuring workers' well-being [3, 4]. The Edwin Smith papyrus (c. 1600 – 1500 BCE) offers detailed descriptions of the diagnosis and the treatment of traumatic cases, including fractures and eye injuries, that occupational physicians also likely would encounter [5, 6]. Similarly, paintings in the tomb of the sculptor Ipuy (c. 1279–1213 BCE) depict various medical interventions, such as fracture reduction, treatment of head injuries, and eye disease management, underscoring the comprehensive care provided to workers by ancient occupational physicians (Fig. 1) [7, 8].

Miners working in desert regions, many of whom were slaves captured through military conquest likely experienced silica dust inhalation, as evidenced by histological examinations of the lungs of workers of the time [9, 10]. Fishermen and farmers contended with animal bites, parasitic infections, and insect stings, while artisans like sculptors and carpenters faced heavy workloads and their own respiratory issues [11, 12]. The "Satire of Trades" (c. 1900–1800 BCE) vividly describes the harsh working conditions of a small potter, highlighting the air quality issues faced by artisans. Bakers risked burns and respiratory problems (flour asthma), while embalmers suffered from spinal pathologies and infections due to their work with human bodies [3, 4].

Based on the analyzed documents, it is possible to conclude that Egyptian workers did indeed suffer from illness and injury directly related to their professions, and that occupational risks in all probability were exacerbated by the absence of individual or collective protections, since such ameliorating interventions were neither described in the texts nor depicted in the artwork. The introduction of occupational doctors, funded by the pharaoh or contractors, may have mitigated the impact of work-related challenges, showcasing a historically unique model of occupational medicine. This approach, reflecting a paternalistic concern for worker health, was distinctively Egyptian and not widely adopted by other ancient civilizations (including Greece and Rome), possibly due to differing social structures and the more dominant role of slavery in those societies.

North Africa from the ptolemaic to Ottoman periods

The conquest of the Pharaonic empire by Alexander the Great (356–323 BCE) in 332 BCE transferred North Africa in general and Egypt in particular to the Greco-Roman culture region for more than a millennium, until the Muslim conquest (641–654 CE). Part of this cultural change was the assimilation of the Greco-Roman medical tradition into the local ancient Egyptian medical tradition. In the Ptolemaic period, medical papyri consist of syncretized practices from Egyptian, Jewish, Greek and eventually Christian origins. As surviving written medicine of that period relates mainly to the high society, with little direct evidence concerning workers' health, we can assume that some ancient Egyptian medical practices persisted, at least on a local basis [13]. The absence of state-sponsored large infrastructure and building projects probably meant that the Pharaonic occupational health apparatus ceased to exist.

During the Roman era, the role of Alexandria as a scientific and educational center declined and students were studying the Hellenistic medical books and trained by local doctors. Skeletons from *Mons Claudianus* (settlement based around a series of granodiorite quarries in the Egyptian eastern Desert) showed Schmorl's nodes and osteophytosis, evidence of continuous heavy lifting and hard physical exercise, but did not exhibit any evidence of dietary deficiency or malnutrition [14].

The Muslim conquest of Northern Africa, which became known as the Maghreb, was less dramatic from the narrow medical point of view, as Islamic medicine was also built on Greco-Roman legacies, and therefore not being essentially different. Islamic physicians were

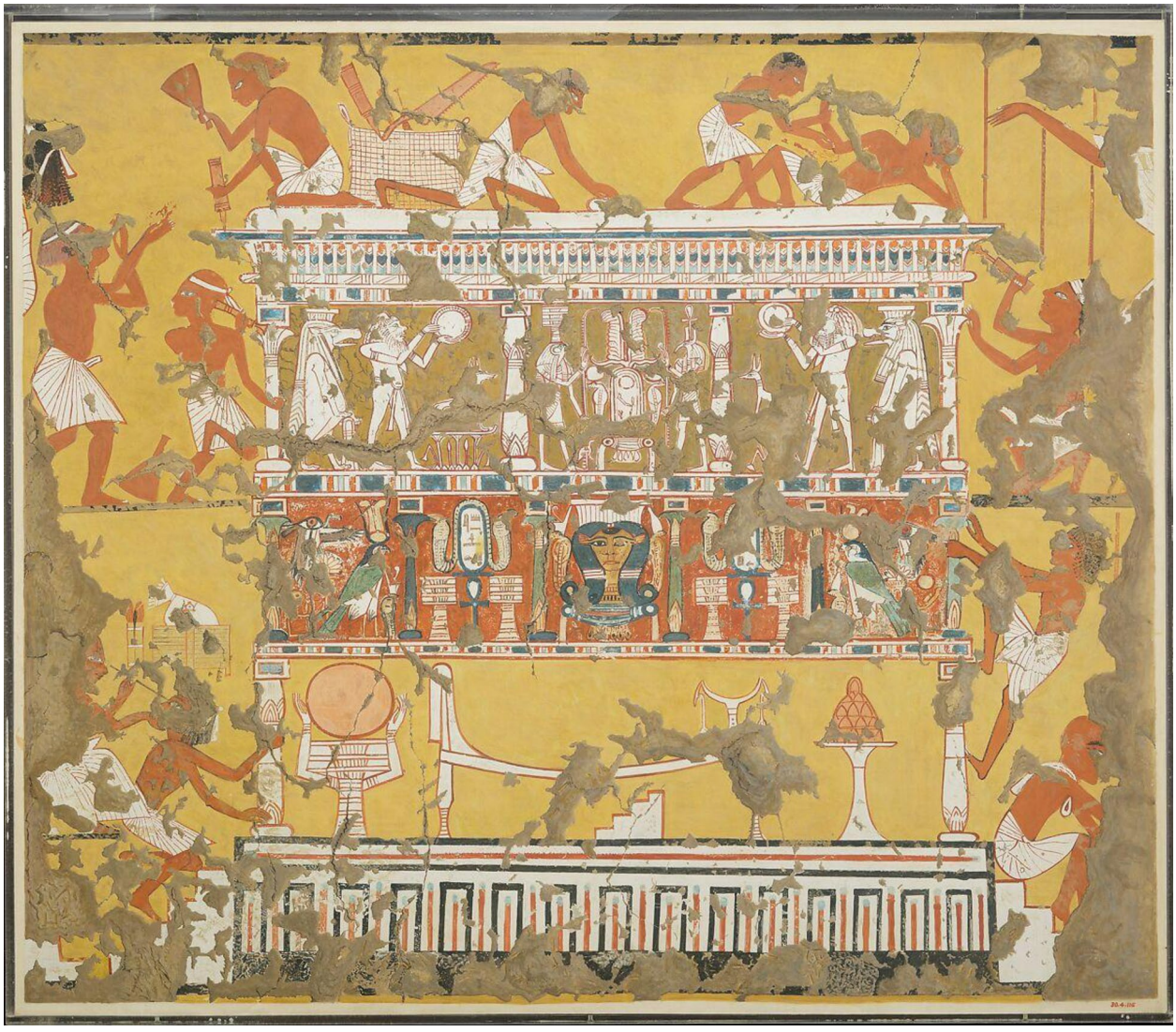

Fig. 1 Building a Catafalque, Tomb of Ipuy. New Kingdom, Ramesside (ca. 1295–1213 BCE). Painted from image at Deir el Medina by Norman de Garis Davies (1865 – 1941). The Metropolitan Museum of Art. New York, USA. https://www.metmuseum.org/art/collection/search/548572 (Public Domain) Accessed 25 January 2025

strongly influenced by the writings of Galen and Hippocrates, as well as by the Greek scholars of Alexandria. Islamic scholars translated Greek writings into Arabic and then produced new medical knowledge based on those texts. Islamic scholars ordered and made the vast and sometimes inconsistent Greco-Roman medical knowledge more systematic by writing encyclopedias and summaries.

The "Canon of Medicine" (an encyclopedia of medicine in 5 books, of which the 3rd and the 4th describe occupational diseases) by Ibn Sina (Avicenna, c. 980–1037) was translated into Latin and then disseminated in manuscript and printed form throughout the Muslim world and Europe [15]. During the 15th and 16th centuries alone, the "Canon of Medicine" was published in Europe more than 35 times.

Case descriptions of patients with occupational illnesses of that period are rare, but can be traced. For example, one of the reasons for dyspnea ("*usrun nafas*" in the Canon) is: "dryness or shrinkage of the lung which can cause lung stiffness", that could be an early description of pneumoconiosis [16]. Muslim and Jewish doctors of Qayrawan (Kairouan, in central Tunisia), wrote in Arabic in the 10th century and were translated into Latin in the late 11th century. The resultant corpus of medical works, formed the core of medical education in Europe, and continued to be influential into the Renaissance. The works of the Jewish physician Isaac Israeli ben Solomon (c. 832–c. 932) and his translator Constantine the African (c. 1020–1087), include many potentially occupational conditions, with some possible treatments, in the Galenic philosophy. For example,

descriptions of (most probably) work related spinal traumas by Haly Abbas (930–994) and their treatment, were introduced to the Salerno medical corpus [17].

Maimonides (1138–1204), Sephardic rabbi and philosopher, who became one of the most prolific and influential scholars of the Middle Ages, lived most of his adult life in Egypt. In his time, he was also a preeminent astronomer and physician, serving as the personal physician of Saladin (c. 1137–1193) (Fig. 2). His renowned treatise "*Regimen Sanitatis*" (Guide to Good Health), was composed in Arabic for the Sultan al-Afdal (c. 1169–1225), son of Saladin [18]. Most notable are his ideas about preventive medicine and public hygiene, explaining that lack of movement or overexertion might lead to disease and stressing the importance of prevention over treatment. He also stresses that the quality of air is important to preservation of health and that people should not live in a region of poor air quality.

In his "Treatise on Asthma" Maimonides observes: "… city air is stagnant, turbid and thick, the natural results of its big buildings, narrow streets, the refuse of its inhabitants… one should at least choose for a residence a wide-open site… living quarters are best located on an upper floor… toilets should be located as far as possible from living areas. The air should be kept dry at all times… The concern for clean air is the foremost in preserving the health of one's body and soul…." [19].

Northern Africa was annexed to the Ottoman empire since the early 16th century, later in that century industrialization started in the Ottoman Empire. "Dilaver Paşa Regulation", published in 1865, was the first written regulation in the history of Ottoman occupational health and safety (eventually not approved by the Sultan). This document, consisted of 100 articles such as assignment of physicians and improvements on working conditions (for example, the daily working time would not exceed 10 h, workers should be given rest periods and provided with a place to sleep) [20].

Meanwhile, in sub-Saharan Africa, written evidence on medicine in general is very scarce. Scottish explorer Mungo Park (1771–1806), in his "Travels into the Interior of Africa" (1799) notes concerning general health and possible work related injuries: "…But notwithstanding that longevity is uncommon among them, it appeared to me that their diseases are but few in number. Their simple diet, and active way of life, preserve them from many of those disorders which embitter the days of luxury and idleness. Fevers and fluxes are the most common and the most fatal… I found them very successful in their management of fractures and dislocations, and their splints and bandages are simple, and easily removed…" [21].

Colonial Africa

During colonial times, health policies in Africa strongly focused on controlling endemic infectious diseases, such as sleeping sickness or malaria, which constituted substantial threats for European expatriates, military expeditions, and local populations. Apart from the publications about the mining industry in South Africa, as reflected by the 1930 Johannesburg Conference on silicosis (see next section on post-colonial era), the scientific literature on occupational health and safety under colonial rule in Africa is sparse.

A notable exception concerns the phosphate mines in France's protectorates in North Africa. In a well-documented chapter of a doctoral dissertation devoted to the Gafsa phosphate mining region in Tunisia [22], Gruskin addressed both the health issues faced by the workforce of the *Compagnie des phosphates et des chemins de fer de Gafsa* – workplace injuries (including "fake" injuries), intestinal parasite infections, and dust hazard – and dental fluorosis ("darmous") found in the population around the mine as a result of environmental fluorine pollution. In Morocco, industrial extraction of phosphates by the state company *Office Chérifien des Phosphates* began in the 1920s [23]. In a 1953 publication [24], Jean Rodier (1920–2003) – who documented (also by means of documentary films) the clinical and other features of manganism among phosphate miners [25] – wrote a comprehensive overview (though without providing quantitative epidemiological data or literature references) of the various existing (or potential) occupational health problems in the Moroccan phosphate mines. These included: harsh working conditions under high temperature and humidity, and specific diseases caused by exposure to lead, manganese, antimony, cobalt, arsenic, inhaled dust particles, low oxygen, toxic gases, fluorine, and hookworm. Following the detection, in 1937, of "ankylostomosis" in the underground Khouribga mine, an intensive detection program by systematic feces examinations initially revealed an "enormous proportion" (up to 66%) of infestation among underground mineworkers, but improved fecal hygiene, individual "prophylaxis" (oral administrations of tetrachloroethylene) and continued surveillance led to substantial reductions in infestation [26, 27]. Rodier concludes with interesting (and for the era, rather progressive) considerations regarding collective and individual preventive measures [24].

Italian colonial rule, especially during the Fascist period, also left its mark on the occupational health landscape in Africa. In Libya and Italian East Africa, indigenous laborers were subjected to forced labor under harsh environmental and working conditions. Infrastructure projects, including roads, railways, and agricultural developments, exposed African workers to risks such as heatstroke, infectious diseases, malnutrition, and

Fig. 2 Statue of Maimonides in Cordoba, Spain inaugurated on June 7, 1964; sculptor Amadeo Olmos Ruiz. Source: https://he.wikiquote.org/wiki/%D7%A8%D7%9E%D7%91%22%D7%9D#%2Fmedia%2F%D7%A7%D7 Accessed 17 February, 2025.

respiratory illnesses [28]. Although Fascist propaganda promoted the image of modern and efficient colonial health systems, these initiatives largely prioritized the needs of Italian settlers, with minimal investment in the health of the African workforce [29]. In Eritrea, agricultural labor policies under Italian colonialism worsened health conditions among workers, who faced high rates of malnutrition, parasitic infections, and exhaustion due

to the heavy reliance on forced labor [28]. More broadly, the exploitation of indigenous labor in the Italian colonies reflected the same patterns observed in other colonial contexts, where occupational risks for African workers were exacerbated by systemic neglect and racial hierarchies [30]. A further element of occupational health policy during Italian colonialism was the extension of social insurance mechanisms to the colonies. After the conquest of Libya (1911–1912) and especially during the 1930s, the Italian National Accident Insurance Fund (*Cassa Nazionale Infortuni*), renamed INFAIL (*Istituto Nazionale Fascista per l'Assicurazione contro gli Infortuni sul Lavoro*), established branch offices in Africa [31, 32]. These services largely prioritized Italian settlers and workers, however, offering minimal protection to indigenous laborers, who remained highly vulnerable and faced significant disparities in compensation for occupational injuries and diseases [32].

In the following, we describe, in more detail, the paradigmatic case of how health and safety were approached and managed in the Katanga mining industry during Belgian colonial rule.

During the period of the "Congo Free State" (1885–1908) under the private ownership of King Leopold II (1835–1909), the exploitation of natural resources concerned mainly ivory and natural rubber. In 1908, the Congo Free State came under the jurisdiction of the Belgian state to become a colony, known as the Belgian Congo, until its independence in 1960 [33]. Under Belgian colonial rule, the extraction of mineral resources would be a dominant source of benefit for the metropole. Belgian geologist Jules Cornet (1865–1929), who laid the foundations of Congolese geology during the Bia-Francqui expedition of 1892, is credited with having described Congo's southernmost region as a "geological scandal" because of its wealth and diversity of mineral resources [34].

The organization of industrial mining formally started in 1900 with the creation of the *Comité Spécial du Katanga* (CSK) followed, in 1906, by the creation of the *Union Minière du Haut-Katanga* (UMHK), a private company that got a monopoly for metal mining and processing (and related operations) in the Congolese portion of the African Copperbelt [35–37]. UMHK's first copper ingot was smelted in 1911, and by 1922 the company belonged to the five principal world producers of copper. Copper production rose from 50,000 tons in 1923 to 139.000 tons in 1930. Production decreased during the economic crisis of the 1930s, but picked up after 1935 and intensified massively to contribute (not without repression of social unrest) to the allied effort during World War Two.

In addition to copper, UMHK produced several other commodities such as zinc and cobalt, as well as radium and uranium. The uranium needed for the Manhattan project A-bomb on Hiroshima came from the Shinkolobwe mine. The post-war years saw the golden age of the UMHK with an extension of mines and refining plants, as well as power plants and other infrastructures. In 1960, the company produced a record 300,000 tons of copper and had 20,000 employees. After Congo's independence (30 June 1960), the mining activities of the UMHK continued under various other statutes and names. Its assets were nationalized in 1967. The current heirs of the UMHK are the *Gécamines* (*Générale des Carrières et des Mines*), on the one hand, and the multinational UMICORE, on the other [35–37].

The general paradigm of colonial rule is to exploit a colonized country's natural resources for the benefit of the metropole. Belgian colonial administration operated under a paternalistic ideology, epitomized by the phrase "*dominer pour servir*" ("to dominate to serve"). This in essence racist mindset allowed colonizers to rationalize their exploitative practices as part of a broader mission to "civilize the indigenous population." The colonial governance relied on a "colonial trinity" comprising the state (with its administration consisting of Belgian nationals and its "*Force Publique*" under Belgian commandment), private companies (such as UMHK), and the church (mainly Catholic missions) providing social services like education and healthcare.

During the early period of industrial mining in the Katanga Copperbelt, the UMHK faced technological problems and difficulties to export production over very long distances to ocean ports, but one of the most serious issues was the shortage of workers in the sparsely populated southern Katanga. Therefore, workers had to be recruited, more or less forcefully, by private recruiters and companies such as the *Bourse du Travail du Katanga* (which operated from 1910 to 1927) and then by the *Office Central du Travail du Katanga*. Thousands of single men were thus recruited from neighboring areas but also from distant regions outside the Congo. As shown in a medical report from 1926 by Richard Bruynoghe (1881–1957), professor at the University of Louvain, mortality among workers was very high (up to 200/1000), with deaths occurring mainly during the first month of employment, this being attributed to a combination of "very defective conditions" during travel, poor initial nutritional state, high susceptibility of natives to respiratory infections, rudimentary collective housing in camps, cold weather, poor food quality, and insufficient preparation and training for mining work (causing numerous accidents) [38].

The economic consequences of labor shortage led, in 1928, to a policy shift towards "stabilization" of the workforce. This move was strongly inspired by UMHK's medical doctors, under the direction of Dr. Leopold

Mottoulle (1884–1964) who headed both the medical department and the department of the *Main-d'Œuvre Indigène* (M.O.I.). The new social policy aimed to solve the shortage of healthy workers by improving the recruiting conditions (see below), improving housing and sanitary conditions, and increasing the quantity and quality of food rations. Henceforth men would be allowed (and encouraged) to be accompanied by their wife and to settle in family housing provided by the company. Progressively, numerous social measures were instituted for UMHK employees and their families: hospitals and schools (carefully segregated between whites and blacks), and the *Œuvre pour la Protection de l'Enfance Noire* (O.P.E.N.). This "totalitarian" policy was conducted without worker participation; unions were forbidden [39]. Nevertheless, organized forms of resistance did occur, including a violently repressed strike in December 1941 [40].

In 1946, Mottoulle concluded that the efforts to stabilize the workforce had been successful and led to improved productivity, a decreased need to recruit workers from far away, and a substantial decline in morbidity and mortality, thereby achieving a substantial population growth [41]. The "generous" social provisions for UMHK workers and their families continued through the subsequent years [42]. In a self-congratulatory book celebrating the UMHK's 50th anniversary in 1956, the company prided itself for its "*oeuvre sociale*" having created a prosperous, happy and loyal African workforce, thus conspicuously ignoring past worker protests [43].

The efforts of the UMHK's medical service focused on ensuring that the workforce would be in good general health for the company's economic benefit. One important endeavor consisted in applying severe procedures to recruit new workers from distant regions in the Belgian Congo, Ruanda-Urundi and elsewhere. As described in detail in a 1933 publication by UMHK's *"médecin en chef"* René Van Nitsen, potential recruits (and their families) were first brought to a *"camp de concentration"*, where they received "abundant food" and rested a few days before being directed to a *"camp de préparation"*, where they underwent a "severe selection" (see Fig. 3) and medical preparation (including vaccinations and deworming) for the long journey (by train or ship) to Katanga, where they would receive education

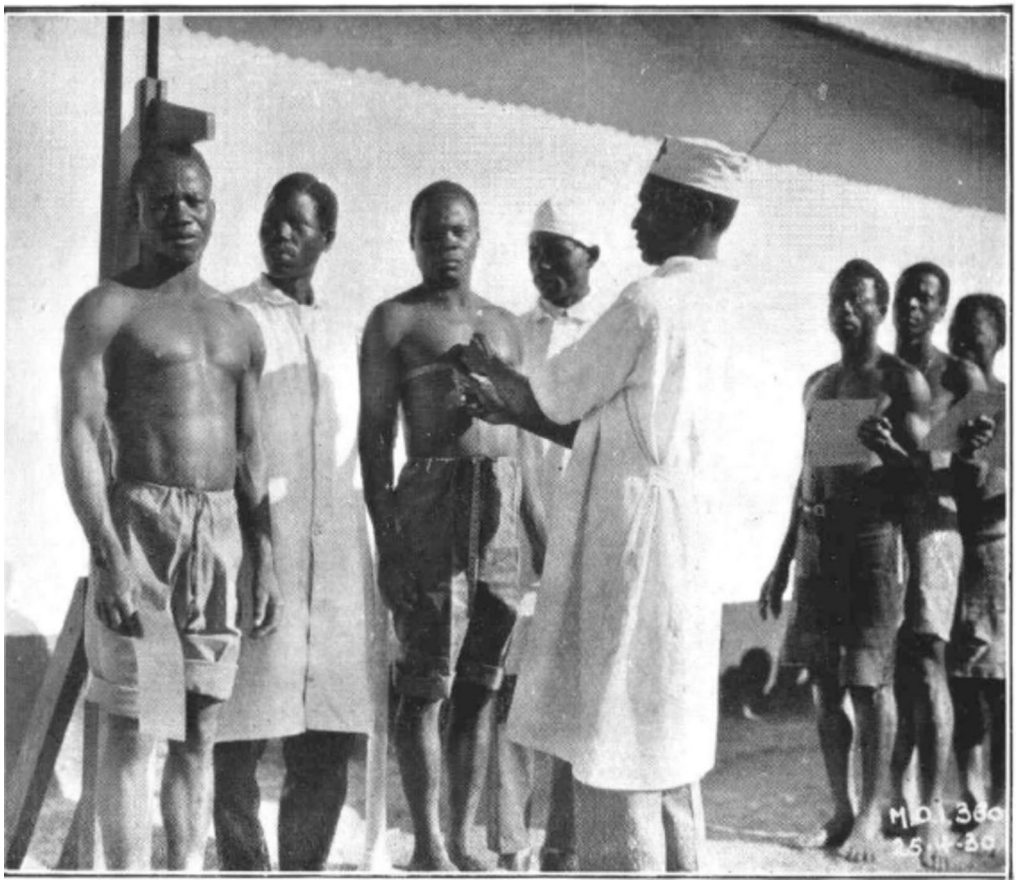

Fig. 3 Measurement of the *Indice de Pignet*, based on height, weight and chest circumference as developed by a French military doctor in 1901, to assess robustness of potential recruits [From Van Nitsen,1933]

for 28 days in a "*camp d'acclimatation et de préparation médicale*" to lead them progressively towards a new way of life [44].

The annual reports of the UMHK medical department (1917–1965) [part of the archives of the UMHK, which are kept in Brussels at the Archives générales du Royaume, Dépot Joseph Cuvelier (AGR2)] provide figures of mortality and morbidity, separately for the M.O.E. (*Main d'Œuvre Européenne*) and the M.O.I., for the period 1917 to 1965 [45, 46]. These reports focused almost exclusively on infectious diseases, such as malaria (the main cause of morbidity), pneumonia (the main cause of mortality), tuberculosis, intestinal diseases (dysentery, typhoid, parasites), and venereal diseases. Reports of the M.O.I. provide figures on occupational accidents, which in the early decades were responsible for two-thirds to half the hospitalizations. Until 1930, work-related injuries, even mild ones, were often followed by tropical phagedenic ulcers leading to very long hospital stays and a high cost of bandages. These complications were prevented by wearing foot and leg protection, and early finding and wound care by specialized nurses on mining sites.

However, neither in these reports, nor in the scholarly literature (e.g., Dibwe dia Mwembu's doctoral thesis [47]), are there data about the prevention, let alone epidemiology, of specific occupational diseases caused by exposure to metals, gases or vapors, ionizing radiation, noise, or musculoskeletal disease. Awareness of the risk of dust-induced lung disease did exist but according to Van Nitsen "We know of no cases of occupational diseases in Katanga, such as silicosis in the gold mines of South Africa. Nevertheless, with the increasing number and variety of industries, workers will have to be protected from some vapors or toxic dusts" [44].

The occurrence of silicosis among the M.O.I. first appeared in the annual reports of the medical department from 1941 onwards (i.e., about ten years after the operational start of the underground Prince Leopold mine of Kipushi) and sporadic cases continued to be mentioned in subsequent years, with variable incidence and without serious documentation. Work on "aerosology" by Lucien Dautrebande (1894–1969) from the University of Liège led to field experiments aimed at decreasing exposure to respirable dusts by aerosolizing sodium chloride solutions in the Kipushi mine [48]. However, no scientific publications exist about the outcome of these experiments.

In summary, after a period of an extremely harsh regime for the workforce of the UMHK, the medical department played an essential role to achieve a stabilization of the workforce, through improvements in general living conditions, health care, and paternalistic social measures. The UMHK medical activity was largely devoted to the prevention and care of tropical infectious diseases for mineworkers and their families. Little attention was devoted to specific occupational diseases, except for accidents and, to some extent, silicosis. In this sense, the practice of medicine at UMHK epitomizes the concept of "mining medicine", as a specific part of "colonial medicine" which, throughout the history of colonialism, was an integral tool in support of imperial interests [49, 50].

Post-colonial period

Transitions from colonial to post-colonial statehood in Africa often resulted in social and economic frameworks largely built on the pre-existing colonial foundations. The health of workers generally, and the focus on occupational health services and systems, followed this pattern. The health of workers in the colonial era was of a low priority, and this legacy, shaped by the emerging post-colonial economy, continued in most countries in Africa.

The countries of Europe, in the 1800's throughout the era of rapid industrialization, began to experience challenges with agriculture and food supply. This forced these nation states to seek alternate supplies for certain crops. Africa presented an important opportunity in that regard. At the Congress of Berlin in 1884, the continent was divided up among the various European powers [51]. To guarantee European economic imperatives, there was the need for further conquest and control – opening the period of "gunboat diplomacy" [52]. This was a key backdrop to later post-colonial development.

The post-colonial economies in Africa were either driven by farming, mining or since the late 1960's, oil and the petrochemical sector in North Africa [53]. In most cases, plantations, mines and oilfields continued to be owned and managed by entities either directly controlled by or with strong ties to the former colonial center. These employed indigenous populations or, if local conditions necessitated, imported labor. A typical description of working on the colonial/post-colonial farms: "Working and living conditions on plantations were generally bad……Tropical diseases were widespread and accidents common." and not dissimilar on the mines: "……Mining took a heavy toll on the workers in the form of accidents and unhealthy living conditions that contributed to the spread of disease" (Fig. 4) [54]. The colonial legacies continued into the current era, as in many instances, the extracted products from these mines held important political and strategic value for the previous colonial centers or the current industrial powers. The impacts on the health of the miners or the exposed communities has been documented as in several countries. The case of uranium extraction in sub-Saharan Africa, with the increased risk of cancer, not only among the workers themselves, but communities exposed to the mountains of mine-dust tailings [55], and in a more localized

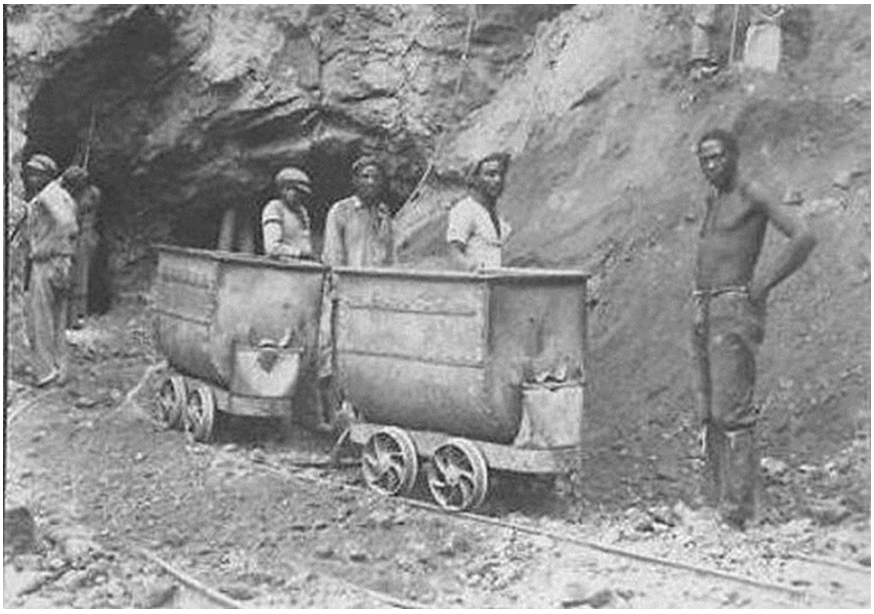

Fig. 4 Miners at Wesselton, Kimberley, early 20th century. Source: https://londonminingnetwork.org/2016/02/londons-mining-history-from-colonialism-to-apartheid-why-rhodes-must-fall/ Accessed 28 January 2025.

manner, phosphate mining in Tunisia [22] and Morocco [27] and copper-cobalt mining in the "African Copperbelt" [56–58] are important examples of this colonial-postcolonial burden.

In instances where wage labor was dependent on the indigenous population, social services such as health, and particularly workers' health, continued to be a low priority in the post-colonial milieu. Through economic expansion, there was an increased demand for labor as well as continued employment of colonial expatriates to manage local entities. Thus, it became necessary to improve health conditions of both workers and their families, giving rise to an emphasis on communicable disease prevention, including vaccination – with expatriate workers being the particular priority. This led to the development of "imperial medicine" which was "particularly interested in controlling, by medical research and eradication campaigns, the most spectacular manifestation of ill-health, epidemic sicknesses. The continued outbreak of such epidemics was an affront to Western dominance, moreover they had serious economic consequences because they killed so many laborers and rendered so many others incapable of work" [59].

There is strong evidence of trade union organization and emerging worker resistance in the early post-colonial period. This was mostly around working conditions generally and was not specific to issues of workers' health. Working conditions were described as "slavery by any other name", which played a central role in shaping the living standards of workers in the Angolan mines [60]. Trade union organization in Ghana grew at a tremendous pace, with the formation of a national union federation of over 320 000 members in 1961 [61]. African mineworkers began organizing in the early 1900's in South Africa, leading to major strikes in the 1940's [62–64]; and Zambian copper miners began organizing by 1935 [65]. Similarly, with the discovery of oil in North Africa and a rapidly developing extraction industry, gave rise to strong worker organizations that became linked to the political movements in the emerging post-colonial periods [22, 66, 67].

There is evidence of worker action resulting in a changing health and safety context. In Nigeria, workers' reaction to poor working conditions resulted in the establishment of some occupational health services and enactment of the Factory Act in 1958 [68]. In South Africa, where the mines were dependent on imported labor from Europe, there was a need to protect this "investment" [69, 70]. This led to internationally benchmarked systems in occupational health by the turn of the 20th century [62, 71]. South Africa's prominence as a leader in mine dust related diseases was highlighted by the global silicosis conference held in Johannesburg in 1930, which documented the best available science on exposure and silicosis at that point in time [72]. The occupational health research agencies established in South Africa at that time created the environment for documenting new diseases, such as mesothelioma, as was done by Wagner and colleagues in 1960 [73, 74]. Slow industrialization in other African countries meant that worker health remained a low priority [75, 76].

The stagnation of many African economies, especially in sub-Saharan Africa, between 1975 and 2000, influenced occupational health systems in these countries [77]. In South Africa, the need for a stable workforce

meant the establishment of townships around the mining and industrial centers, requiring changes to the migrant labor system that was the foundation of the mining industry [71]. The emergence of the HIV/AIDS epidemic in the country saw an increase in risk for occupational tuberculosis among the silica exposed workers requiring new forms of health services in these mining centers [78]. According to the 2004 WHO Occupational Health Situational Analysis, it was estimated that between 5-10% of workers had access to services [79]. This is supported by surveys in South Africa and has remained unchanged over almost a quarter of a century [80–82]. In 2001, only 48% of African countries had any health and safety legislation, and even this was poorly enforced [79].

As multinational corporations entered into these economies in more recent decades, they needed to meet international benchmarks in health and safety to ensure their African products could be exported globally [83]. This included health and safety standards. In many sub-Saharan countries, occupational health services exist largely within these multinational corporations, and the few occupational health professionals that are present in these countries, are employed at these sites [84].

The nature of work in African countries further mitigates against effective health and safety protection. Since the early 2000's, there has been an increasing shift toward the informal economy; currently, that sector accounts for 20–90% of the economies across various countries [85]. Informal workers and small enterprises typically do not have the resources for worker health protection, and thus in instances where these are not provided by the state, such workers go without.

In summary, the picture of occupational safety and health in the African continent in the post-colonial period, if not bleak, is far from a positive view. Local conditions vary, especially among differing regions such as North Africa, South Africa, and East and West Africa. Nonetheless, similar issues are faced across the continent, especially in regard to natural resources extraction, agriculture, and the informal sector.

Limitations

By considering thousands of years of history in a single review, admittedly we can only touch on the service of many topics. For example, an extensive review of the history of Roman approaches to occupational medicine, although potentially relevant to the Roman Empire in North Africa, was beyond the scope of this paper. We have referred to previous in-depth historiographic research where this already has been carried out, particularly in the case of South Africa. This review relies largely on secondary sources and does not go in depth by exploiting primary sources. The archival material presented on Katanga does take that approach, however, and in so doing points the way to the potential for similar methods to interrogate other questions in the history of occupational health in Africa that could not be similarly tackled in a single review. We also acknowledge that considering the sweep of time across Africa as a whole rather than treating the history of northern Africa as entirely separate from sub-Saharan regions runs the risk of being disjointed. We would argue, however, that these historical differences are in themselves informative and that the sum is greater than the parts.

Conclusion

The long history of occupational health on the African continent has been characterized by poor working conditions, especially in mineral extraction. The overlay of colonial exploitation only made these matters worse. Recognizing these historical injustices is crucial to developing effective occupational health policies that prioritize worker safety and well-being. Although progress has been made, many of these historical patterns persist today, especially in informal labor sectors and industries linked to global markets. An integrated approach to the history of occupational health on the African continent provides context for better understanding of many present problems, that were beyond the scope of this review (for example, precarious employment, exposure to toxic substances, and climate change-related occupational hazards, among others) and for anticipating future trends. By learning from the past, Africa can move toward a future in which occupational health can be actively promoted as a fundamental right.

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Authors' contributions
PB conceived the idea for the article. All authors contributed to data collection and manuscript writing. PB prepared the figures. All authors read and approved the final manuscript.

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Declarations

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References

1. Cimmino F. Vita quotidiana Degli egizi. Milano: Il Saggiatore; 2020.
2. Gochfeld M. Chronologic history of occupational medicine. J Occup Environ Med. 2005;47(2):96–114. https://doi.org/10.1097/01.jom.0000152917.03649.0e.
3. Halioua B. La médecine au temps des pharaons. Paris: Liana Levi; 2002.
4. Zacco R. La cultura medica Nell'antico egitto. Bologna: Edizioni Martina; 2002.
5. Ravasio L, Riva MA. The Spine in Ancient Egypt: insights from medical texts, depictions, and mummified remains. Spine (Phila Pa 1976). 2024;1:1391–2. https://doi.org/10.1097/BRS.0000000000005046.
6. Brandt-Rauf PW, Brandt-Rauf SI. History of occupational medicine: relevance of Imhotep and the Edwin Smith papyrus. Br J Ind Med. 1987;44:68–70. https://doi.org/10.1136/oem.44.1.68.
7. Hebron C. Occupational health in Ancient Egypt: the evidence from artistic representation. In: McDonald A, Riggs C, editors. Current Research in Egyptology. BAR International Series 909. Oxford: Archaeopress; 2000. p. 45–9.
8. Faiad M. Ancient Egyptian medicine. Cairo: Publisher; 2006.
9. Curry A, Anfield C, Tapp E. Electron microscopy of the Manchester mummies. In: David AR, editor. The Manchester museum mummy project. Manchester: Manchester Museum; 1979. pp. 103–12.
10. Carozzi L. Contributo bibliografico Alla storia Della pneumoconiosi (Silicosi): Dall'8° Secolo avanti Cristo al 1871. Rass Med Ind. 1941;12:401–22.
11. Ziskind B, Halioua B. Occupational medicine in ancient Egypt. Med Hypotheses. 2007;69:942–5. https://doi.org/10.1016/j.mehy.2007.02.014.
12. Zawilla NH. Overview and current situation of occupational medicine in Egypt. Egypt J Occup Med. 2016;40:37–60. https://doi.org/10.21608/ejom.2016.830.
13. Lang P. Medicine and society in ptolemaic Egypt. Studies in ancient medicine, 41. Leiden, Boston: Brill; 2013.
14. Draycott JL. Approaches to healing in Roman Egypt. Thesis submitted to the University of Nottingham for the degree of Doctor of Philosophy. 2011. https://eprints.nottingham.ac.uk/13064/1/556119.pdf. Accessed 17 Feb 2025.
15. Avicenna. Canon of medicine. https://archive.org/stream/AvicennasCanonOfMedicine/9670940-Canon-of-Medicine_djvu.txt Accessed 17 Feb 2025.
16. Hashemi SM, Raza M. The traditional diagnosis and treatment of respiratory diseases: a description from Avicenna's canon of medicine. Ther Adv Respir Dis. 2009;3:319–28.
17. Burnett C. Constantine the African and the Qayrawani doctors: contribution of the 'Phoenicians' of North Africa to Latin Medicine in the Middle Ages and Renaissance. https://muslimheritage.com/constantine-the-african/. Accessed 17 Feb 2025.
18. Bos G. Maimonides, on the Regimen of Health. A new parallel Arabic-English translation. The Medical Works of Moses Maimonides, 12. Leiden, Boston: Brill; 2019.
19. Rosner F. Moses. Maimonides: biographic outlines. Rambam Maimonides Med J. 2010;1:e0002. https://doi.org/10.5041/RMMJ.10002.
20. Republic of Turkey Ministry of Labour and Social Security. Towards a safe and healthy growth – law on occupational health and safety No. 6331. Accessed 17 Feb 2025. https://www.csgb.gov.tr/medias/4579/kitap08.pdf
21. Park M. Travels in the interior of Africa. 1858. p. 228. https://publicdomainreview.org/collection/mungo-park-s-travels-in-the-interior-of-africa-1858/. Accessed 17 Feb 2025.
22. Gruskin RL. Capitalism, resistance, and environment in Tunisia's Gafsa phosphate mining region, 1880s–1960s. Doctoral Dissertation, Stanford University; 2021. https://purl.stanford.edu/fv569sv1631. Accessed 25 Apr 2025.
23. Pancheri G. Note di patologia e assistenza sanitaria nelle miniere di fosfati di Khouribgha nel Marocco Francese. Rass Med Ind Ig Lav. 1952;21:143–9.
24. Rodier J. Les maladies professionnelles dans les mines marocaines. Maroc Med. 1953;32:205–12.
25. Hicham C, Reis J, Rodier M, Belahsen F, Spencer PS. Jean Rodier: history of manganism in Morocco. Neurotoxicology. 2020;81:66–9. https://doi.org/10.1016/j.neuro.2020.08.004.
26. Becmeur A, Lafferre M, Lamotte C. L'ankylostomose dans les mines de phosphate Marocain. Gaz Med Fr. 1950;57:869–74.
27. Becmeur A, Lafferre M. Nuisances dans les exploitations minières de phosphates au Maroc. Maroc Med. 1961;40:392–5.
28. Del Boca A. Gli italiani in Africa Orientale. Roma-Bari: Laterza; 1976.
29. Barrera G. The construction of Racial hierarchies in colonial Eritrea: the Liberal and early fascist period (1897–1937). In: Palumbo P, editor. A place in the Sun: Africa in Italian colonial culture from Post-Unification to the present. Berkeley: University of California Press; 2003. pp. 81–115.
30. Labanca N, Oltremare. Storia Dell'espansione coloniale Italiana. Bologna: Il Mulino; 2002.
31. Bernacchi L. L'estensione della legge infortuni alla Libia in rapporto alla medicina infortunistica. Boll Cassa Naz d'Assic. 1914;1:12–7.
32. Ministero dell'Africa Italiana. L'istituto nazionale fascista per l'assicurazione contro gli infortuni sul lavoro. Afr It. 1940;3:1083–7.
33. Van Reybrouck D. Congo: the epic history of a people. New York: Harper Collins; 2014.
34. Charlet JM, editor. The Geology of Central Africa and the Copper District of Shaba. Proceedings of International Cornet Symposium. Mons and Brussels: Faculté Polytechnique de Mons and the Royal Academy of Overseas Sciences; 1997. pp. 17–20. https://www.kaowarsom.be/documents/PUBLICATIONS/COLLOQUE%20INTERNATIONAL%20CORNET.pdf. Accessed 11 Feb 2025.
35. Brion R, Moreau J-L. Van mijnbouw tot Mars: de ontstaansgeschiedenis van Umicore. De la mine à Mars: la genèse d'Umicore. Lannoo: Tielt; 2006.
36. Brion R, Moreau J-L. Inventaire des Archives du Groupe Union Minière. 1821–1987. Archives générales du Royaume 2 (AGR2). Brussels: Dépôt Joseph Cuvelier; 2015.
37. Vellut JL. Mining in the Belgian congo. In: Birmingham D, Martin PM, editors. History of central Africa. Volume two. London and New York: Longman; 1983. pp. 126–63.
38. Bruynoghe R. Considérations générales sur les principales causes de morbidité et de mortalité parmi les travailleurs indigènes de l'Union Minière. Brussels: Archives Générales du Royaume, Dépôt Joseph Cuvelier (AGR2 349); 1926.
39. Fetter B. L'Union minière du Haut-Katanga, 1920–1940: La naissance d'une sous-culture totalitaire. Les Cahiers Du CEDAF. 1973;6:1–40.
40. Higginson J. A working class in the making: Belgian colonial labor policy, private enterprise, and the African mineworker, 1907–1951. Madison: University of Wisconsin; 1989.
41. Mottoulle L. Politique sociale de L'Union minière du Haut-Katanga pour sa main d'œuvre indigène et ses résultats au cours de vingt années d'application. Inst Royal Colonial Belge Mémoires. 1946;14(3):1–78.
42. Various authors. 1906–1956 Union Minière du Haut-Katanga. Evolution des techniques et des activités sociales. Brussels: L. Cuypers; 1957.
43. Various authors. Union Minière du Haut-Katanga 1906-1956. Brussels: L. Cuypers; 1956.
44. Van Nitsen R. L'hygiène des travailleurs noirs dans les camps industriels du Haut-Katanga. Inst R Colon Belge. 1933;1(5):1–249 Mémoires.
45. Archives générales du Royaume. Annual reports of the Medical Department [Fonds AGR2, files 673–717]. Brussels: Dépôt Joseph Cuvelier; 1917–1965.
46. Archives générales du Royaume. Annual reports of the Main-d'Œuvre Indigène (M.O.I.) [Fonds AGR2, files 653–659]. Brussels: Dépôt Joseph Cuvelier; 1922–1965.
47. Dibwe dia Mwembu, D. Industrialisation et santé. La transformation de la morbidité et la mortalité à l'Union Minière du Haut-Katanga, 1910–1970. Doctoral Thesis. Québec: Université Laval; 1990.
48. Dautrebande L, Cartry D, Van Kerkom J, Cereghetti A. Essai de prévention de la silicose. Bruxelles: Union Minière du Haut-Katanga; 1954.
49. MacLeod R. Introduction. In: MacLeod R, Lewis M, editors. Disease, medicine, and empire: perspectives on Western medicine and the experience of European expansion. London & New York: Routledge; 1988. pp. 1–18.
50. Lyons M. Public health in Colonial Africa: the Belgian Congo. In: Porter D, editor. The history of public health and the modern state. Clio Medica Vol. 26. Wellcome Institute series in the history of medicine. Rodopi: BRILL EBA Books USA; 1994. pp. 356 – 84.
51. Heath E. Berlin conference of 1884–1885. In: Gates HL Jr, Appiah KA, editors. Encyclopedia of Africa. Oxford: Oxford University Press; 2010.
52. Ocheni S, Nwankwo BC. Analysis of colonialism and its impact in Africa. Cross Cult Commun. 2012;8:46–54.
53. Bowerman JN. Petroleum developments in North Africa in 1966. AAPG Bull. 1967;51:1564–86.
54. Ziltener P, Kunzler D. Impacts of colonialism: a research survey. J World Syst Res. 2013;19:290–311.
55. Hecht G. Being nuclear: Africans and the global uranium trade. Cambridge: The MIT Press; 2012. http://www.jstor.org/stable/j.ctt5hhk5k. Accessed 25 Apr 2025.
56. Banza CLN, Nawrot TS, Haufroid V, et al. High human exposure to Cobalt and other metals in Katanga, a mining area of the Democratic Republic of congo. Environ Res. 2009;109:745–52. https://doi.org/10.1016/j.envres.2009.04.012.
57. Banza Lubaba Nkulu C, Casas L, Haufroid V, et al. Sustainability of artisanal mining of Cobalt in DR congo. Nat Sustain. 2018;1:495–504. https://doi.org/10.1038/s41893-018-0139-4.

58. Peša I. Mining, waste and environmental thought on the central African Copperbelt, 1950–2000. Environ Hist. 2022;28(2):259–84.
59. Elson RE. International commerce, the state and society: economic and social change. In: Tarling N, editor. The Cambridge history of Southeast Asia, vol. 2, part 1: from C. 1800 to the 1930s. Cambridge: Cambridge University Press; 1999.
60. Dolan L. Welfare experiences of Portuguese angolan miners: a longitudinal comparative study, 1918–1974. African Economic History Working Paper No. 73. African Economic History Network. https://www.aehnetwork.org/working-papers/welfare-experiences-of-portuguese-angolan-miners-a-longitudinal-comparative-study-1918-1974. Accessed 17 Feb 2025.
61. Crisp J. The story of an African working class: Ghanaian miners struggle, 1870–1980. London: Zed Books; 1984. p. 87.
62. Naidoo RN. Mining: South Africa's legacy and burden in the context of occupational respiratory diseases. Glob Health Act. 2013;6:20152. https://doi.org/10.3402/gha.v6i0.20512.
63. South Africa. Report of the miners' phthisis commission. Pretoria: Government Printer and Stationery Office; 1903.
64. McCulloch J. South Africa's gold mines & the politics of silicosis. Johannesburg: Boydell & Brewer Ltd; 2012.
65. Larmer M. Mineworkers in Zambia: labour and political change in post-colonial Africa. International Library of African Studies vol. 18. London: Tauris Academic Studies; 2007.
66. Norman J. Labor and politics in Libya and Arab Africa. New York: Bookman Associates; 1965.
67. Bini E. Building an oil empire: labor and gender relations in American company towns in Libya, 1950s–1970s. In: Atabaki T, Bini E, Ehsani K, editors. Working for oil. Cham: Palgrave Macmillan; 2018.
68. Omokhodion F. Occupational health in Nigeria. Occup Med (Lond). 2009;59(3):201. https://doi.org/10.1093/occmed/kqn110.
69. Editorial. The prevention of miners' phthisis. Br Med J. 1902;2:1276.
70. Oliver T. Gold miners' phthisis and some of the dangers to health incidental to gold mining in the Transvaal. Lancet. 1902;159:1677–9.
71. Zwi A, Fonn S, Steinberg M. Occupational health and safety in South Africa: the perspectives of capital, state and unions. Soc Sci Med. 1988;27:691–702.
72. International Labour Office. Silicosis. Records of the International Conference held at Johannesburg, 13–27 August 1930. Studies and Reports Series F: Industrial Hygiene, No. 13. UK: International Labour Office (Geneva); 1930. https://webapps.ilo.org/public/libdoc/ilo/ILO-SR/ILO-SR_F13_engl.pdf. Accessed 25 Apr 2025.
73. Wagner JC, Sleggs CA, Marchand P. Diffuse pleural mesothelioma and asbestos exposure in the North Western cape Province. Br J Ind Med. 1960;17:260–71.
74. Riva MA, Carnevale F, Sironi VA, De Vito G, Cesana G. Mesothelioma and asbestos, fifty years of evidence: Chris Wagner and the contribution of the Italian occupational medicine community. Med Lav. 2010;101:409–15.
75. Gumede V. Post-colonial development in Africa – Samir Amin's lens. Politikon. 2023;50:438–51. https://doi.org/10.1080/02589346.2023.2300893
76. Bayeh E. The political and economic legacy of colonialism in the post-independence African States. Int J Commer IT Soc Sci. 2015;2:3394–5702.
77. Toh K. Emerging growth economies in Sub-Saharan Africa. Am Econ. 2016;61:229–44.
78. Rees D, Murray J, Nelson G, Sonnenberg P. Oscillating migration and the epidemics of silicosis, tuberculosis, and HIV infection in South African gold miners. Am J Ind Med. 2010;53:398–404. https://doi.org/10.1002/ajim.20716.
79. WHO Regional Committee for Africa. Occupational health and safety in the African region: situation analysis and perspectives. AFR/RC54/13 Rev. 1. Brazzaville: Republic of Congo; 2004.
80. Lowe RE, Barron P, Steyn SD, Malekela LL, Steinberg MH, Reid G. Occupational health services in Johannesburg and Randburg. S Afr Med J. 1990;77:581–4.
81. Jeebhay M, Jacobs B. Occupational health services in South Africa. In: Crisp N, Ntuli A, editors. South African health review, fifth ed. Durban: Health Systems Trust; 1999. pp. 257–76.
82. Masekameni MD, Moyo D, Khoza N, Chamdimba C. Accessing occupational health services in the Southern African development community region. Int J Environ Res Public Health. 2020;17:6767. https://doi.org/10.3390/ijerph17186767.
83. Tayo C, Yuriev A, Boiral O. Adopting ISO management standards in Africa: barriers and cultural challenges. In: Heras-Saizarbitoria I, editor. ISO 9001, ISO 14001, and New Management Standards. 2018. pp. 59–82.
84. Moyo D, Zungu M, Kgalamono S, Mwila CD. Review of occupational health and safety organization in expanding economies: the case of Southern Africa. Ann Glob Health. 2015;81:495–502. https://doi.org/10.1016/j.aogh.2015.07.002.
85. Kiaga A, Leung V. The transition from the informal to the formal economy in Africa. Background Paper No. 4 – Global Employment Policy Review working paper series. Geneva: ILO; 2020. https://researchrepository.ilo.org/esploro/outputs/995219124502676. Accessed 17 Feb 2025.

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