



La-Net

# COM 306

## INTRODUCTION TO OCCUPATIONAL HEALTH



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**Course code: COM 306**

**Course title: Introduction to Occupational Health**

**Course credit load: 1 Unit**

# **Series 1: Development and History of Occupational Health**

- **Part 1.1: Defining Occupational Health**

- Sub Part 1.1.1: What is occupational health?
- Sub Part 1.1.2: Goals and scope of occupational health
- Sub Part 1.1.3: Occupational health versus occupational safety

- **Part 1.2: Historical Development of Occupational Health**

- Sub Part 1.2.1: Pre-industrial and early observations of work-related illness
- Sub Part 1.2.2: The Industrial Revolution and the birth of occupational medicine
- Sub Part 1.2.3: The growth of international occupational health institutions

- **Part 1.3: Development of Occupational Health in Nigeria**

- Sub Part 1.3.1: Colonial era labour and health regulation
- Sub Part 1.3.2: Post-independence occupational health structures
- Sub Part 1.3.3: Current institutions and the practice of occupational health in Nigeria



## Introduction

Work is central to human survival and dignity, but the same activities that sustain livelihoods can also expose workers to hazards capable of causing injury, illness, or death. Occupational health is the field of public health concerned with protecting and promoting the wellbeing of people in their working lives, addressing the physical, chemical, biological, and psychosocial conditions that workers encounter.

This Series introduces the meaning and scope of occupational health, traces its historical development from early observations of work-related disease to the formal discipline practised today, and examines how occupational health has developed in Nigeria specifically.

Understanding this background is essential for appreciating the working environments, health problems, and regulatory frameworks of occupational health more broadly.

By tracing this history, learners gain an appreciation of how occupational health practice has been shaped by industrial change, scientific discovery, and policy development, and why continued vigilance remains necessary in modern workplaces.

## Series Learning Outcomes

Upon completing this Series, you should be able to:

- **SLO 1.1** define occupational health and distinguish it from occupational safety (Linked to Part 1.1),
- **SLO 1.2** describe the historical development of occupational health internationally, from early observations to the establishment of international institutions (Linked to Part 1.2), and
- **SLO 1.3** describe the development of occupational health practice and institutions in Nigeria (Linked to Part 1.3).

## 1.1 Defining Occupational Health



### 1.1.1 What is occupational health?

**Occupational health** is defined by the World Health Organization and the International Labour Organization as the promotion and maintenance of the highest degree of physical, mental, and social wellbeing of workers in all occupations. It is a **multidisciplinary field** that draws on medicine, toxicology, engineering, psychology, and law to identify, evaluate, and control conditions in the workplace that may cause harm. Occupational health practitioners work to prevent ill health arising from working conditions, to protect workers from risks to their health, and to place and maintain workers in jobs suited to their physical and psychological capabilities.

The field is concerned not only with diagnosing and treating illnesses once they occur but, more importantly, with **preventing** them in the first place through the **recognition, evaluation, and control** of workplace hazards. Occupational health therefore sits at the intersection of medicine and engineering, requiring practitioners to understand both the biological effects of exposure and the practical means of reducing that exposure in real working environments.

Fill in the blank: Occupational health is the promotion and maintenance of the highest degree of physical, mental, and social \_\_\_\_\_ of workers in all occupations, as defined jointly by the WHO and the ILO.

### 1.1.2 Goals and scope of occupational health

The goals of occupational health are threefold: to **protect and promote** the health of workers by preventing occupational diseases, accidents, and injuries; to **enhance** the physical and mental working capacity of workers; and to **develop and promote** healthy and safe work environments, organisations, and working cultures that support productivity and wellbeing. These goals extend beyond the individual worker to encompass the broader organisation and even national productivity, since a healthy workforce contributes directly to economic development.

The **scope** of occupational health is broad, covering exposure to **physical agents** such as noise and vibration, **chemical agents** such as solvents and dusts, **biological agents** such as infectious pathogens, **ergonomic factors** such as repetitive movement and poor posture, and **psychosocial**



**factors** such as work stress and harassment. Occupational health programmes typically include pre-employment and periodic medical examinations, workplace hazard surveys, health education, and emergency preparedness.

Fill in the blank: The scope of occupational health covers physical, chemical, biological, ergonomic, and \_\_\_\_\_ factors in the workplace, requiring health examinations, hazard surveys, and health education as part of a comprehensive programme.

### 1.1.3 Occupational health versus occupational safety

**Occupational health** and **occupational safety** are closely related but distinct concepts that are often combined under the term occupational health and safety (OHS). Occupational health focuses on preventing and managing illness arising from exposure to workplace hazards over time, such as respiratory disease from dust inhalation or hearing loss from chronic noise exposure. Occupational safety, by contrast, focuses on preventing **accidents and injuries** that occur suddenly, such as falls, machinery entanglement, or electrical shock.

In practice, the two fields overlap considerably and are usually managed together within a single occupational health and safety programme, since many interventions, such as proper machine guarding or adequate ventilation, serve both health and safety objectives simultaneously.

Distinguishing the two helps practitioners apply the most appropriate tools: **health surveillance and exposure monitoring** for occupational health, and **risk assessment and engineering controls** for occupational safety.

Fill in the blank: Occupational health addresses illness from prolonged exposure to hazards, while occupational \_\_\_\_\_ addresses sudden accidents and injuries; both are usually managed together as occupational health and safety (OHS).



## OCCUPATIONAL HEALTH & SAFETY: VENN DIAGRAM OF OVERLAPPING CONCEPTS

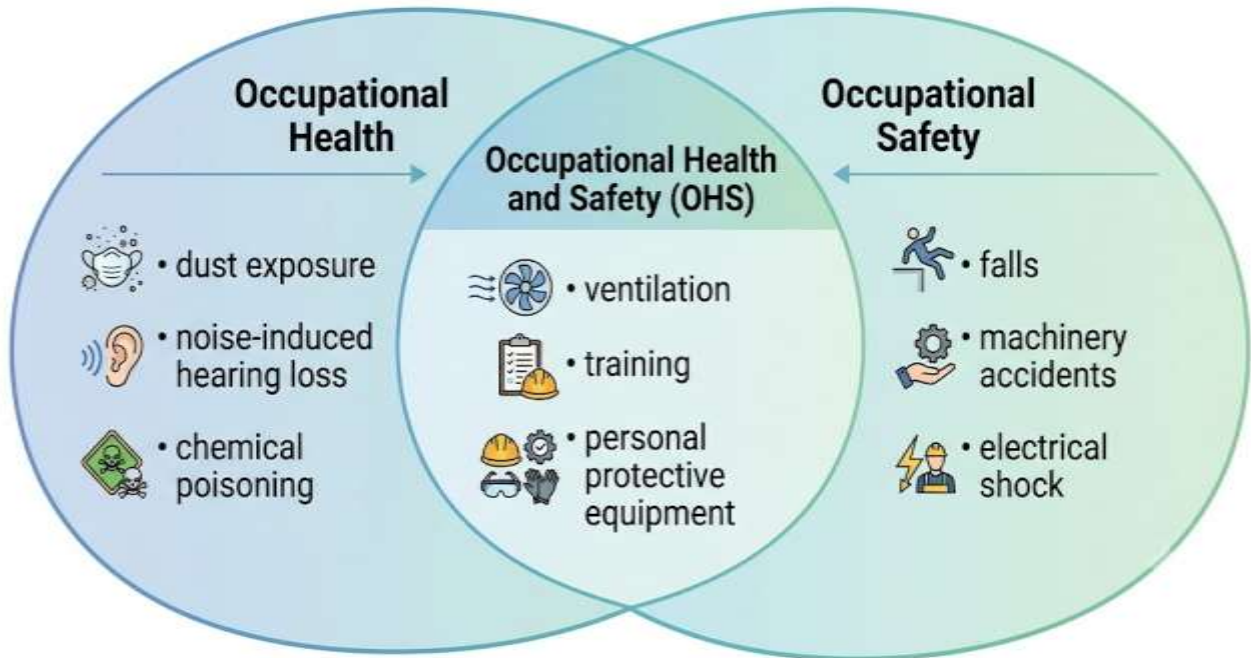


Figure 1.1: The relationship between occupational health and occupational safety, showing their distinct concerns and shared overlap

### Pilot questions 1.1

1. Define occupational health according to the WHO and ILO. (Linked to SLO 1.1)
2. State the three main goals of occupational health. (Linked to SLO 1.1)
3. Distinguish between occupational health and occupational safety. (Linked to SLO 1.1)

## 1.2 Historical Development of Occupational Health

### 1.2.1 Pre-industrial and early observations of work-related illness

Awareness that certain occupations carry specific health risks dates back many centuries. The Greek physician **Hippocrates** noted lead poisoning among metal workers as early as the fourth century BC. Centuries later, the Swiss physician **Paracelsus** described illnesses among miners and metal smelters in the sixteenth century, recognising a connection between specific trades and characteristic diseases. The most influential early figure was **Bernardino Ramazzini**, an Italian





physician often called the father of occupational medicine, who in 1700 published *De Morbis Artificum Diatriba* (Diseases of Workers), the first systematic study of occupational diseases across nearly fifty different trades.

Ramazzini's most important contribution was methodological: he insisted that physicians should always ask patients **what work they did**, recognising that occupation was a critical clue to diagnosis. This simple but powerful principle remains a cornerstone of occupational medicine practice today. His work catalogued diseases among miners, painters, potters, and many other tradespeople, laying the intellectual foundation for the systematic study of work-related illness that would expand dramatically during the Industrial Revolution.

Fill in the blank: Bernardino Ramazzini, known as the father of occupational medicine, published *De Morbis Artificum Diatriba* in \_\_\_\_\_, the first systematic study of diseases among workers across nearly fifty trades.

## 1.2.2 The Industrial Revolution and the birth of occupational medicine

The **Industrial Revolution** of the eighteenth and nineteenth centuries transformed work on an unprecedented scale, concentrating large numbers of workers, including many children, in factories and mines under conditions that produced severe and widespread occupational disease and injury. Diseases such as **black lung** among coal miners, **phossy jaw** among match factory workers exposed to white phosphorus, and mercury poisoning among hatters became common enough to attract public and medical attention. The severity of these conditions prompted the first protective legislation, including the **British Factory Acts** beginning in 1802, which gradually introduced limits on child labour and basic safety requirements.

Alongside legislation, the nineteenth century saw the emergence of **occupational medicine** as a recognised medical specialty. Physicians such as Charles Turner Thackrah in Britain published detailed studies linking specific trades to specific diseases, while **industrial hygiene** began to develop as a discipline focused on measuring and controlling workplace exposures. By the early twentieth century, several countries had established factory inspectorates and required medical



examinations for certain hazardous trades, marking the transition from informal observation to systematic occupational health practice.

Fill in the blank: The Industrial Revolution produced severe occupational diseases such as black lung and phossy jaw, prompting the first protective legislation, including the British Factory \_\_\_\_\_ beginning in 1802.

### 1.2.3 The growth of international occupational health institutions

The twentieth century saw occupational health become formalised at an international level. The **International Labour Organization (ILO)** was established in 1919 as part of the Treaty of Versailles, with improving labour conditions, including occupational safety and health, among its founding mandates; it has since adopted numerous international conventions setting minimum standards for workplace health and safety that member states, including Nigeria, are encouraged to ratify and implement. In 1950, the ILO and the **World Health Organization (WHO)** jointly established a definition of occupational health that remains in use today and created a **Joint ILO/WHO Committee on Occupational Health** to guide international policy.

These international bodies have driven the global spread of occupational health standards, occupational disease classification systems, and **exposure limit guidelines** that national governments adapt to their own contexts. Their influence extends to developing countries through technical assistance, training programmes, and international conventions that shape national labour laws, including those eventually adopted in Nigeria.

Fill in the blank: The \_\_\_\_\_ was established in 1919 under the Treaty of Versailles and, together with the WHO, jointly defined occupational health in 1950 through a Joint Committee on Occupational Health.

#### Pilot questions 1.2

1. Explain the contribution of Bernardino Ramazzini to occupational medicine. (Linked to SLO 1.2)
2. Describe two occupational diseases that became prominent during the Industrial Revolution. (Linked to SLO 1.2)





3. State the role of the ILO and WHO in the development of occupational health internationally.  
(Linked to SLO 1.2)

## 1.3 Development of Occupational Health in Nigeria

### 1.3.1 Colonial era labour and health regulation

The formal regulation of occupational health in Nigeria began during the colonial period, primarily in response to conditions in **mining, plantation agriculture, and the construction of railways and ports** that employed large numbers of Nigerian workers under British colonial administration. The **Factories Ordinance of 1955**, modelled on British factory legislation, was among the first formal instruments addressing workplace conditions in Nigeria, requiring basic safety measures and the registration of factories employing a minimum number of workers.

During this period, occupational health concerns centred largely on **mining regions such as the tin mines of Jos**, where Nigerian labourers worked under harsh conditions with minimal protective measures, and on labour-intensive agricultural plantations producing cash crops for export. These early regulations were limited in scope and enforcement, reflecting the priorities of a colonial administration more concerned with productivity than worker welfare, but they established the legal foundation upon which post-independence occupational health legislation would later build.

Fill in the blank: The Factories Ordinance of \_\_\_\_\_, modelled on British legislation, was among the first formal instruments addressing workplace conditions in colonial Nigeria, particularly in mining and agriculture.

### 1.3.2 Post-independence occupational health structures

Following independence in 1960, Nigeria gradually developed its own occupational health institutions and legislation, building on the colonial-era Factories Ordinance, which was eventually replaced by the **Factories Act of 1987**. This Act expanded coverage to a wider range of industries and introduced more comprehensive requirements for workplace inspection, accident reporting, and the appointment of safety officers in larger establishments. The **Federal**



**Ministry of Labour and Employment** was established with responsibility for enforcing labour and safety standards, while the Federal Ministry of Health took on responsibility for the broader public health dimensions of occupational disease.

Nigeria also became an active member of the ILO following independence, ratifying several **international labour conventions** over subsequent decades that committed the country to internationally recognised standards on issues including minimum working age, occupational safety, and workers' compensation. These commitments, although not always fully enforced in practice, provided an important policy framework that shaped subsequent Nigerian legislation.

Fill in the blank: The Factories Act of \_\_\_\_\_ replaced the colonial Factories Ordinance, expanding coverage and introducing requirements for workplace inspection and safety officers in larger Nigerian establishments.

### 1.3.3 Current institutions and the practice of occupational health in Nigeria

Today, occupational health practice in Nigeria involves several key institutions working alongside one another. The **Federal Ministry of Labour and Employment** oversees compliance with the Factories Act and related safety regulations through its Inspectorate Division. The **Nigeria Social Insurance Trust Fund (NSITF)** administers the Employees' Compensation Act of 2010, providing compensation to workers who suffer occupational injuries or diseases. Academic and professional bodies, including the **Association of Occupational and Environmental Health of Nigeria**, support training, research, and continuing professional development for practitioners in the field.

Despite this institutional framework, occupational health practice in Nigeria continues to face significant challenges, including **weak enforcement** of existing regulations, a **shortage of trained occupational health professionals**, particularly outside major urban centres, and the predominance of the **informal sector**, where the majority of Nigerian workers are employed without formal occupational health coverage. These challenges form an important backdrop for understanding the practical occupational health problems facing the country.



Fill in the blank: The Nigeria Social Insurance Trust Fund (NSITF) administers the Employees' \_\_\_\_\_ Act of 2010, which provides compensation to Nigerian workers who suffer occupational injuries or diseases.

**Pilot questions 1.3**

1. Describe the role of the Factories Ordinance of 1955 in colonial Nigeria. (Linked to SLO 1.3)
2. State two key institutions involved in occupational health practice in Nigeria today. (Linked to SLO 1.3)
3. Identify two challenges currently facing occupational health practice in Nigeria. (Linked to SLO 1.3)



## Series Summary

This Series introduced occupational health as the field concerned with protecting and promoting the physical, mental, and social wellbeing of workers, distinguishing it from occupational safety, which focuses specifically on preventing sudden accidents and injuries rather than illness arising from prolonged exposure. The Series then traced the historical roots of the discipline, beginning with early observations linking specific trades to specific illnesses, most notably the pioneering work of Bernardino Ramazzini, whose systematic study of workers' diseases in 1700 established occupation as a central consideration in diagnosis. The Industrial Revolution dramatically intensified occupational health problems as factories and mines exposed large numbers of workers, including children, to severe hazards, prompting the first protective legislation and the gradual emergence of occupational medicine as a formal specialty.

The Series concluded by examining how these international developments shaped occupational health in Nigeria specifically, from colonial-era regulation focused on mining and plantation labour through to the more comprehensive post-independence legal framework, including the Factories Act of 1987 and the Employees' Compensation Act of 2010. Today, occupational health in Nigeria is supported by institutions including the Federal Ministry of Labour and Employment and the Nigeria Social Insurance Trust Fund, although significant challenges remain, including weak enforcement and the large proportion of Nigerian workers employed in the informal sector without occupational health coverage. This historical foundation prepares learners to understand the working environments, health problems, and regulatory frameworks of occupational health more broadly.

## Glossary of Terms

- **Occupational health:** the field concerned with promoting and maintaining the highest degree of physical, mental, and social wellbeing of workers in all occupations, as jointly defined by the WHO and ILO.



- **Occupational safety:** the branch of workplace protection concerned with preventing sudden accidents and injuries, as distinct from the prevention of illness from prolonged exposure addressed by occupational health.
- **Industrial hygiene:** the discipline concerned with anticipating, recognising, evaluating, and controlling workplace conditions that may cause illness or impaired health among workers.
- **International Labour Organization (ILO):** a United Nations agency established in 1919 responsible for setting international labour standards, including those relating to occupational safety and health.
- **Factories Act:** Nigerian legislation, most recently revised in 1987, governing workplace safety requirements, inspection, and the registration of factories employing workers above a specified threshold.
- **Employees' Compensation Act:** Nigerian legislation enacted in 2010 establishing a no-fault compensation scheme, administered by the NSITF, for workers who suffer occupational injuries, diseases, or death.
- **Nigeria Social Insurance Trust Fund (NSITF):** the Nigerian government agency responsible for administering the Employees' Compensation Act and providing compensation to workers affected by occupational injury or disease.
- **Occupational disease:** an illness caused by exposure to a hazard encountered specifically in the course of employment, typically developing over a period of repeated or prolonged exposure.
- **Bernardino Ramazzini:** an Italian physician of the seventeenth and eighteenth centuries widely regarded as the father of occupational medicine, author of the first systematic study of workers' diseases.
- **Informal sector:** economic activity that takes place outside formal regulatory and tax structures, characterised in Nigeria by the absence of occupational health coverage for most workers employed within it.
- **Factory inspectorate:** the regulatory body, under the Federal Ministry of Labour and Employment in Nigeria, responsible for inspecting workplaces to ensure compliance with safety and health legislation.

## Concept Check Questions [Series 1]

### Objective Questions



1. Occupational health is defined by the WHO and ILO as the promotion and maintenance of the highest degree of physical, mental, and \_\_\_\_\_ wellbeing of workers. (Linked to SLO 1.1)
2. Bernardino Ramazzini, the father of occupational medicine, published his major work in the year \_\_\_\_\_. (Linked to SLO 1.2)
3. The \_\_\_\_\_ was established in 1919 under the Treaty of Versailles with a mandate including labour conditions. (Linked to SLO 1.2)
4. The colonial-era instrument addressing workplace conditions in Nigeria was the Factories \_\_\_\_\_ of 1955. (Linked to SLO 1.3)
5. The Nigerian Act that replaced the colonial factories legislation in 1987 is known as the Factories \_\_\_\_\_. (Linked to SLO 1.3)
6. The Nigerian agency responsible for administering workers' compensation under the 2010 Act is the \_\_\_\_\_. (Linked to SLO 1.3)

### Short-Answer Questions

7. Explain the difference between occupational health and occupational safety. (Linked to SLO 1.1)
8. Describe the significance of Ramazzini's contribution to occupational medicine. (Linked to SLO 1.2)
9. State two challenges facing occupational health practice in Nigeria today. (Linked to SLO 1.3)

### Long-Answer Questions

10. Discuss the historical development of occupational health from early observations to the establishment of international institutions. (Linked to SLO 1.2)
11. Evaluate the development of occupational health regulation and institutions in Nigeria from the colonial era to the present. (Linked to SLO 1.3)

## Answers to Concept Check Questions [Series 1]

### Objective Questions

1. Social.
2. 1700.





3. International Labour Organization (ILO).
4. Ordinance.
5. Act.
6. Nigeria Social Insurance Trust Fund (NSITF).

### Short-Answer Questions

7. Occupational health addresses illness arising from prolonged or repeated exposure to workplace hazards, while occupational safety addresses sudden accidents and injuries; the two are closely related and usually managed together as occupational health and safety.
8. Ramazzini's *De Morbis Artificum Diatriba* (1700) was the first systematic study of diseases across nearly fifty trades, and his insistence that physicians ask patients about their occupation established occupation as a central diagnostic consideration that remains foundational to occupational medicine today.
9. Two challenges: weak enforcement of existing occupational health regulations due to limited inspectorate capacity, and the predominance of the informal sector, where most Nigerian workers lack any occupational health coverage.

### Long-Answer Questions

10. **Basic response:** Early observations: Hippocrates noted lead poisoning; Ramazzini (1700) published the first systematic study of workers' diseases across nearly fifty trades, establishing occupation as central to diagnosis. Industrial Revolution: factories and mines produced severe occupational diseases (black lung, phossy jaw); first protective legislation (British Factory Acts from 1802); occupational medicine emerged as a specialty. International institutions: ILO established 1919 (Treaty of Versailles); ILO and WHO jointly defined occupational health in 1950 and created a Joint Committee to guide international policy and standards.

**Value-added response:** This progression from informal trade-disease observation to formal international institutions illustrates how occupational health has matured alongside industrialisation itself; the same pattern of hazard exposure followed by regulatory response that characterised nineteenth-century Europe is now being repeated, often more rapidly, in industrialising economies such as Nigeria, making historical awareness directly relevant to anticipating and addressing contemporary occupational health challenges.



11. **Basic response:** Colonial era: Factories Ordinance (1955), modelled on British legislation, addressed mining and plantation labour with limited scope and enforcement. Post-independence: Factories Act (1987) expanded coverage and introduced inspection and safety officer requirements; Nigeria ratified several ILO conventions. Current institutions: Federal Ministry of Labour and Employment (enforcement); NSITF (administers Employees' Compensation Act 2010); professional bodies support training and research. Persistent challenges: weak enforcement; shortage of trained professionals; informal sector predominance.

**Value-added response:** Nigeria's occupational health framework has expanded considerably since the colonial period in legal scope, but the gap between legislation on paper and enforcement in practice remains the central obstacle; addressing this gap, particularly by extending meaningful protection to informal sector workers who form the majority of the Nigerian workforce, represents the most pressing priority for occupational health policy going forward.

## Answers to Pilot Questions [Series 1]

### Part 1.1

1. Occupational health is the promotion and maintenance of the highest degree of physical, mental, and social wellbeing of workers in all occupations, as jointly defined by the World Health Organization and the International Labour Organization.
2. The three goals are: to protect and promote worker health by preventing occupational disease and injury; to enhance workers' physical and mental working capacity; and to develop healthy and safe work environments and organisational cultures.
3. Occupational health focuses on preventing and managing illness arising from prolonged exposure to workplace hazards, while occupational safety focuses on preventing sudden accidents and injuries; the two are usually combined under occupational health and safety.

### Part 1.2

1. Ramazzini, known as the father of occupational medicine, published *De Morbis Artificum Diatriba* in 1700, the first systematic study of diseases across nearly fifty trades, and established the principle that physicians should always ask patients about their occupation.



2. Two prominent diseases were black lung among coal miners caused by prolonged dust inhalation, and phossy jaw among match factory workers caused by exposure to white phosphorus.
3. The ILO, established in 1919, set international labour standards including occupational safety; in 1950, the ILO and WHO jointly defined occupational health and created a Joint Committee on Occupational Health to guide international policy.

### **Part 1.3**

1. The Factories Ordinance of 1955, modelled on British legislation, was the first formal instrument addressing workplace conditions in colonial Nigeria, focusing on mining and plantation agriculture with limited scope and enforcement.
2. Two key institutions are the Federal Ministry of Labour and Employment, which enforces the Factories Act through its Inspectorate Division, and the Nigeria Social Insurance Trust Fund, which administers the Employees' Compensation Act.
3. Two challenges are weak enforcement of existing regulations due to limited inspectorate capacity, and the predominance of the informal sector, where most Nigerian workers have no occupational health coverage.



## References and Attributions [Series 1]

### Textual References

- International Labour Organization. (2019). Occupational safety and health: Synergies between security and productivity. Geneva: ILO.
- World Health Organization. (2017). Protecting workers' health. Geneva: WHO.
- Federal Republic of Nigeria. (1987). Factories Act, Cap F1, Laws of the Federation of Nigeria.
- Federal Republic of Nigeria. (2010). Employees' Compensation Act. Abuja: National Assembly.
- Franco, G. (1999). Ramazzini and workers' health. The Lancet, 354(9192), 1837 to 1839.

### Figures, Plates, Tables, and Boxes

- Figure 1.1: The relationship between occupational health and occupational safety. AI generation prompt: "Create a clean Venn diagram with two overlapping circles labelled Occupational Health and Occupational Safety; in the Health-only area list: dust exposure, noise-induced hearing loss, chemical poisoning; in the Safety-only area list: falls, machinery accidents, electrical shock; in the overlapping middle area labelled Occupational Health and Safety (OHS) list: ventilation, training, personal protective equipment; use a clean infographic style with a white background and labelled text." Suggested OER search string: "occupational health and safety Venn diagram overlap infographic".



Course code: COM 306

Course title: Introduction to Occupational Health

Course credit load: 1 Unit

## Series 2: Working Environment, Health, and Services

- **Part 2.1: The Working Environment and Its Hazards**
  - Sub Part 2.1.1: Components of the working environment
  - Sub Part 2.1.2: Categories of workplace hazards
  - Sub Part 2.1.3: The hazard to harm pathway
- **Part 2.2: Occupational Health Practice**
  - Sub Part 2.2.1: Pre-employment and periodic medical examinations
  - Sub Part 2.2.2: Workplace hazard surveillance and risk assessment
  - Sub Part 2.2.3: The occupational health team
- **Part 2.3: Occupational Health Services**
  - Sub Part 2.3.1: Models of occupational health service delivery
  - Sub Part 2.3.2: Health education and promotion at work
  - Sub Part 2.3.3: Occupational health services in the Nigerian context



## Introduction

The working environment encompasses every physical, chemical, biological, and social condition that surrounds a worker while performing their duties, and it is within this environment that the practical work of occupational health takes place. Understanding the working environment and the services designed to protect workers within it builds directly on the foundational definitions and historical context established in the previous Series.

This Series examines the components of the working environment and the main categories of hazards found there, before turning to occupational health practice, the day-to-day activities through which occupational health professionals identify and manage risks, and finally to the organisation and delivery of occupational health services in workplaces and in Nigeria specifically.

Mastering this material equips learners to recognise the practical mechanisms through which occupational health is delivered and to appreciate the structures that support healthy and safe work in real organisational settings.

## Series Learning Outcomes

Upon completing this Series, you should be able to:

- **SLO 2.1** identify the components of the working environment and classify the main categories of workplace hazards (Linked to Part 2.1),
- **SLO 2.2** describe the key activities of occupational health practice, including medical examinations and hazard surveillance (Linked to Part 2.2), and
- **SLO 2.3** describe models of occupational health service delivery and the current state of these services in Nigeria (Linked to Part 2.3).



## 2.1 The Working Environment and Its Hazards

### 2.1.1 Components of the working environment

The **working environment** refers to the totality of conditions, both physical and organisational, within which a person performs their job. It includes the **physical workplace** itself, such as buildings, machinery, equipment, and layout; the **ambient conditions** such as temperature, lighting, noise, and air quality; and the **organisational climate**, including work schedules, supervisory relationships, and workplace culture. Each of these elements can either support worker wellbeing or contribute to ill health, depending on how it is designed and managed.

A safe and healthy working environment is one in which hazards have been identified and controlled to the greatest extent reasonably practicable. Conversely, a poorly designed working environment, even without any single major hazard, can gradually erode worker health through cumulative **ergonomic strain**, chronic stress, or low-level repeated exposures. Recognising the working environment as a system, rather than a simple physical space, is essential to effective occupational health practice.

Fill in the blank: The working environment includes the physical workplace, ambient conditions such as noise and lighting, and the \_\_\_\_\_ climate, including work schedules and workplace culture.





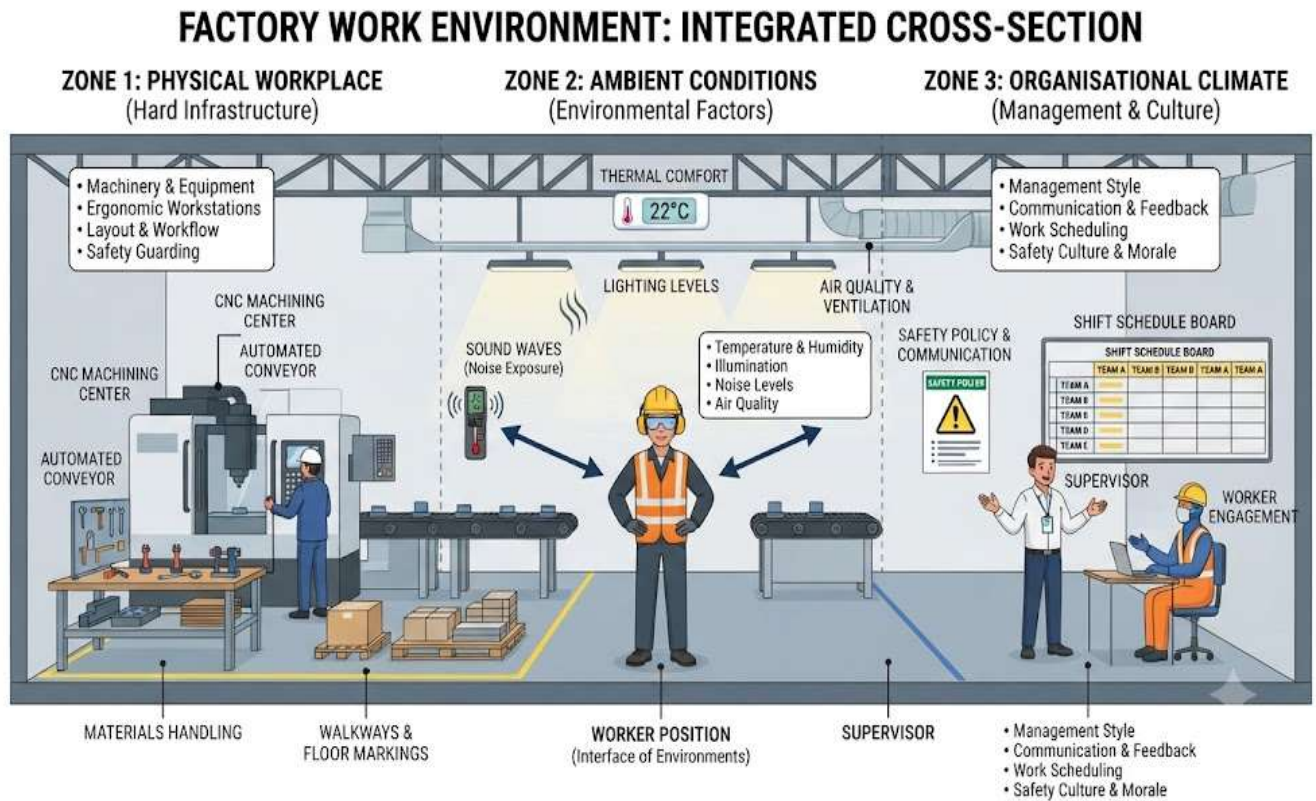


Figure 2.1: The components of the working environment, showing how the physical workplace, ambient conditions, and organisational climate together surround the worker

### 2.1.2 Categories of workplace hazards

Workplace hazards are conventionally grouped into five broad categories. **Physical hazards** include noise, vibration, extreme temperatures, radiation, and poor lighting. **Chemical hazards** include dusts, fumes, vapours, gases, and liquids capable of causing poisoning, irritation, or long-term disease. **Biological hazards** include bacteria, viruses, fungi, and parasites encountered particularly in healthcare, agriculture, and laboratory settings.

**Ergonomic hazards** arise from poor workstation design, repetitive movement, awkward postures, or manual handling of heavy loads, and contribute to musculoskeletal disorders over time. **Psychosocial hazards** include excessive workload, poor management practices, harassment, and job insecurity, all of which can contribute to stress-related illness. Most real



workplaces present a combination of hazards from several of these categories simultaneously, requiring a comprehensive approach to identification and control.

Fill in the blank: The five categories of workplace hazards are physical, chemical, biological, ergonomic, and \_\_\_\_\_; most real workplaces present hazards from several categories simultaneously.

### 2.1.3 The hazard to harm pathway

Understanding how a **hazard** translates into actual **harm** is central to occupational health practice. A hazard is anything with the potential to cause harm; **exposure** occurs when a worker comes into contact with that hazard; and **risk** is the likelihood that harm will actually occur, which depends on the level, duration, and frequency of exposure as well as individual susceptibility. This distinction matters because the presence of a hazard alone does not guarantee harm; control measures act by breaking the pathway between hazard and exposure, or between exposure and harm.

The **hierarchy of controls** provides a structured approach to reducing risk along this pathway, ranked from most to least effective: elimination of the hazard entirely; substitution with a less hazardous alternative; engineering controls such as ventilation or machine guarding; administrative controls such as training and work scheduling; and personal protective equipment as the last line of defence. Applying controls higher in this hierarchy generally produces more reliable and sustainable protection than relying on lower-tier measures alone.

Fill in the blank: The hazard to harm pathway moves from hazard to exposure to risk; the hierarchy of controls ranks interventions from elimination (most effective) down to personal protective \_\_\_\_\_ (least effective).



# HIERARCHY OF CONTROLS

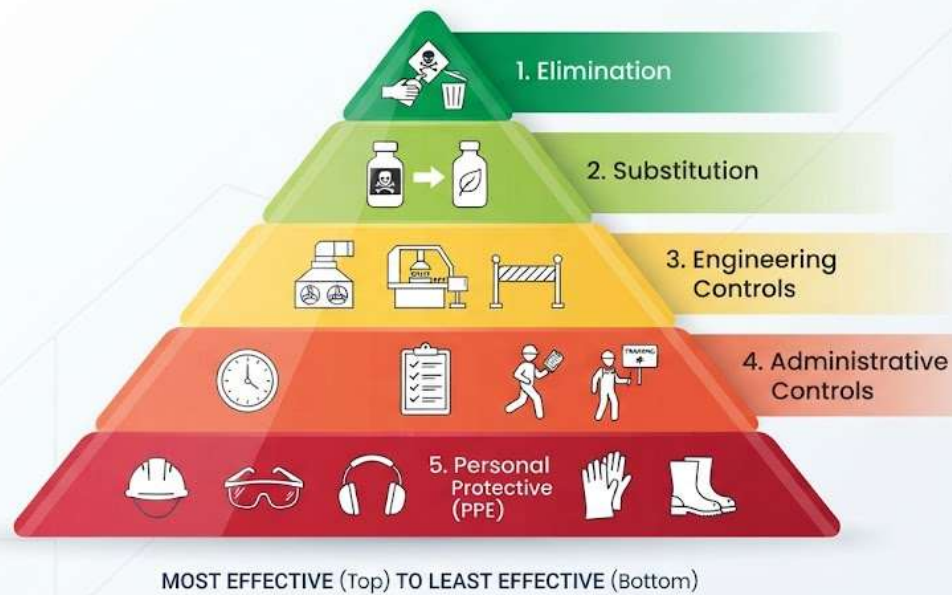


Figure 2.2: The hierarchy of controls, ranking intervention strategies from least effective (personal protective equipment) to most effective (elimination)

## Pilot questions 2.1

1. List the three components that make up the working environment. (Linked to SLO 2.1)
2. Explain why a poorly designed working environment can harm workers even without a single major hazard. (Linked to SLO 2.1)
3. Name the five categories of workplace hazards and give one example of each. (Linked to SLO 2.1)
4. Distinguish between a hazard, exposure, and risk. (Linked to SLO 2.1)
5. Explain the hierarchy of controls and state which level is most effective. (Linked to SLO 2.1)



## 2.2 Occupational Health Practice

### 2.2.1 Pre-employment and periodic medical examinations

A core activity of occupational health practice is **medical surveillance** of workers through structured examinations. A **pre-employment medical examination** is conducted before a worker begins a job, establishing a baseline health status and confirming that the individual is fit for the specific duties and exposures associated with the role. This examination typically includes a medical history, physical examination, and relevant tests such as lung function or hearing assessments depending on the anticipated hazards of the job.

**Periodic medical examinations** are conducted at regular intervals throughout employment, particularly for workers exposed to specific hazards such as noise, dust, or chemicals, allowing early detection of any deterioration in health that may be linked to workplace exposure. **Exit medical examinations** conducted when a worker leaves a job provide a final health record and can help identify occupational illness that may not yet have been detected. Together, these examinations form a continuous record that supports both individual worker protection and broader surveillance of workplace health trends.

Fill in the blank: A pre-employment medical examination establishes a baseline health status, while a \_\_\_\_\_ medical examination, conducted at regular intervals, allows early detection of health deterioration linked to workplace exposure.



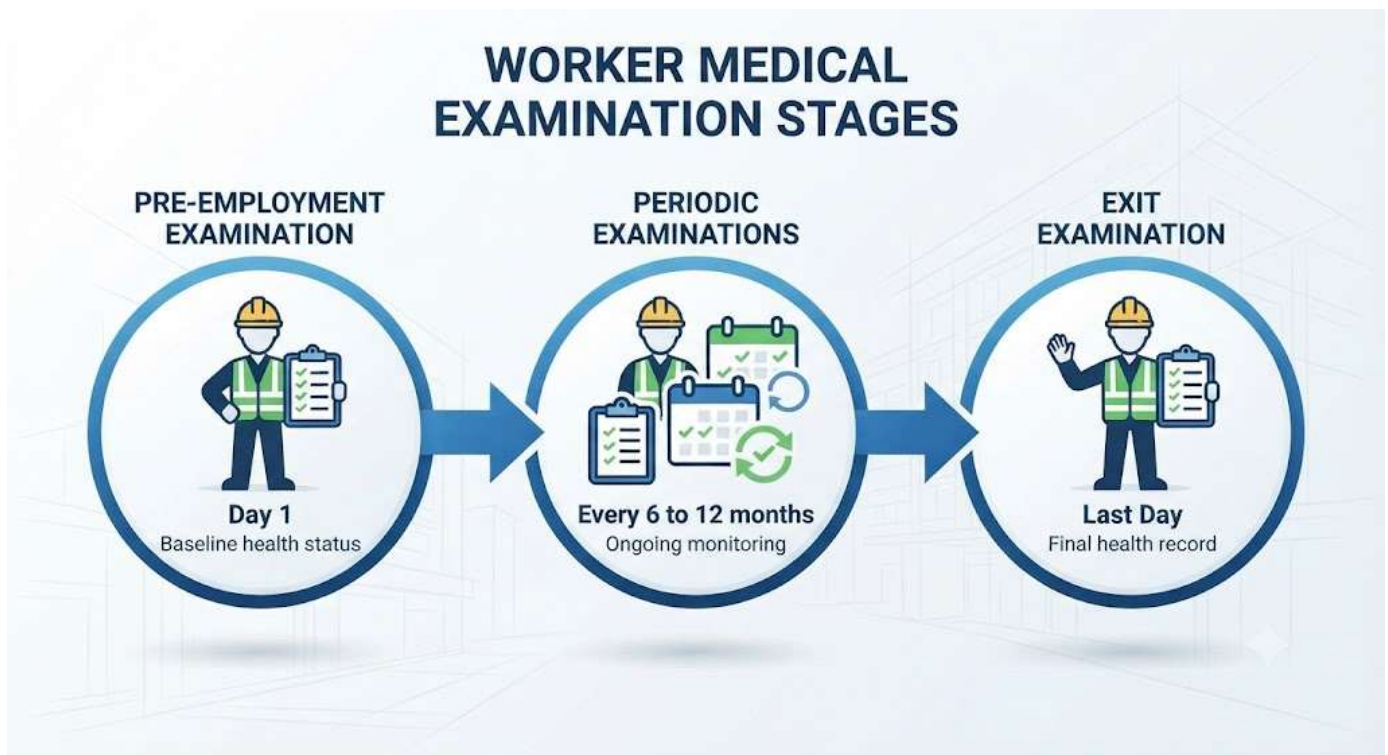


Figure 2.3: The timeline of worker medical surveillance, showing pre-employment, periodic, and exit medical examinations across the course of employment

### 2.2.2 Workplace hazard surveillance and risk assessment

**Hazard surveillance** involves the systematic and ongoing collection of data on workplace conditions to identify hazards before they cause harm. This includes **environmental monitoring**, such as measuring noise levels, dust concentrations, or chemical vapour levels, and comparing these measurements against established occupational exposure limits. Surveillance data allows occupational health practitioners to track trends over time and to prioritise interventions where exposure levels are approaching or exceeding safe thresholds.

**Risk assessment** is the structured process of identifying hazards, evaluating who might be harmed and how, estimating the likelihood and severity of harm, and determining what control measures are needed. A thorough risk assessment considers not only the hazard itself but also the number of workers exposed, the duration of exposure, and the effectiveness of any existing controls. Risk assessments should be reviewed periodically and whenever working conditions change significantly, ensuring that control measures remain appropriate over time.





Fill in the blank: Hazard surveillance involves ongoing environmental monitoring, while \_\_\_\_\_ assessment identifies hazards, evaluates potential harm, and determines what control measures are needed.

### 2.2.3 The occupational health team

Effective occupational health practice typically requires a **multidisciplinary team** rather than a single professional working in isolation. The **occupational physician** leads clinical aspects of the service, conducting examinations and managing occupational illness. The **occupational health nurse** often carries out the majority of routine surveillance, health education, and first-line care, and is frequently the most visible occupational health presence in a workplace. The **industrial hygienist** specialises in measuring and controlling environmental exposures, while the **safety officer** focuses on accident prevention and regulatory compliance.

Depending on the size and resources of an organisation, these roles may be filled by separate specialists or combined within a smaller team or even a single practitioner in resource-limited settings. Larger organisations, particularly in industries with significant hazards such as mining or manufacturing, typically maintain dedicated occupational health units, while smaller employers may rely on external consultants or shared services to fulfil these functions.

Fill in the blank: The occupational health team typically includes the occupational physician, the occupational health nurse, the industrial hygienist, and the \_\_\_\_\_ officer, each contributing a distinct area of expertise.





Figure 2.4: The composition of a typical occupational health team, showing the distinct roles of each professional

### Pilot questions 2.2

1. Distinguish between pre-employment, periodic, and exit medical examinations. (Linked to SLO 2.2)
2. Explain why periodic medical examinations are particularly important for workers exposed to noise, dust, or chemicals. (Linked to SLO 2.2)
3. Explain the purpose of hazard surveillance in occupational health practice. (Linked to SLO 2.2)
4. Describe the key steps involved in conducting a risk assessment. (Linked to SLO 2.2)
5. Name three members of a typical occupational health team and state the main function of each. (Linked to SLO 2.2)



## 2.3 Occupational Health Services

### 2.3.1 Models of occupational health service delivery

Occupational health services can be organised according to several different models depending on the size of the employer and available resources. The **in-house model** involves an organisation employing its own occupational health staff, typically seen in large companies, mines, and major industrial facilities with significant and ongoing exposure risks. The **group or shared service model** allows several smaller employers to jointly fund and access occupational health services, spreading costs while still providing structured coverage.

The **external or contracted model** involves an employer purchasing occupational health services from an independent provider, such as a private clinic or consultancy, on an as-needed or contracted basis; this is common among small and medium-sized enterprises that cannot justify a dedicated in-house team. Finally, in many low-resource settings, occupational health needs are addressed, often inadequately, through general primary healthcare services that lack specific occupational health training or focus, highlighting a significant gap in coverage for many workers.

Fill in the blank: Models of occupational health service delivery include in-house services, group or shared services, external contracted services, and reliance on general \_\_\_\_\_ healthcare, which often lacks specific occupational training.





## MODELS OF OCCUPATIONAL HEALTH SERVICE DELIVERY

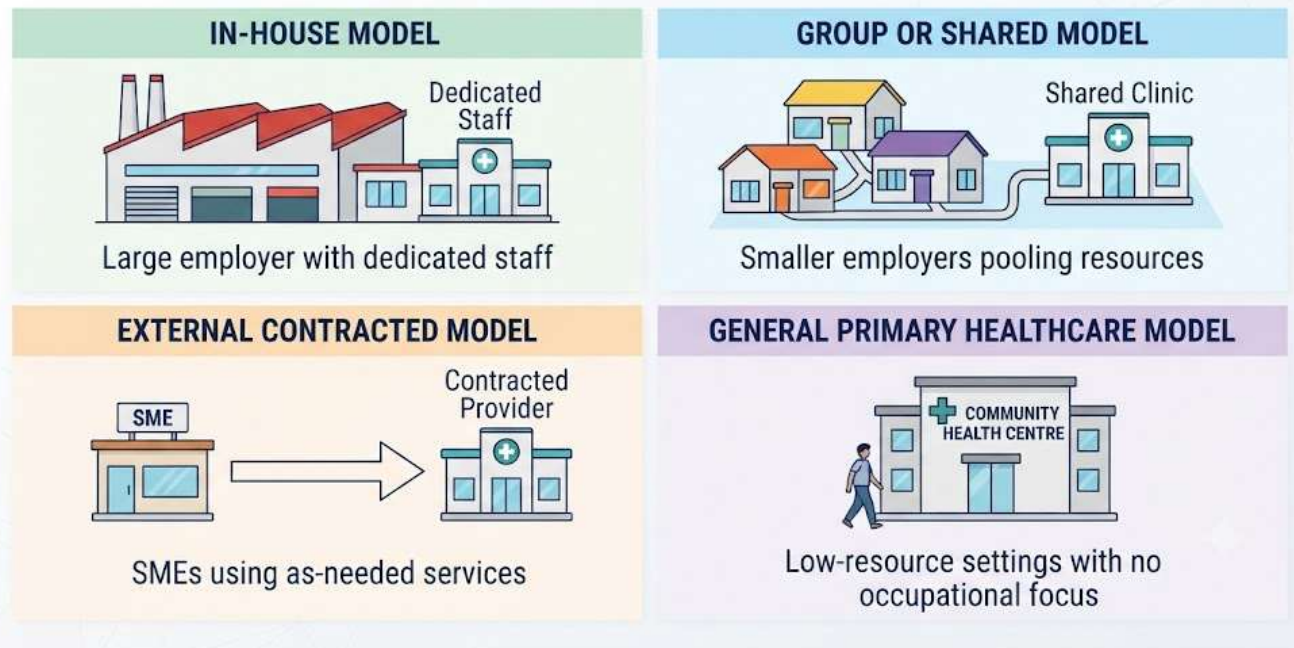


Figure 2.5: The four models of occupational health service delivery, ranging from dedicated in-house services to reliance on general primary healthcare

### 2.3.2 Health education and promotion at work

Beyond clinical examinations and hazard control, occupational health services play an important role in **health education and promotion** within the workplace. This includes training workers on the specific hazards associated with their roles and the correct use of control measures and personal protective equipment, as well as broader health promotion activities addressing issues such as nutrition, smoking cessation, and physical activity that influence overall worker wellbeing and indirectly affect occupational risk.

Effective health education programmes are tailored to the specific literacy levels, languages, and cultural context of the workforce, and are most successful when delivered through a combination of methods, including formal training sessions, visual signage, and ongoing reinforcement by supervisors. Workplace health promotion has been shown to improve not only individual health outcomes but also organisational productivity and reduce absenteeism, providing a strong business case for investment alongside the ethical imperative to protect workers.



Fill in the blank: Workplace health education includes hazard-specific training and broader health \_\_\_\_\_ activities such as nutrition and smoking cessation, both of which contribute to reduced absenteeism and improved productivity.

### 2.3.3 Occupational health services in the Nigerian context

Occupational health services in Nigeria remain unevenly distributed, with most structured services concentrated among **large formal-sector employers**, particularly in the oil and gas, mining, and manufacturing sectors, where regulatory and commercial pressures justify investment in dedicated occupational health units. Public sector workplaces and smaller private employers, by contrast, often provide minimal or no formal occupational health coverage, leaving the majority of Nigerian workers without structured protection.

The predominance of the **informal sector** in the Nigerian economy presents a particular challenge, as informal workers, including artisans, market traders, and small-scale farmers, typically have no access to organised occupational health services at all and bear the full burden of any work-related illness or injury themselves. Expanding occupational health coverage to reach these underserved groups, potentially through community-based and primary healthcare-integrated models, remains an important priority for improving worker health outcomes across the country.

Fill in the blank: Occupational health services in Nigeria are concentrated among large formal-sector employers, while workers in the \_\_\_\_\_ sector, including artisans and traders, typically have no access to structured occupational health coverage.

#### Pilot questions 2.3

1. Describe the in-house and external contracted models of occupational health service delivery. (Linked to SLO 2.3)
2. Explain why general primary healthcare is often inadequate for meeting occupational health needs. (Linked to SLO 2.3)
3. Explain the importance of health education and promotion within occupational health services. (Linked to SLO 2.3)



4. Describe the current state of occupational health service coverage in Nigeria. (Linked to SLO 2.3)
5. Explain why the informal sector represents a particular challenge for occupational health coverage in Nigeria. (Linked to SLO 2.3)



## Series Summary

This Series examined the working environment as a system encompassing physical conditions, ambient factors, and organisational climate, and classified workplace hazards into five categories: physical, chemical, biological, ergonomic, and psychosocial. The hazard to harm pathway, moving from hazard through exposure to risk, was used to introduce the hierarchy of controls, which ranks interventions from elimination, the most reliable approach, down to personal protective equipment as the last line of defence. The Series then turned to occupational health practice, the structured activities through which professionals protect workers, including pre-employment, periodic, and exit medical examinations that monitor worker health over time, hazard surveillance and risk assessment that systematically identify and evaluate workplace conditions, and the multidisciplinary occupational health team, comprising physicians, nurses, industrial hygienists, and safety officers, each contributing distinct expertise.

The Series concluded by examining how these services are delivered in practice, distinguishing in-house, shared, and externally contracted service models suited to organisations of different sizes, and highlighting the role of health education and promotion in building worker awareness and improving overall wellbeing. Within Nigeria specifically, occupational health services remain concentrated among large formal-sector employers in industries such as oil, gas, and mining, while public sector workplaces, small enterprises, and especially the large informal sector continue to face significant gaps in coverage, representing an important ongoing challenge for the practice of occupational health across the country.

## Glossary of Terms

1. **Working environment:** the totality of physical, ambient, and organisational conditions within which a person performs their job.
2. **Hazard:** anything with the potential to cause harm to a worker, whether physical, chemical, biological, ergonomic, or psychosocial in nature.
3. **Exposure:** the contact a worker has with a hazard, the level and duration of which influences the likelihood of resulting harm.



4. **Risk:** the likelihood that a hazard will actually result in harm, taking into account the level, duration, and frequency of exposure and individual susceptibility.
5. **Hierarchy of controls:** a structured ranking of intervention strategies from most to least effective: elimination, substitution, engineering controls, administrative controls, and personal protective equipment.
6. **Pre-employment medical examination:** a health assessment conducted before a worker begins a job to establish baseline health status and confirm fitness for anticipated duties and exposures.
7. **Periodic medical examination:** a health assessment conducted at regular intervals during employment to detect any deterioration in health linked to workplace exposure.
8. **Hazard surveillance:** the systematic and ongoing collection of data on workplace conditions and exposures to identify hazards before they cause harm.
9. **Risk assessment:** the structured process of identifying hazards, evaluating potential harm, and determining appropriate control measures.
10. **Occupational health team:** the multidisciplinary group of professionals, typically including an occupational physician, occupational health nurse, industrial hygienist, and safety officer, who deliver occupational health services.
11. **Informal sector:** economic activity outside formal regulatory structures, characterised in Nigeria by the absence of organised occupational health coverage for most workers within it.



## Concept Check Questions [Series 2]

### Objective Questions

- The working environment includes the physical workplace, ambient conditions, and the organisational \_\_\_\_\_. (Linked to SLO 2.1)
- The five categories of workplace hazards are physical, chemical, biological, ergonomic, and \_\_\_\_\_. (Linked to SLO 2.1)
- In the hierarchy of controls, \_\_\_\_\_ of the hazard is the most effective intervention, while personal protective equipment is the least effective. (Linked to SLO 2.1)
- A \_\_\_\_\_ medical examination is conducted before a worker begins a job to establish a baseline health status. (Linked to SLO 2.2)
- The occupational health team member who specialises in measuring and controlling environmental exposures is the industrial \_\_\_\_\_. (Linked to SLO 2.2)
- In Nigeria, workers in the \_\_\_\_\_ sector typically have no access to structured occupational health services. (Linked to SLO 2.3)

### Short-Answer Questions

- Explain the difference between a hazard, exposure, and risk. (Linked to SLO 2.1)
- Describe the purpose of periodic medical examinations in occupational health practice. (Linked to SLO 2.2)
- State two models of occupational health service delivery. (Linked to SLO 2.3)

### Long-Answer Questions

- Discuss the categories of workplace hazards and the hierarchy of controls used to manage them. (Linked to SLO 2.1)
- Evaluate the state of occupational health service delivery and coverage in Nigeria. (Linked to SLO 2.3)



## Answers to Concept Check Questions [Series 2]

### Objective Questions

1. Climate.
2. Psychosocial.
3. Elimination.
4. Pre-employment.
5. Hygienist.
6. Informal.

### Short-Answer Questions

7. A hazard is anything with the potential to cause harm; exposure occurs when a worker comes into contact with that hazard; risk is the likelihood that harm will actually occur, depending on the level, duration, and frequency of exposure and individual susceptibility.
8. Periodic medical examinations are conducted at regular intervals during employment, particularly for workers exposed to specific hazards, allowing early detection of any deterioration in health that may be linked to workplace exposure.
9. Two models: the in-house model, where an organisation employs its own occupational health staff, and the external or contracted model, where an employer purchases services from an independent provider on an as-needed basis.

### Long-Answer Questions

10. **Basic response:** Hazard categories: physical (noise, vibration, temperature, radiation); chemical (dusts, fumes, vapours, gases); biological (bacteria, viruses, fungi, parasites); ergonomic (poor workstation design, repetitive movement, manual handling); psychosocial (workload, harassment, job insecurity). Hierarchy of controls (most to least effective): elimination; substitution; engineering controls; administrative controls; personal protective equipment.

**Value-added response:** Applying controls higher in the hierarchy produces more reliable protection because they reduce or remove the hazard at its source rather than relying on individual worker behaviour or equipment use, which can fail through inconsistent compliance; effective occupational health practice therefore prioritises elimination and





substitution wherever feasible, reserving personal protective equipment as a supplementary measure rather than the primary line of defence.

11. **Basic response:** Service models: in-house (large employers; mining, manufacturing); group/shared (smaller employers pooling resources); external contracted (small and medium enterprises); reliance on general primary healthcare (low-resource settings; lacks occupational focus). Nigerian context: structured services concentrated in oil, gas, mining, manufacturing; public sector and small enterprises have minimal coverage; informal sector workers (artisans, traders, farmers) typically have no organised occupational health access.

**Value-added response:** The uneven distribution of occupational health services in Nigeria mirrors broader patterns of formal versus informal economic activity; because the majority of the Nigerian workforce operates within the informal sector, meaningful improvement in national occupational health outcomes will require innovative, low-cost, and community-integrated service models rather than continued reliance on the conventional in-house model, which by its nature only reaches workers within large formal organisations.

## Answers to Pilot Questions [Series 2]

### Part 2.1

6. The working environment is made up of the physical workplace (buildings, machinery, layout), ambient conditions (temperature, lighting, noise, air quality), and the organisational climate (work schedules, supervisory relationships, workplace culture).
7. A poorly designed working environment can cause cumulative ergonomic strain, chronic stress, or low-level repeated exposures even without a single major hazard, gradually eroding worker health over time.
8. The five categories are physical (e.g. noise), chemical (e.g. dusts), biological (e.g. bacteria), ergonomic (e.g. repetitive movement), and psychosocial (e.g. excessive workload).



9. A hazard is anything with the potential to cause harm; exposure occurs when a worker comes into contact with that hazard; risk is the likelihood that harm will actually occur, depending on the level, duration, and frequency of exposure and individual susceptibility.
10. The hierarchy of controls ranks interventions from most to least effective: elimination, substitution, engineering controls, administrative controls, and personal protective equipment; elimination of the hazard entirely is the most effective level.

## **Part 2.2**

11. A pre-employment examination establishes a baseline before work begins; a periodic examination is repeated at regular intervals during employment to detect health changes linked to exposure; an exit examination is conducted when a worker leaves a job to provide a final health record.
12. Workers exposed to noise, dust, or chemicals are at risk of cumulative damage that develops gradually and may not be noticeable to the worker; periodic examinations allow early detection of these changes before they become severe or irreversible.
13. Hazard surveillance systematically and continuously collects data on workplace conditions, such as noise or dust levels, allowing practitioners to track trends and identify hazards before they cause harm.
14. Risk assessment involves identifying hazards, evaluating who might be harmed and how, estimating the likelihood and severity of harm, and determining what control measures are needed, considering exposure duration and existing controls.
15. Three members: the occupational physician (leads clinical care and examinations); the occupational health nurse (conducts routine surveillance, health education, and first-line care); the industrial hygienist (measures and controls environmental exposures).

## **Part 2.3**

1. The in-house model involves an organisation employing its own occupational health staff, typically large companies and mines with significant exposure risks. The external contracted model involves an employer purchasing services from an independent provider on an as-needed basis, common among small and medium-sized enterprises.



2. General primary healthcare services often lack specific occupational health training or focus, meaning they are not equipped to identify or manage work-related exposures and illnesses, leaving workers in low-resource settings inadequately served.
3. Health education and promotion train workers on specific hazards and correct use of controls, and address broader wellbeing factors such as nutrition and smoking cessation, improving both individual health outcomes and organisational productivity while reducing absenteeism.
4. Occupational health services in Nigeria are concentrated among large formal-sector employers, particularly in oil, gas, mining, and manufacturing; public sector and small private employers have minimal coverage; the large informal sector, including artisans, traders, and farmers, typically has no access to structured occupational health services at all.
5. The informal sector employs the majority of Nigerian workers but operates outside formal regulatory and tax structures, meaning these workers have no employer-provided occupational health coverage and must bear the full burden of any work-related illness or injury themselves.



## References and Attributions [Series 2]

### Textual References

6. International Labour Organization. (2021). World Employment and Social Outlook: Trends. Geneva: ILO.
7. World Health Organization. (2010). Healthy Workplaces: A Model for Action. Geneva: WHO.
8. National Institute for Occupational Safety and Health. (2015). Hierarchy of Controls. Atlanta: NIOSH.
9. Fasunloro, A., and Owotade, F. J. (2004). Occupational hazards among healthcare workers in Nigeria. African Journal of Medicine and Medical Sciences, 33(3), 235 to 240.

### Figures, Plates, Tables, and Boxes

10. Figure 2.1: The components of the working environment. AI generation prompt: "Create a clean labelled illustration of a factory floor cross-section divided into three annotated zones: Physical Workplace (showing machinery, equipment, and layout), Ambient Conditions (showing a thermometer, lighting fixtures, and sound waves representing noise), and Organisational Climate (showing a shift schedule board and a supervisor talking with a worker); place a worker figure at the centre where all three zones meet; use a clean flat infographic illustration style with labelled text boxes." Suggested OER search string: "working environment components diagram physical ambient organisational".
11. Figure 2.2: The hierarchy of controls. AI generation prompt: "Create a clean pyramid infographic with five horizontal bands labelled, from top (narrowest) to bottom (widest): Elimination, Substitution, Engineering Controls, Administrative Controls, Personal Protective Equipment; use a colour gradient from green at the top to red at the bottom; include small icons next to each band representing the concept; clean professional infographic style." Suggested OER search string: "hierarchy of controls pyramid diagram occupational safety".
12. Figure 2.3: The timeline of worker medical surveillance. AI generation prompt: "Create a clean horizontal timeline infographic showing three stages of worker medical examination connected by an arrow: Pre-Employment Examination (worker with clipboard icon, labelled Day 1, baseline health status), Periodic Examinations (repeated



worker and clipboard icons with calendar symbols, labelled Every 6 to 12 months, ongoing monitoring), and Exit Examination (worker with clipboard icon, labelled Last Day, final health record); use a clean professional infographic style with icons and short captions." Suggested OER search string: "occupational health medical examination timeline pre-employment periodic exit".

13. Figure 2.4: The composition of a typical occupational health team. AI generation prompt: "Create a clean organisational chart with a central box labelled Occupational Health Team connected to four surrounding boxes labelled Occupational Physician (clinical care and examinations), Occupational Health Nurse (surveillance and health education), Industrial Hygienist (exposure measurement and control), and Safety Officer (accident prevention and compliance); use a professional flat design style with connecting lines." Suggested OER search string: "occupational health team organisational chart roles diagram".
14. Figure 2.5: The four models of occupational health service delivery. AI generation prompt: "Create a clean four-panel comparison infographic showing four models of occupational health service delivery: Panel 1 In-House Model (large factory building with attached clinic, labelled Large employer with dedicated staff); Panel 2 Group or Shared Model (three smaller buildings connected to one shared central clinic, labelled Smaller employers pooling resources); Panel 3 External Contracted Model (small office building with an arrow pointing to a separate clinic building, labelled SMEs using as-needed services); Panel 4 General Primary Healthcare Model (worker walking into a generic community health centre, labelled Low-resource settings with no occupational focus); use a clean flat infographic illustration style." Suggested OER search string: "occupational health service delivery models comparison diagram".



**Course code: COM 306**

**Course title: Introduction to Occupational Health**

**Course credit load: 1 Unit**

## **Series 3: Occupational Health Problems in Nigeria and Their Control**

- **Part 3.1: Major Occupational Health Problems in Nigeria**
  - Sub Part 3.1.1: Overview of the occupational disease burden in Nigeria
  - Sub Part 3.1.2: Occupational injuries and accidents
  - Sub Part 3.1.3: Occupational diseases by sector
- **Part 3.2: Occupational Safety and Hygiene**
  - Sub Part 3.2.1: Principles of occupational safety
  - Sub Part 3.2.2: Industrial hygiene practice
  - Sub Part 3.2.3: Personal protective equipment
- **Part 3.3: Strategies for Control and Prevention**
  - Sub Part 3.3.1: Primary, secondary, and tertiary prevention
  - Sub Part 3.3.2: Workplace safety management systems
  - Sub Part 3.3.3: Challenges and opportunities for control in Nigeria



## Introduction

Having examined what occupational health is, how it developed, and how it is practised and delivered, this Series turns to the practical reality of occupational health problems as they manifest in Nigerian workplaces today, and the strategies available to control and prevent them. The burden of occupational disease and injury in Nigeria remains substantial and is often underreported, making this a critical area of study for any occupational health practitioner.

This Series examines the major occupational health problems found across Nigerian industries, the principles of occupational safety and industrial hygiene that underpin prevention efforts, and the broader strategies, from individual protective measures to organisational safety management systems, used to control these problems. Particular attention is given to the practical challenges of implementing effective control measures within the Nigerian context.

By the end of this Series, learners will be equipped to recognise common occupational health problems and to apply established control principles to reduce risk in real workplace settings.

## Series Learning Outcomes

Upon completing this Series, you should be able to:

- **SLO 3.1** describe the major occupational health problems found in Nigeria, including injuries and sector-specific diseases (Linked to Part 3.1),
- **SLO 3.2** explain the principles of occupational safety and industrial hygiene, including the role of personal protective equipment (Linked to Part 3.2), and
- **SLO 3.3** describe strategies for the control and prevention of occupational health problems and the challenges facing their implementation in Nigeria (Linked to Part 3.3).





## 3.1 Major Occupational Health Problems in Nigeria

### 3.1.1 Overview of the occupational disease burden in Nigeria

The **occupational disease burden** in Nigeria is substantial but frequently underestimated, owing to limited reporting systems, weak diagnostic capacity for occupational illness, and the large proportion of the workforce employed in the **informal sector**, where no surveillance occurs at all. Available data, though incomplete, indicate that **musculoskeletal disorders, respiratory diseases, hearing loss, and skin conditions** are among the most commonly reported occupational health problems across formal Nigerian workplaces.

Several factors contribute to this elevated burden, including **ageing industrial infrastructure** with inadequate engineering controls, limited enforcement of existing safety regulations, low awareness of occupational hazards among workers, and inconsistent use of protective equipment. Understanding the scale and pattern of this burden is the necessary first step towards designing effective prevention strategies tailored to the Nigerian context.

Fill in the blank: Musculoskeletal disorders, respiratory diseases, hearing loss, and \_\_\_\_\_ conditions are among the most commonly reported occupational health problems in Nigerian workplaces.

### 3.1.2 Occupational injuries and accidents

In addition to chronic occupational diseases, **occupational injuries and accidents** represent a major and often more visible component of the occupational health burden in Nigeria. Common causes include **falls from height** on construction sites, **machinery-related injuries** in manufacturing and agro-processing, **road traffic accidents** among commercial drivers and transport workers, and **burns and explosions** associated with the informal fuel and gas sectors.

Many of these injuries are entirely preventable through basic engineering controls and adherence to established safety procedures, yet they continue to occur at high rates, partly because of inadequate **safety training**, weak enforcement of safety regulations on construction and industrial sites, and economic pressures that lead workers and employers to prioritise



productivity over safety compliance. Accurate injury reporting remains a persistent challenge, as many incidents in the informal sector go entirely unrecorded.

Fill in the blank: Common causes of occupational injury in Nigeria include falls from height, machinery-related injuries, road traffic accidents, and \_\_\_\_\_ associated with the informal fuel and gas sectors.

### 3.1.3 Occupational diseases by sector

Different sectors of the Nigerian economy present distinct occupational disease patterns. The **mining and quarrying sector** is associated with high rates of respiratory disease, including silicosis and pneumoconiosis, from prolonged dust inhalation. The **manufacturing sector** presents risks of noise-induced hearing loss, chemical exposure, and musculoskeletal disorders from repetitive tasks. The **agricultural sector** carries risks of pesticide poisoning, musculoskeletal strain, and zoonotic infections.

The **healthcare sector** presents elevated risks of needlestick injuries, infectious disease transmission, and psychosocial stress, while the rapidly growing **oil and gas sector** carries risks including chemical exposure, fire and explosion hazards, and offshore working conditions with limited emergency access. Recognising these sector-specific patterns allows occupational health practitioners to prioritise interventions where the risk profile demands the most urgent attention.

Fill in the blank: Sector-specific occupational diseases in Nigeria include silicosis in mining, noise-induced hearing loss in manufacturing, pesticide poisoning in agriculture, and needlestick injuries in the \_\_\_\_\_ sector.

| <u>Sector</u>               | <u>Major Occupational Health Problems</u>                                |
|-----------------------------|--------------------------------------------------------------------------|
| <b>Mining and Quarrying</b> | Silicosis, pneumoconiosis                                                |
| <b>Manufacturing</b>        | Noise-induced hearing loss, chemical exposure, musculoskeletal disorders |
| <b>Agriculture</b>          | Pesticide poisoning, musculoskeletal strain, zoonotic infections         |
| <b>Healthcare</b>           | Needlestick injuries, infectious disease, psychosocial stress            |



|                     |                                               |
|---------------------|-----------------------------------------------|
| <b>Oil and Gas</b>  | Chemical exposure, fire and explosion hazards |
| <b>Construction</b> | Falls from height, musculoskeletal injuries   |

Table 3.1: Major occupational health problems by economic sector in Nigeria

### Pilot questions 3.1

1. Explain why the occupational disease burden in Nigeria is frequently underestimated. (Linked to SLO 3.1)
2. List four commonly reported occupational health problems in Nigerian workplaces. (Linked to SLO 3.1)
3. Describe three common causes of occupational injury in Nigeria. (Linked to SLO 3.1)
4. Explain why injury reporting in Nigeria remains incomplete. (Linked to SLO 3.1)
5. Describe the occupational health problems associated with the mining and healthcare sectors. (Linked to SLO 3.1)

## 3.2 Occupational Safety and Hygiene

### 3.2.1 Principles of occupational safety

**Occupational safety** rests on several core principles aimed at preventing accidents before they occur. The principle of **hazard identification** requires the systematic recognition of all potential sources of harm within a workplace before any incident takes place. The principle of **risk prioritisation** recognises that resources are limited and that control efforts should focus first on hazards with the greatest potential severity and likelihood of harm.

The principle of **continuous improvement** holds that safety is not a one-time achievement but an ongoing process requiring regular review and adaptation as working conditions, technologies, and personnel change. Finally, the principle of **shared responsibility** recognises that safety depends on commitment from both employers, who must provide safe systems of work, and workers, who must follow established procedures and report hazards they observe.



Fill in the blank: Core principles of occupational safety include hazard identification, risk prioritisation, continuous improvement, and shared \_\_\_\_\_ between employers and workers.

### 3.2.2 Industrial hygiene practice

**Industrial hygiene** is the discipline concerned with the practical recognition, evaluation, and control of workplace exposures, and follows a structured process. **Recognition** involves identifying potential exposure sources through workplace inspection and worker consultation.

**Evaluation** involves measuring the actual level of exposure, typically through air sampling, noise dosimetry, or other quantitative methods, and comparing results against established occupational exposure limits.

**Control** involves implementing measures to reduce exposure to acceptable levels, guided by the hierarchy of controls introduced in the previous Series. Industrial hygienists in Nigeria face particular practical challenges, including limited access to calibrated monitoring equipment, a shortage of accredited laboratories for sample analysis, and the high cost of imported control technologies, all of which constrain the routine application of industrial hygiene practice in many Nigerian workplaces.

Fill in the blank: Industrial hygiene practice follows three steps: recognition of exposure sources, \_\_\_\_\_ of exposure levels through measurement, and control through implementation of appropriate measures.



# THE INDUSTRIAL HYGIENE PROCESS

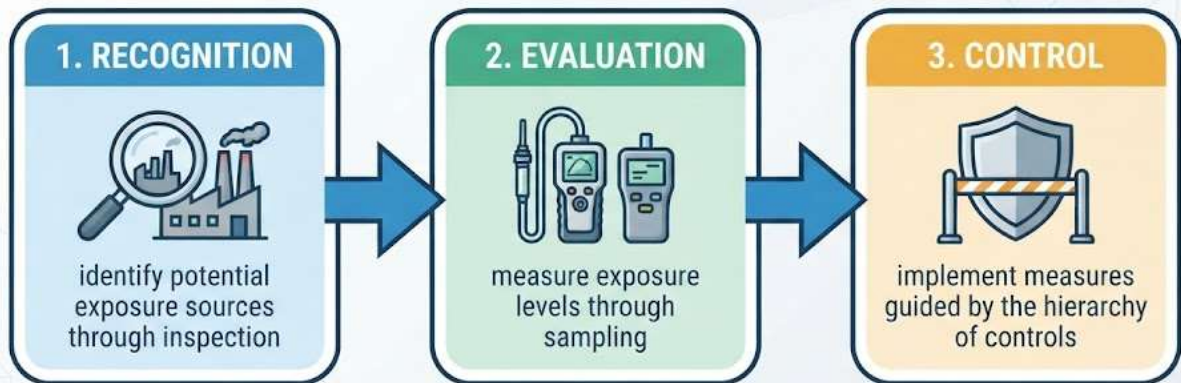


Figure 3.1: The three-step industrial hygiene process: recognition, evaluation, and control of workplace exposures

## 3.2.3 Personal protective equipment

**Personal protective equipment (PPE)** forms the last line of defence in the hierarchy of controls and includes a wide range of items selected according to the specific hazard present.

**Respiratory protection** such as dust masks and respirators guards against airborne contaminants. **Hearing protection** such as earplugs and earmuffs reduces exposure to harmful noise levels. **Eye and face protection** guards against chemical splashes, flying particles, and radiation.

**Hand protection** through appropriate gloves guards against chemical, thermal, and mechanical hazards, while **protective clothing and footwear** guard against a range of physical and chemical risks depending on the work setting. Effective use of PPE requires correct selection for the specific hazard, proper fit, consistent use, and regular maintenance or replacement; PPE that is uncomfortable, poorly fitted, or unavailable is frequently not used consistently, undermining its protective value regardless of how appropriate the equipment selection may be in theory.



Fill in the blank: Personal protective equipment includes respiratory, hearing, eye and face, hand, and \_\_\_\_\_ protection; its effectiveness depends on correct selection, proper fit, and consistent use.

### Pilot questions 3.2

1. State four core principles of occupational safety. (Linked to SLO 3.2)
2. Describe the three steps of industrial hygiene practice. (Linked to SLO 3.2)
3. Identify three practical challenges facing industrial hygiene practice in Nigeria. (Linked to SLO 3.2)
4. List four types of personal protective equipment and the hazard each protects against. (Linked to SLO 3.2)
5. Explain why personal protective equipment may fail to provide effective protection even when correctly selected. (Linked to SLO 3.2)

## 3.3 Strategies for Control and Prevention

### 3.3.1 Primary, secondary, and tertiary prevention

Occupational health control strategies are commonly classified into three levels of prevention.

**Primary prevention** aims to prevent exposure or harm from occurring at all, through measures such as hazard elimination, substitution, engineering controls, and worker education; this is the most desirable level of prevention because it addresses the root cause before any harm occurs.

**Secondary prevention** aims to detect early signs of harm through screening and surveillance, such as periodic medical examinations, allowing intervention before disease becomes severe or irreversible.

**Tertiary prevention** aims to manage established disease or injury to minimise further deterioration and support recovery, including medical treatment, rehabilitation, and workplace accommodation for affected workers. An effective occupational health programme integrates all



three levels, recognising that even the best primary prevention efforts will not eliminate every risk, making secondary and tertiary measures essential complements rather than substitutes for primary prevention.

Fill in the blank: Occupational health prevention has three levels: primary prevention (preventing exposure), secondary prevention (early detection through screening), and \_\_\_\_\_ prevention (managing established disease or injury).

### 3.3.2 Workplace safety management systems

A **safety management system** provides the organisational structure through which an employer systematically manages occupational health and safety risk. Key components include a documented **safety policy** stating organisational commitment and responsibilities; **hazard identification and risk assessment procedures** conducted regularly and whenever conditions change; **incident reporting and investigation systems** that capture near-misses as well as actual injuries to identify underlying causes.

**Training and competency programmes** ensure workers understand the hazards they face and the controls in place; **performance monitoring** tracks safety indicators over time to identify trends and evaluate the effectiveness of interventions; and **management review** ensures senior leadership regularly evaluates and updates the system. Organisations that implement comprehensive safety management systems consistently demonstrate lower injury rates than those relying on ad hoc or reactive approaches to safety.

Fill in the blank: A safety management system includes a documented safety policy, hazard identification procedures, incident reporting, training programmes, and \_\_\_\_\_ monitoring to track safety indicators over time.

### 3.3.3 Challenges and opportunities for control in Nigeria

Several significant challenges constrain the effective control of occupational health problems in Nigeria. **Weak regulatory enforcement** means that even well-designed legislation often fails to translate into safer workplace practice. A **shortage of trained occupational health**





**professionals** limits the capacity to conduct risk assessments and implement control measures, particularly outside major urban centres. The **predominance of the informal sector** means the majority of Nigerian workers fall entirely outside any formal control framework.

Despite these challenges, several opportunities exist for improving occupational health control in Nigeria, including growing awareness among larger employers driven by international supply chain requirements, the expansion of professional training programmes in occupational health, increasing use of mobile technology for hazard reporting and worker education, and the potential to integrate basic occupational health services into existing primary healthcare infrastructure to extend coverage to underserved workers. Addressing these challenges systematically represents one of the most important tasks facing occupational health practice in Nigeria today.

Fill in the blank: Challenges to occupational health control in Nigeria include weak regulatory enforcement, a shortage of trained professionals, and the predominance of the \_\_\_\_\_ sector, which falls outside formal control frameworks.

### Challenges versus Opportunities for Occupational Health Control in Nigeria



Figure 3.2: Challenges and opportunities for occupational health control and prevention in Nigeria



### Pilot questions 3.3

1. Distinguish between primary, secondary, and tertiary prevention in occupational health. (Linked to SLO 3.3)
2. List four key components of a workplace safety management system. (Linked to SLO 3.3)
3. Explain why incident reporting systems should capture near-misses as well as actual injuries. (Linked to SLO 3.3)
4. Identify three challenges facing occupational health control in Nigeria. (Linked to SLO 3.3)
5. Describe two opportunities for improving occupational health control in Nigeria. (Linked to SLO 3.3)



## Series Summary

This Series examined the practical reality of occupational health problems in Nigeria, beginning with the substantial but frequently underestimated disease burden, including musculoskeletal disorders, respiratory disease, hearing loss, and skin conditions, alongside common injuries such as falls, machinery-related accidents, and road traffic incidents. Different economic sectors present distinct risk profiles, with mining associated with respiratory disease, manufacturing with noise-induced hearing loss, agriculture with pesticide poisoning, and healthcare with infectious disease and needlestick injuries. The Series then introduced the principles of occupational safety, including hazard identification, risk prioritisation, continuous improvement, and shared responsibility, alongside the structured practice of industrial hygiene, which proceeds through recognition, evaluation, and control of exposures, and the role of personal protective equipment as the final layer of defence when higher-level controls cannot fully eliminate risk.

The Series concluded by examining strategies for control and prevention, distinguishing primary prevention, which addresses exposure before harm occurs, from secondary prevention, which detects early signs of harm through screening, and tertiary prevention, which manages established disease to minimise further deterioration. Effective control depends on comprehensive workplace safety management systems incorporating policy, risk assessment, incident reporting, training, and ongoing performance monitoring. Despite persistent challenges in Nigeria, including weak enforcement, a shortage of trained professionals, and the predominance of the informal sector, growing opportunities exist through expanding training, technology-enabled hazard reporting, and integration with primary healthcare to extend protection to a greater share of the Nigerian workforce.

## Glossary of Terms

1. **Occupational disease burden:** the overall scale and pattern of work-related illness within a population, often underestimated due to limited surveillance and informal sector employment.



2. **Pneumoconiosis:** a group of lung diseases caused by the inhalation of dust, commonly associated with mining and quarrying work.
3. **Silicosis:** a specific form of pneumoconiosis caused by the inhalation of crystalline silica dust, common among miners and quarry workers.
4. **Hierarchy of controls:** a structured ranking of intervention strategies from most to least effective, used to guide industrial hygiene control measures.
5. **Industrial hygiene:** the discipline concerned with the recognition, evaluation, and control of workplace exposures that may cause illness or impaired health.
6. **Personal protective equipment (PPE):** equipment worn by a worker to minimise exposure to a specific hazard, forming the last line of defence in the hierarchy of controls.
7. **Primary prevention:** intervention aimed at preventing exposure or harm from occurring at all, through measures such as elimination, substitution, and engineering controls.
8. **Secondary prevention:** intervention aimed at detecting early signs of harm through screening and surveillance, allowing action before disease becomes severe.
9. **Tertiary prevention:** intervention aimed at managing established disease or injury to minimise further deterioration and support recovery.
10. **Safety management system:** the organisational structure, including policy, risk assessment, incident reporting, training, and review, through which an employer systematically manages occupational health and safety risk.
11. **Near-miss:** an incident that had the potential to cause harm but did not, valuable for identifying underlying hazards before an actual injury occurs.



## Concept Check Questions [Series 3]

### Objective Questions

- Musculoskeletal disorders, respiratory diseases, hearing loss, and \_\_\_\_\_ conditions are among the most commonly reported occupational health problems in Nigeria. (Linked to SLO 3.1)
- The mining sector in Nigeria is particularly associated with \_\_\_\_\_, a lung disease caused by dust inhalation. (Linked to SLO 3.1)
- Industrial hygiene practice proceeds through three steps: recognition, \_\_\_\_\_, and control. (Linked to SLO 3.2)
- Personal protective equipment forms the \_\_\_\_\_ line of defence in the hierarchy of controls. (Linked to SLO 3.2)
- \_\_\_\_\_ prevention aims to prevent exposure or harm from occurring at all, through elimination and engineering controls. (Linked to SLO 3.3)
- A workplace \_\_\_\_\_ management system includes policy, risk assessment, incident reporting, training, and performance monitoring. (Linked to SLO 3.3)

### Short-Answer Questions

- Explain why occupational injury reporting in Nigeria remains incomplete. (Linked to SLO 3.1)
- Describe the three steps of industrial hygiene practice. (Linked to SLO 3.2)
- Distinguish between primary and secondary prevention in occupational health. (Linked to SLO 3.3)

### Long-Answer Questions

- Discuss the major occupational health problems found in Nigeria, including both injuries and sector-specific diseases. (Linked to SLO 3.1)
- Evaluate the challenges and opportunities for occupational health control and prevention in Nigeria. (Linked to SLO 3.3)



## Answers to Concept Check Questions [Series 3]

### Objective Questions

1. Skin.
2. Silicosis.
3. Evaluation.
4. Last.
5. Primary.
6. Safety.

### Short-Answer Questions

7. Reporting remains incomplete because many incidents, particularly in the informal sector, are never recorded, surveillance systems are limited, and there is low awareness among workers of the importance of reporting even minor injuries.
8. Recognition involves identifying potential exposure sources through inspection and worker consultation; evaluation involves measuring actual exposure levels through air sampling or other quantitative methods; control involves implementing measures, guided by the hierarchy of controls, to reduce exposure to acceptable levels.
9. Primary prevention aims to prevent exposure or harm from occurring at all, through measures such as elimination and engineering controls, while secondary prevention aims to detect early signs of harm through screening and surveillance, allowing intervention before disease becomes severe.

### Long-Answer Questions

10. **Basic response:** Disease burden: musculoskeletal disorders, respiratory disease, hearing loss, skin conditions; underestimated due to weak surveillance and informal sector employment. Injuries: falls from height (construction); machinery injuries (manufacturing); road traffic accidents (transport); burns and explosions (informal fuel sector). Sector patterns: mining (silicosis, pneumoconiosis); manufacturing (noise-induced hearing loss, chemical exposure); agriculture (pesticide poisoning, zoonotic infections); healthcare (needlestick injuries, infectious disease); oil and gas (chemical exposure, fire hazards).



**Value-added response:** The concentration of specific occupational health problems within particular sectors reflects the underlying hazard profile of each industry, and this sector-specific pattern provides occupational health practitioners with a practical framework for prioritising interventions; rather than applying generic safety measures uniformly, resources can be targeted at the specific hazards most prevalent in a given sector, such as respiratory protection programmes in mining or hearing conservation programmes in manufacturing, maximising the impact of limited occupational health resources.

11. **Basic response:** Challenges: weak regulatory enforcement; shortage of trained occupational health professionals, particularly outside urban centres; predominance of informal sector workers outside any formal control framework. Opportunities: growing employer awareness driven by international supply chain requirements; expansion of professional training programmes; mobile technology for hazard reporting and worker education; integration of occupational health into existing primary healthcare infrastructure.

**Value-added response:** The most promising path forward for occupational health control in Nigeria likely lies not in replicating resource-intensive in-house models suited to large formal employers, but in leveraging lower-cost, scalable approaches, particularly mobile technology and primary healthcare integration, that can extend at least basic occupational health protection to the much larger population of informal sector workers who currently receive none at all.





## Answers to Pilot Questions [Series 3]

### Part 3.1

6. The burden is underestimated because of limited reporting systems, weak diagnostic capacity for occupational illness, and the large informal sector workforce where no surveillance occurs at all.
7. Four commonly reported problems are musculoskeletal disorders, respiratory diseases, hearing loss, and skin conditions.
8. Three common causes are falls from height on construction sites, machinery-related injuries in manufacturing, and road traffic accidents among commercial drivers and transport workers.
9. Injury reporting remains incomplete because many incidents, particularly in the informal sector, go entirely unrecorded due to weak surveillance systems and low awareness of the importance of reporting.
10. Mining is associated with respiratory disease, including silicosis and pneumoconiosis, from dust inhalation; healthcare is associated with needlestick injuries, infectious disease transmission, and psychosocial stress.

### Part 3.2

11. Four principles are hazard identification, risk prioritisation, continuous improvement, and shared responsibility between employers and workers.
12. Recognition identifies potential exposure sources; evaluation measures actual exposure levels through sampling or monitoring; control implements measures to reduce exposure, guided by the hierarchy of controls.
13. Three challenges are limited access to calibrated monitoring equipment, a shortage of accredited laboratories for sample analysis, and the high cost of imported control technologies.
14. Four types are respiratory protection (against airborne contaminants), hearing protection (against noise), eye and face protection (against chemical splashes and particles), and hand protection (against chemical, thermal, and mechanical hazards).



15. PPE may fail to protect effectively if it is uncomfortable, poorly fitted, unavailable, or not used consistently, even when the equipment itself is correctly selected for the hazard.

### **Part 3.3**

1. Primary prevention prevents exposure or harm from occurring through elimination and engineering controls; secondary prevention detects early signs of harm through screening; tertiary prevention manages established disease to minimise deterioration and support recovery.
2. Four components are a documented safety policy, hazard identification and risk assessment procedures, incident reporting and investigation systems, and training and competency programmes.
3. Capturing near-misses allows underlying hazards to be identified and corrected before they result in an actual injury, providing valuable early warning data that pure injury statistics alone would miss.
4. Three challenges are weak regulatory enforcement, a shortage of trained occupational health professionals outside major urban centres, and the predominance of the informal sector outside formal control frameworks.
5. Two opportunities are growing employer awareness driven by international supply chain requirements, and the integration of basic occupational health services into existing primary healthcare infrastructure to extend coverage.



## References and Attributions [Series 3]

### Textual References

6. International Labour Organization. (2022). Improving the Safety and Health of Young Workers. Geneva: ILO.
7. Federal Ministry of Labour and Employment. (2018). National Policy on Occupational Safety and Health. Abuja: FMLE.
8. Nuhu, S., et al. (2019). Occupational hazards among artisanal miners in Nigeria. Journal of Environmental and Occupational Health, 5(2), 45 to 53.
9. World Health Organization. (2017). Protecting Workers' Health Series No. 3: Industrial Hygiene. Geneva: WHO.

### Figures, Plates, Tables, and Boxes

10. Table 3.1: Major occupational health problems by economic sector in Nigeria. AI generation prompt: "Create a clean two-column table titled Occupational Health Problems by Nigerian Economic Sector; left column header Sector, right column header Major Occupational Health Problems; six rows: Mining and Quarrying (silicosis, pneumoconiosis), Manufacturing (noise-induced hearing loss, chemical exposure, musculoskeletal disorders), Agriculture (pesticide poisoning, musculoskeletal strain, zoonotic infections), Healthcare (needlestick injuries, infectious disease, psychosocial stress), Oil and Gas (chemical exposure, fire and explosion hazards), Construction (falls from height, musculoskeletal injuries); use a clean professional table design with alternating row shading." Suggested OER search string: "occupational health problems by industry sector table Nigeria".
11. Figure 3.1: The three-step industrial hygiene process. AI generation prompt: "Create a clean three-step horizontal flow diagram titled The Industrial Hygiene Process, with three boxes connected by arrows: Box 1 labelled Recognition with a magnifying glass over a factory icon and text identify potential exposure sources through inspection; Box 2 labelled Evaluation with a measuring device or air sampling pump icon and text measure exposure levels through sampling; Box 3 labelled Control with a shield or barrier icon and text implement measures guided by the hierarchy of controls; use a clean



professional infographic style with consistent colour scheme." Suggested OER search string: "industrial hygiene process recognition evaluation control diagram".

12. Figure 3.2: Challenges and opportunities for occupational health control and prevention in Nigeria. AI generation prompt: "Create a clean grouped bar chart titled Challenges versus Opportunities for Occupational Health Control in Nigeria; left group of four red bars labelled Weak Enforcement, Professional Shortage, Informal Sector Coverage Gap, Limited Resources; right group of four green bars labelled Employer Awareness, Training Expansion, Mobile Technology, Primary Healthcare Integration; use a clean professional infographic chart style with a legend distinguishing Challenges (red) from Opportunities (green)." Suggested OER search string: "occupational health challenges opportunities Nigeria bar chart infographic".



**Course code: COM 306**

**Course title: Introduction to Occupational Health**

**Course credit load: 1 Unit**

## **Series 4: Agricultural and Industrial Health Risks**

- **Part 4.1: Health Problems of Agricultural Workers in Nigeria**
  - Sub Part 4.1.1: Overview of agricultural occupational health risks
  - Sub Part 4.1.2: Pesticide exposure and poisoning
  - Sub Part 4.1.3: Musculoskeletal and zoonotic risks in agriculture
- **Part 4.2: Occupational Lung Diseases**
  - Sub Part 4.2.1: Pneumoconiosis and dust-related lung disease
  - Sub Part 4.2.2: Occupational asthma and chemical lung injury
  - Sub Part 4.2.3: Diagnosis, management, and prevention of lung disease
- **Part 4.3: Occupational Skin Diseases**
  - Sub Part 4.3.1: Contact dermatitis
  - Sub Part 4.3.2: Other occupational skin conditions
  - Sub Part 4.3.3: Prevention and management of occupational skin disease



## Introduction

Agriculture and industry remain two of the largest sources of employment in Nigeria, and both expose workers to distinctive patterns of occupational health risk that warrant focused attention. Agricultural workers face a combination of chemical, biological, ergonomic, and environmental hazards rooted in the nature of farming itself, while industrial workers across manufacturing, mining, and processing sectors face hazards capable of producing serious and sometimes irreversible disease of the lungs and skin.

This Series examines the specific health problems affecting agricultural workers in Nigeria, before turning to two of the most significant categories of occupational disease found across Nigerian industry: occupational lung diseases and occupational skin diseases. Each of these conditions has distinct causes, presentations, and prevention strategies that build on the general principles of hazard control and prevention established in the previous Series.

A clear understanding of these specific disease categories equips learners to recognise affected workers early, to understand the underlying mechanisms of harm, and to apply targeted preventive measures suited to agricultural and industrial settings.

## Series Learning Outcomes

Upon completing this Series, you should be able to:

- **SLO 4.1** describe the major health problems affecting agricultural workers in Nigeria, including pesticide exposure and musculoskeletal risk (Linked to Part 4.1),
- **SLO 4.2** describe the major occupational lung diseases, their causes, and their prevention (Linked to Part 4.2), and
- **SLO 4.3** describe the major occupational skin diseases, their causes, and their prevention (Linked to Part 4.3).



## 4.1 Health Problems of Agricultural Workers in Nigeria

### 4.1.1 Overview of agricultural occupational health risks

**Agriculture** remains the largest employer of labour in Nigeria, engaging a substantial proportion of the workforce in crop production, livestock rearing, and fishing. Agricultural work exposes labourers to a uniquely broad combination of hazards, including **chemical exposure** from pesticides and fertilisers, **biological hazards** from contact with soil, plants, and animals, **physical hazards** from machinery, sun exposure, and extreme heat, and **ergonomic strain** from prolonged manual labour using basic tools.

Unlike formal industrial settings, the great majority of agricultural work in Nigeria occurs within the **informal sector**, typically on small family-owned farms with minimal access to protective equipment, training, or occupational health services. This combination of high hazard exposure and low protective coverage makes agricultural workers among the most vulnerable occupational groups in the country, despite agriculture rarely being prioritised in national occupational health policy and resource allocation.

Fill in the blank: Agriculture remains the largest employer of labour in Nigeria, but agricultural work occurs largely within the \_\_\_\_\_ sector, with minimal access to protective equipment and occupational health services.

### 4.1.2 Pesticide exposure and poisoning

**Pesticide exposure** represents one of the most serious chemical hazards facing Nigerian agricultural workers. Exposure occurs through **dermal contact** during mixing and spraying, **inhalation** of spray drift or vapours, and **ingestion** from contaminated hands, food, or water.

**Organophosphate and carbamate pesticides**, widely used in Nigerian agriculture, inhibit the enzyme acetylcholinesterase, producing symptoms including excessive salivation, sweating, muscle twitching, and in severe cases, respiratory failure and death.

**Acute pesticide poisoning** is frequently underreported in Nigeria due to limited access to healthcare in rural areas and low awareness of the connection between symptoms and pesticide exposure among both workers and healthcare providers. **Chronic low-level exposure** is also a



concern, with growing evidence linking long-term pesticide exposure to neurological effects, reproductive problems, and certain cancers, although the full extent of this chronic burden in Nigeria remains poorly documented due to limited surveillance.

Fill in the blank: Organophosphate and carbamate pesticides inhibit the enzyme \_\_\_\_\_, producing symptoms including excessive salivation, sweating, and muscle twitching in cases of acute poisoning.

#### 4.1.3 Musculoskeletal and zoonotic risks in agriculture

Beyond chemical hazards, Nigerian agricultural workers face significant **musculoskeletal risk** from the predominantly manual nature of farm labour, including prolonged bending during planting and harvesting, repetitive use of hand tools such as hoes and cutlasses, and carrying heavy loads over long distances, often without mechanical assistance. These activities contribute to a high prevalence of **chronic back pain, joint disorders, and repetitive strain injuries** among the agricultural workforce, conditions that are rarely formally diagnosed or treated.

Agricultural workers are also exposed to **zoonotic diseases**, infections transmitted from animals to humans, through close contact with livestock and their products. Examples relevant to the Nigerian context include **anthrax** from infected livestock, **brucellosis** from unpasteurised milk and contact with infected animals, and **avian influenza** among poultry workers. Reducing both musculoskeletal and zoonotic risk requires a combination of improved tool design, mechanisation where feasible, animal health surveillance, and basic hygiene practices that are often poorly resourced in smallholder farming contexts.

Fill in the blank: Agricultural workers face zoonotic disease risks including anthrax, brucellosis, and \_\_\_\_\_ influenza, transmitted through close contact with livestock and their products.







Figure 4.1: Major occupational health risks facing agricultural workers in Nigeria

#### Pilot questions 4.1

1. Explain why agricultural workers in Nigeria are particularly vulnerable to occupational health risks. (Linked to SLO 4.1)
2. Describe three routes through which agricultural workers may be exposed to pesticides. (Linked to SLO 4.1)
3. Explain the mechanism by which organophosphate pesticides cause poisoning. (Linked to SLO 4.1)
4. Describe two musculoskeletal risks faced by agricultural workers in Nigeria. (Linked to SLO 4.1)
5. Define zoonotic disease and give two examples relevant to Nigerian agricultural workers. (Linked to SLO 4.1)



## 4.2 Occupational Lung Diseases

### 4.2.1 Pneumoconiosis and dust-related lung disease

**Pneumoconiosis** refers to a group of lung diseases caused by the inhalation and accumulation of dust particles in the lungs over a prolonged period, leading to inflammation and progressive scarring of lung tissue. **Silicosis**, caused by inhalation of crystalline silica dust, is among the most significant pneumoconioses affecting Nigerian workers, particularly those in mining, quarrying, and stone-cutting, where fine silica particles are generated during drilling and crushing activities.

**Coal workers' pneumoconiosis** affects coal miners through inhalation of coal dust, while **asbestosis** results from inhalation of asbestos fibres, historically used in construction and insulation materials. These diseases share a common feature: once significant lung scarring has occurred, the damage is generally irreversible, making prevention through dust control far more important than treatment after disease has developed. Affected workers typically present with progressive breathlessness, persistent cough, and reduced exercise tolerance that may not become apparent until years after the relevant exposure occurred.

Fill in the blank: Silicosis is caused by inhalation of crystalline \_\_\_\_\_ dust and is among the most significant pneumoconioses affecting Nigerian miners and quarry workers.

### 4.2.2 Occupational asthma and chemical lung injury

**Occupational asthma** is a form of asthma caused or significantly worsened by exposure to a specific agent in the workplace, distinct from pre-existing asthma that happens to be present in a worker. Common causative agents in Nigerian workplaces include **flour and grain dust** in milling and bakery work, **isocyanates** used in spray painting and foam manufacturing, and **latex proteins** encountered by healthcare workers using rubber gloves.

Unlike pneumoconiosis, occupational asthma can develop after relatively brief exposure in sensitised individuals and often improves, at least partially, if exposure is stopped early, making prompt recognition particularly important. Acute **chemical lung injury** can also occur following accidental high-level exposure to irritant gases such as chlorine or ammonia, common in



industrial settings handling these chemicals, producing immediate symptoms of breathlessness, chest tightness, and in severe cases, life-threatening pulmonary oedema requiring emergency treatment.

Fill in the blank: Occupational asthma can develop after relatively brief exposure to a causative agent such as flour dust, isocyanates, or \_\_\_\_\_ proteins, and often improves if exposure is stopped early.

#### 4.2.3 Diagnosis, management, and prevention of lung disease

**Diagnosis** of occupational lung disease relies on a combination of a detailed **occupational history** linking symptoms to specific workplace exposures, **chest imaging** such as X-ray or CT scan to identify characteristic patterns of lung damage, and **lung function testing** (spirometry) to quantify the degree of respiratory impairment. Establishing a clear link between symptoms and workplace exposure is essential not only for clinical management but also for any subsequent compensation claim.

**Management** of established pneumoconiosis is largely supportive, since lung scarring cannot be reversed, focusing on removing the worker from further exposure, treating complications, and providing pulmonary rehabilitation. Occupational asthma, by contrast, may improve significantly if exposure ceases promptly. **Prevention** remains the most effective strategy for all occupational lung diseases, relying on dust suppression techniques such as wet drilling, adequate ventilation, respiratory protective equipment, and regular lung function surveillance to detect early signs of disease before significant impairment develops.

Fill in the blank: Diagnosis of occupational lung disease relies on occupational history, chest imaging, and lung function \_\_\_\_\_; prevention through dust suppression and ventilation remains the most effective strategy.

| <u>Disease</u>                    | <u>Key Features</u>                                                                               |
|-----------------------------------|---------------------------------------------------------------------------------------------------|
| <b>Pneumoconiosis / Silicosis</b> | Caused by inhalation of silica or coal dust; leads to <b>irreversible scarring</b> of lung tissue |



|                             |                                                                                                                    |
|-----------------------------|--------------------------------------------------------------------------------------------------------------------|
| <b>Asbestosis</b>           | Caused by inhalation of asbestos fibres; results in <b>irreversible fibrosis</b> and increased cancer risk         |
| <b>Occupational Asthma</b>  | Triggered by flour dust, isocyanates, latex; often <b>improves if exposure is stopped early</b>                    |
| <b>Chemical Lung Injury</b> | Acute exposure to irritant gases (chlorine, ammonia); outcome is <b>variable</b> , can be life-threatening acutely |

Table 4.1: Comparison of major occupational lung diseases by cause and reversibility

### Pilot questions 4.2

1. Define pneumoconiosis and name two specific examples relevant to Nigerian industry. (Linked to SLO 4.2)
2. Explain why prevention is more important than treatment for pneumoconiosis. (Linked to SLO 4.2)
3. Describe occupational asthma and name three causative agents found in Nigerian workplaces. (Linked to SLO 4.2)
4. Distinguish between occupational asthma and pneumoconiosis in terms of reversibility. (Linked to SLO 4.2)
5. Describe the three components used to diagnose occupational lung disease. (Linked to SLO 4.2)

## 4.3 Occupational Skin Diseases

### 4.3.1 Contact dermatitis

**Contact dermatitis** is the most common occupational skin disease and occurs in two distinct forms. **Irritant contact dermatitis** results from direct chemical or physical damage to the skin barrier, commonly caused by frequent contact with water, detergents, solvents, or cement, and can affect any worker with sufficient exposure regardless of individual susceptibility. **Allergic contact dermatitis**, by contrast, occurs only in individuals who have become sensitised to a



specific substance, such as certain dyes, rubber chemicals, or metals like nickel and chromium, with the immune system reacting upon subsequent exposure.

Both forms present with redness, itching, scaling, and sometimes blistering of the affected skin, typically on the hands and forearms where contact is greatest. In Nigeria, occupational contact dermatitis is particularly common among **hairdressers, construction workers handling wet cement, healthcare workers exposed to frequent handwashing and gloves, and agricultural workers handling pesticides and plant materials**, reflecting the breadth of occupations involving repeated skin contact with irritant or sensitising substances.

Fill in the blank: Irritant contact dermatitis results from direct damage to the skin barrier, while \_\_\_\_\_ contact dermatitis occurs only in individuals who have become sensitised to a specific substance.

#### 4.3.2 Other occupational skin conditions

Beyond contact dermatitis, several other occupational skin conditions affect Nigerian workers. **Occupational skin cancer** can result from prolonged exposure to ultraviolet radiation among outdoor agricultural and construction workers, or from contact with carcinogenic substances such as certain mineral oils and tars used in industrial settings. **Occupational infections** of the skin, including fungal infections among workers in hot, humid environments and bacterial infections from contaminated wounds, are common in agricultural and informal sector work where hygiene facilities are often limited.

**Chemical burns** can occur from accidental contact with strong acids, alkalis, or other corrosive substances used in manufacturing and cleaning industries, producing immediate tissue damage requiring urgent treatment. **Mechanical skin trauma**, including abrasions, lacerations, and calluses, is common among workers performing repetitive manual tasks, particularly in agriculture and construction, and while often considered minor, can become entry points for secondary infection if not properly managed.



Fill in the blank: Occupational skin conditions beyond contact dermatitis include skin cancer from ultraviolet exposure, occupational infections, chemical burns, and mechanical skin \_\_\_\_\_ from repetitive manual tasks.

| <u>Condition</u>                   | <u>Cause and Affected Workers</u>                                                                              |
|------------------------------------|----------------------------------------------------------------------------------------------------------------|
| <b>Irritant Contact Dermatitis</b> | Frequent contact with water, detergents, solvents, cement; affects healthcare workers and construction workers |
| <b>Allergic Contact Dermatitis</b> | Sensitisation to dyes, rubber, nickel, chromium; affects hairdressers and factory workers                      |
| <b>Occupational Skin Cancer</b>    | Prolonged UV exposure, mineral oils and tars; affects outdoor agricultural and construction workers            |
| <b>Occupational Skin Infection</b> | Fungal and bacterial infections in hot humid conditions; affects agricultural and informal sector workers      |
| <b>Chemical Burns</b>              | Contact with strong acids or alkalis; affects manufacturing and cleaning industry workers                      |

Table 4.2: Major occupational skin diseases by cause and affected worker groups in Nigeria

#### 4.3.3 Prevention and management of occupational skin disease

**Prevention** of occupational skin disease relies primarily on minimising direct skin contact with hazardous substances through appropriate **personal protective equipment**, particularly gloves selected for resistance to the specific chemical involved, since not all gloves protect against all substances. **Barrier creams** can provide additional protection in some settings, though they are not a substitute for proper glove use. **Workplace hygiene facilities**, including accessible handwashing stations and mild, non-irritating soap, reduce cumulative skin exposure throughout the working day.

Early recognition and reporting of skin symptoms allows workers to be moved away from the causative exposure before the condition becomes severe or chronic, which is particularly important for allergic contact dermatitis, where continued exposure after sensitisation tends to



worsen symptoms progressively. **Health education** on correct glove use, skin care, and the early signs of occupational skin disease, delivered as part of routine occupational health programmes, remains an effective and low-cost approach to reducing the burden of these largely preventable conditions across Nigerian workplaces.

Fill in the blank: Prevention of occupational skin disease relies on appropriate personal protective equipment, particularly correctly selected gloves, workplace hygiene facilities, and early \_\_\_\_\_ and reporting of skin symptoms.

### **Pilot questions 4.3**

1. Distinguish between irritant and allergic contact dermatitis. (Linked to SLO 4.3)
2. Name three occupational groups in Nigeria particularly affected by contact dermatitis. (Linked to SLO 4.3)
3. Describe two occupational skin conditions other than contact dermatitis. (Linked to SLO 4.3)
4. Explain why glove selection must be matched to the specific chemical hazard present. (Linked to SLO 4.3)
5. Explain why early recognition and reporting of skin symptoms is particularly important for allergic contact dermatitis. (Linked to SLO 4.3)





## Series Summary

This Series examined three specific categories of occupational health problems affecting Nigerian workers. Agricultural workers, the largest occupational group in Nigeria, face a uniquely broad combination of chemical, biological, physical, and ergonomic hazards, with pesticide poisoning from organophosphate and carbamate compounds representing a particularly serious chemical risk, alongside musculoskeletal strain from manual labour and zoonotic diseases such as anthrax and brucellosis transmitted through close contact with livestock. The Series then examined occupational lung diseases, distinguishing pneumoconiosis, including silicosis among miners and quarry workers, which causes irreversible lung scarring, from occupational asthma, which can develop after brief exposure to agents such as flour dust or isocyanates but often improves if exposure is stopped early, and acute chemical lung injury from irritant gas exposure.

The Series concluded with occupational skin diseases, the most common of which is contact dermatitis, occurring in irritant and allergic forms affecting workers including hairdressers, construction workers, and healthcare staff with frequent skin exposure to irritant or sensitising substances. Other significant skin conditions include occupational skin cancer from ultraviolet exposure, occupational infections, chemical burns, and mechanical trauma. Across all three categories, prevention through reduced exposure, appropriate protective equipment, workplace hygiene, and early symptom recognition remains far more effective and less costly than managing established disease, reinforcing the central importance of proactive occupational health practice across Nigeria's agricultural and industrial sectors.

## Glossary of Terms

1. **Organophosphate:** a class of pesticide that inhibits the enzyme acetylcholinesterase, causing symptoms including excessive salivation, sweating, and muscle twitching in cases of poisoning.
2. **Zoonotic disease:** an infection transmitted from animals to humans, such as anthrax or brucellosis, posing particular risk to workers in close contact with livestock.





3. **Pneumoconiosis:** a group of lung diseases caused by the inhalation and accumulation of dust particles, leading to progressive and generally irreversible lung scarring.
4. **Silicosis:** a specific form of pneumoconiosis caused by inhalation of crystalline silica dust, common among miners, quarry workers, and stone-cutters.
5. **Occupational asthma:** asthma caused or significantly worsened by exposure to a specific agent in the workplace, which can often improve if exposure is stopped early.
6. **Spirometry:** a lung function test that measures the volume and flow of air a person can breathe, used to quantify respiratory impairment in occupational lung disease.
7. **Contact dermatitis:** inflammation of the skin caused by direct contact with an irritant or allergenic substance, occurring in irritant and allergic forms.
8. **Irritant contact dermatitis:** skin inflammation caused by direct chemical or physical damage to the skin barrier, which can affect any worker with sufficient exposure.
9. **Allergic contact dermatitis:** skin inflammation occurring only in individuals who have become immunologically sensitised to a specific substance upon subsequent exposure.
10. **Barrier cream:** a topical preparation applied to the skin to provide additional protection against irritants, used as a supplement to, not a substitute for, proper glove use.
11. **Acetylcholinesterase:** an enzyme inhibited by organophosphate and carbamate pesticides, whose inhibition produces the characteristic symptoms of acute pesticide poisoning.



## Concept Check Questions [Series 4]

### Objective Questions

- Agricultural work in Nigeria occurs largely within the \_\_\_\_\_ sector, with minimal access to protective equipment and occupational health services. (Linked to SLO 4.1)
- Organophosphate pesticides inhibit the enzyme \_\_\_\_\_, producing symptoms of acute poisoning. (Linked to SLO 4.1)
- \_\_\_\_\_, caused by inhalation of crystalline silica dust, is among the most significant pneumoconioses affecting Nigerian miners. (Linked to SLO 4.2)
- Occupational asthma can develop after relatively brief exposure and often \_\_\_\_\_ if exposure is stopped early. (Linked to SLO 4.2)
- \_\_\_\_\_ contact dermatitis results from direct chemical or physical damage to the skin barrier and can affect any worker with sufficient exposure. (Linked to SLO 4.3)
- \_\_\_\_\_ contact dermatitis occurs only in individuals who have become sensitised to a specific substance. (Linked to SLO 4.3)

### Short-Answer Questions

- Describe two zoonotic diseases relevant to Nigerian agricultural workers. (Linked to SLO 4.1)
- Explain why prevention is more important than treatment for pneumoconiosis. (Linked to SLO 4.2)
- Distinguish between irritant and allergic contact dermatitis. (Linked to SLO 4.3)

### Long-Answer Questions

- Discuss the major occupational health problems affecting agricultural workers in Nigeria. (Linked to SLO 4.1)
- Compare occupational lung diseases and occupational skin diseases in terms of their causes and prevention. (Linked to SLOs 4.2 to 4.3)



## Answers to Concept Check Questions [Series 4]

### Objective Questions

1. Informal.
2. Acetylcholinesterase.
3. Silicosis.
4. Improves.
5. Irritant.
6. Allergic.

### Short-Answer Questions

7. Anthrax can be transmitted from infected livestock; brucellosis can be transmitted through unpasteurised milk and contact with infected animals.
8. Once significant lung scarring from pneumoconiosis has occurred, the damage is irreversible, making dust control and exposure prevention far more important than treatment after disease has developed.
9. Irritant contact dermatitis results from direct chemical or physical damage to the skin barrier and can affect any worker with sufficient exposure, while allergic contact dermatitis occurs only in individuals who have become immunologically sensitised to a specific substance.

### Long-Answer Questions

10. **Basic response:** Agricultural risks: chemical exposure (pesticides, fertilisers); biological hazards (soil, plants, animals); physical hazards (machinery, sun, heat); ergonomic strain (manual labour). Pesticide poisoning: organophosphates and carbamates inhibit acetylcholinesterase; symptoms include salivation, sweating, muscle twitching; routes include dermal, inhalation, ingestion. Musculoskeletal risk: bending, repetitive tool use, heavy load carrying causing back pain and joint disorders. Zoonotic disease: anthrax, brucellosis, avian influenza from livestock contact. Context: largely informal sector; minimal protective equipment or health services.

**Value-added response:** The breadth of hazards facing Nigerian agricultural workers, spanning chemical, biological, physical, and ergonomic categories simultaneously,



distinguishes agriculture from most other occupational sectors where a narrower range of hazard types typically predominates; this complexity, combined with the informal and dispersed nature of most farming activity, means that conventional workplace-based occupational health interventions are poorly suited to this sector, and more innovative, community-based approaches integrating agricultural extension services with basic occupational health education may offer a more practical path to improving worker protection.

11. **Basic response:** Lung diseases: pneumoconiosis/silicosis (dust inhalation; irreversible scarring; mining, quarrying); occupational asthma (flour dust, isocyanates, latex; often reversible if exposure stops early); chemical lung injury (acute irritant gas exposure; variable severity). Prevention: dust suppression, ventilation, respiratory PPE, lung function surveillance. Skin diseases: irritant and allergic contact dermatitis (chemicals, wet work, sensitisers); skin cancer (UV exposure); infections; chemical burns; mechanical trauma. Prevention: appropriate gloves matched to hazard, barrier creams, hygiene facilities, early symptom reporting.

**Value-added response:** Although lung and skin diseases affect different organ systems, both categories share a common underlying principle: many of the most severe forms, particularly pneumoconiosis and established allergic contact dermatitis, become essentially permanent once fully developed, meaning that the practical value of occupational health intervention lies overwhelmingly in exposure prevention and early detection rather than in treatment after the fact, reinforcing why surveillance and control measures must be prioritised from the outset of any occupational health programme covering these conditions.



## Answers to Pilot Questions [Series 4]

### Part 4.1

6. Agricultural workers are vulnerable because they face a broad combination of chemical, biological, physical, and ergonomic hazards, and the majority of agricultural work occurs in the informal sector with minimal access to protective equipment, training, or occupational health services.
7. Three routes are dermal contact during mixing and spraying, inhalation of spray drift or vapours, and ingestion from contaminated hands, food, or water.
8. Organophosphate pesticides inhibit the enzyme acetylcholinesterase, producing symptoms including excessive salivation, sweating, muscle twitching, and in severe cases, respiratory failure.
9. Two risks are chronic back pain from prolonged bending during planting and harvesting, and repetitive strain injuries from repeated use of hand tools such as hoes and cutlasses.
10. A zoonotic disease is an infection transmitted from animals to humans. Two examples are anthrax, from infected livestock, and brucellosis, from unpasteurised milk and contact with infected animals.

### Part 4.2

11. Pneumoconiosis is a group of lung diseases caused by inhalation and accumulation of dust particles in the lungs. Two examples relevant to Nigerian industry are silicosis (from silica dust in mining and quarrying) and coal workers' pneumoconiosis (from coal dust in mining).
12. Prevention is more important because once significant lung scarring has occurred, the damage is generally irreversible, so dust control before exposure occurs is far more effective than any treatment available after disease has developed.
13. Occupational asthma is asthma caused or significantly worsened by exposure to a specific workplace agent. Three causative agents are flour and grain dust, isocyanates, and latex proteins.



14. Pneumoconiosis causes irreversible lung scarring once it has developed, while occupational asthma often improves, at least partially, if exposure to the causative agent is stopped early, particularly when recognised promptly.
15. The three components are a detailed occupational history linking symptoms to workplace exposures, chest imaging such as X-ray or CT scan, and lung function testing (spirometry) to quantify respiratory impairment.

#### **Part 4.3**

1. Irritant contact dermatitis results from direct chemical or physical damage to the skin barrier and can affect any worker with sufficient exposure. Allergic contact dermatitis occurs only in individuals who have become sensitised to a specific substance, with the immune system reacting upon subsequent exposure.
2. Three occupational groups are hairdressers (exposed to dyes and chemicals), construction workers (exposed to wet cement), and healthcare workers (exposed to frequent handwashing and glove use).
3. Two conditions are occupational skin cancer, from prolonged ultraviolet exposure among outdoor workers, and occupational skin infections, including fungal infections common in hot, humid agricultural and informal sector settings.
4. Glove selection must match the specific chemical because not all glove materials protect against all substances; a glove that is effective against one chemical may allow penetration of a different chemical, providing a false sense of protection.
5. Early recognition is particularly important for allergic contact dermatitis because continued exposure after sensitisation tends to worsen symptoms progressively, so removing the worker from the causative exposure as soon as possible prevents the condition from becoming severe or chronic.



## References and Attributions [Series 4]

### Textual References

6. World Health Organization. (2020). Occupational Health: Pesticide Poisoning and Agricultural Workers. Geneva: WHO.
7. Adisa, R., and Adebayo, P. F. (2012). Occupational health hazards among farmers in Nigeria. *Journal of Agricultural Extension*, 16(1), 18 to 28.
8. International Labour Organization. (2013). Occupational Lung Diseases: An International Perspective. Geneva: ILO.
9. Diepgen, T. L., and Coenraads, P. J. (1999). The epidemiology of occupational contact dermatitis. *International Archives of Occupational and Environmental Health*, 72(8), 496 to 506.

### Figures, Plates, Tables, and Boxes

10. Figure 4.1: Major occupational health risks facing agricultural workers in Nigeria. AI generation prompt: "Create a clean labelled illustration of a Nigerian farmer working in a field using a hoe, with four callout boxes connected by lines pointing to relevant parts of the scene: one near the farmer's back and hands labelled Musculoskeletal Strain (bending, lifting, repetitive tool use); one near a pesticide spray tank labelled Pesticide Exposure (dermal, inhalation, ingestion routes); one near nearby livestock labelled Zoonotic Risk (anthrax, brucellosis, avian influenza); one showing the sun overhead labelled Heat and Sun Exposure; use a clean educational infographic illustration style." Suggested OER search string: "agricultural worker occupational health hazards diagram illustration".
11. Table 4.1: Comparison of major occupational lung diseases by cause and reversibility. AI generation prompt: "Create a clean two-column comparison table titled Occupational Lung Diseases: Cause and Reversibility; columns Disease and Key Features; four rows: Pneumoconiosis/Silicosis (silica or coal dust inhalation, irreversible scarring), Asbestosis (asbestos fibre inhalation, irreversible), Occupational Asthma (flour dust, isocyanates, latex; often improves if exposure stopped early), Chemical Lung Injury (acute irritant gas exposure such as chlorine or ammonia; variable, can be life-threatening acutely); use a clean professional table design with alternating row shading." Suggested OER search string: "occupational lung diseases comparison table pneumoconiosis asthma".



12. Table 4.2: Major occupational skin diseases by cause and affected worker groups in Nigeria. AI generation prompt: "Create a clean two-column table titled Occupational Skin Diseases: Cause and Affected Workers; columns Condition and Cause and Affected Workers; five rows: Irritant Contact Dermatitis (frequent contact with water, detergents, solvents, cement; healthcare workers, construction workers), Allergic Contact Dermatitis (sensitisation to dyes, rubber, nickel, chromium; hairdressers, factory workers), Occupational Skin Cancer (prolonged UV exposure, mineral oils and tars; outdoor agricultural and construction workers), Occupational Skin Infection (fungal and bacterial infections in hot humid conditions; agricultural and informal sector workers), Chemical Burns (contact with strong acids or alkalis; manufacturing and cleaning industry workers); use a clean professional table design with alternating row shading." Suggested OER search string: "occupational skin diseases table causes affected workers diagram".





**Course code: COM 306**

**Course title: Introduction to Occupational Health**

**Course credit load: 1 Unit**

## **Series 5: Regulations, Compensation, and Policy Frameworks**

- **Part 5.1: Estimating Occupational and Environmental Health Risks**
  - Sub Part 5.1.1: Principles of risk estimation
  - Sub Part 5.1.2: Occupational exposure limits
  - Sub Part 5.1.3: Environmental health risks linked to occupational settings
- **Part 5.2: National and International Regulations**
  - Sub Part 5.2.1: International regulatory frameworks
  - Sub Part 5.2.2: Nigerian national legislation
  - Sub Part 5.2.3: Regulatory enforcement and compliance challenges
- **Part 5.3: The Workmen's Compensation Framework**
  - Sub Part 5.3.1: Principles of workers' compensation
  - Sub Part 5.3.2: The Employees' Compensation Act and its provisions
  - Sub Part 5.3.3: The compensation claims process and ongoing challenges



## Introduction

Effective occupational health practice does not exist in isolation; it operates within a framework of risk estimation, legal regulation, and compensation systems that together create the incentives and obligations driving workplace protection. Without robust regulation and a functioning compensation system, even the best technical knowledge of hazards and controls covered in earlier Series has limited practical effect on actual worker outcomes.

This Series examines how occupational and environmental health risks are systematically estimated, the national and international regulatory frameworks that set minimum standards for workplace health and safety, and the Workmen's Compensation framework, now embodied in Nigeria's Employees' Compensation Act, through which injured or ill workers seek redress. Together, these topics complete the picture of how occupational health functions as a system encompassing science, law, and social protection.

Understanding these frameworks equips learners to appreciate not only the technical aspects of occupational health practice covered throughout this course, but also the legal and policy environment within which that practice must operate in Nigeria.

## Series Learning Outcomes

Upon completing this Series, you should be able to:

- **SLO 5.1** describe the principles of estimating occupational and environmental health risks, including the use of exposure limits (Linked to Part 5.1),
- **SLO 5.2** discuss national and international regulations relating to occupational health (Linked to Part 5.2), and
- **SLO 5.3** explain the Workmen's Compensation Act and the compensation claims process in Nigeria (Linked to Part 5.3).



## 5.1 Estimating Occupational and Environmental Health Risks

### 5.1.1 Principles of risk estimation

**Risk estimation** in occupational health is the systematic process of quantifying the likelihood and severity of harm arising from workplace exposures, providing the evidence base needed to prioritise control measures and allocate limited resources effectively. The process typically begins with **hazard identification**, followed by **exposure assessment**, which measures or estimates the level, duration, and frequency of worker contact with the hazard, often through direct sampling or, where sampling is not feasible, through validated estimation models.

**Dose-response relationships**, established through toxicological and epidemiological research, describe how the probability and severity of harm increases with exposure level, forming the scientific foundation for setting safe exposure thresholds. **Risk characterisation** then integrates exposure data with dose-response information to estimate the overall probability of harm to an exposed population, allowing comparison across different hazards and informing decisions about which risks require the most urgent control.

Fill in the blank: Risk estimation involves hazard identification, exposure assessment, dose-response analysis, and risk \_\_\_\_\_, which integrates exposure and dose-response data to estimate the probability of harm.

### 5.1.2 Occupational exposure limits

**Occupational exposure limits (OELs)** are reference values representing the maximum concentration of a hazardous substance to which a worker may be exposed over a specified period without significant risk to health, derived from toxicological research and epidemiological studies of exposed populations. The most widely referenced limits internationally are the **Threshold Limit Values (TLVs)** published by the American Conference of Governmental Industrial Hygienists, though many countries, including Nigeria, adapt or adopt limits from international bodies given limited local toxicological research capacity.

Exposure limits are typically expressed as **time-weighted averages (TWA)** over an eight-hour working day, reflecting cumulative exposure across a typical shift, alongside **short-term**



**exposure limits (STEL)** that cap exposure over brief fifteen-minute periods to prevent acute effects from short bursts of high concentration. It is important to recognise that exposure limits represent a level of acceptable risk rather than a guarantee of complete safety, and that limits are periodically revised as new toxicological evidence emerges.

Fill in the blank: Occupational exposure limits are typically expressed as time-weighted averages over an eight-hour day and short-term exposure limits over \_\_\_\_\_-minute periods to prevent acute effects.

### 5.1.3 Environmental health risks linked to occupational settings

**Occupational hazards** frequently extend beyond the immediate workplace to create broader **environmental health risks** affecting surrounding communities and ecosystems. Industrial discharge of chemical effluents into water bodies can contaminate drinking water sources used by nearby communities, while airborne emissions from factories and processing facilities can affect air quality well beyond the factory boundary, contributing to respiratory illness among residents who have no direct employment relationship with the source facility.

In Nigeria, this overlap is particularly significant in regions with intensive industrial or extractive activity, such as the **Niger Delta oil-producing areas**, where occupational hazards faced by oil workers exist alongside broader environmental contamination affecting fishing and farming communities dependent on local land and water resources. Recognising this connection between occupational and environmental health is essential for designing interventions that protect not only workers directly but also the wider communities whose health is affected by the same underlying hazards.

Fill in the blank: Occupational hazards can extend beyond the workplace to create environmental health risks, as seen in regions such as the Niger Delta, where oil industry activity affects both workers and surrounding \_\_\_\_\_ and farming communities.



## From Risk Estimation to Exposure Limits

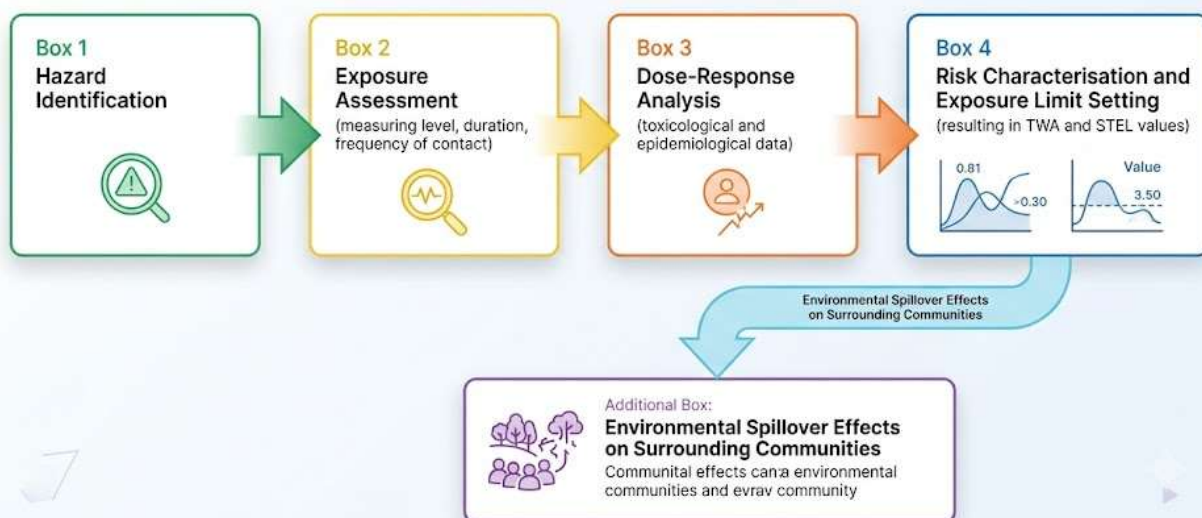


Figure 5.1: The risk estimation process, from hazard identification to the setting of occupational exposure limits, with environmental spillover effects on surrounding communities

### Pilot questions 5.1

1. Describe the four steps involved in occupational risk estimation. (Linked to SLO 5.1)
2. Define occupational exposure limit and name one internationally recognised source of such limits. (Linked to SLO 5.1)
3. Distinguish between a time-weighted average and a short-term exposure limit. (Linked to SLO 5.1)
4. Explain why occupational exposure limits do not represent a guarantee of complete safety. (Linked to SLO 5.1)
5. Explain how occupational hazards in the Niger Delta region illustrate the overlap between occupational and environmental health risk. (Linked to SLO 5.1)



## 5.2 National and International Regulations

### 5.2.1 International regulatory frameworks

The **International Labour Organization (ILO)** has adopted numerous conventions establishing minimum international standards for occupational safety and health, including the **Occupational Safety and Health Convention, 1981 (No. 155)**, which requires ratifying states to formulate and implement a coherent national policy on occupational safety and health, and the **Occupational Health Services Convention, 1985 (No. 161)**, which establishes standards for the provision of occupational health services.

Beyond the ILO, the **World Health Organization (WHO)** contributes technical guidance and global strategies on occupational health, while regional and international bodies, including the **International Commission on Occupational Health (ICOH)**, support professional standards and knowledge exchange. Although Nigeria has ratified several relevant ILO conventions, ratification alone does not automatically translate into domestic legal enforceability; conventions typically require corresponding national legislation to take effect within a country's own legal system.

Fill in the blank: ILO Convention No. 155 requires ratifying states to formulate a coherent national policy on occupational safety and \_\_\_\_\_, but ratification alone does not automatically translate into domestic legal enforceability.

### 5.2.2 Nigerian national legislation

Nigeria's primary occupational health and safety legislation is the **Factories Act of 1987**, which governs workplace safety requirements, mandates the registration and inspection of factories employing a specified minimum number of workers, and establishes requirements for safety officers, accident reporting, and basic welfare facilities. The **Labour Act** provides broader employment protections, including provisions relating to working hours, leave entitlements, and conditions of employment that indirectly support worker health and wellbeing.

More recent legislation includes the **Employees' Compensation Act of 2010**, which replaced the earlier Workmen's Compensation Act and established a no-fault compensation scheme



administered by the Nigeria Social Insurance Trust Fund, examined in detail in Part 5.3. The **National Policy on Occupational Safety and Health**, adopted in 2006 and periodically updated, provides the overarching strategic framework guiding government action on occupational health, though its implementation has historically lagged behind its stated ambitions due to resource and capacity constraints.

Fill in the blank: Nigeria's primary occupational safety legislation is the Factories Act of 1987, while the Employees' Compensation Act of 2010 replaced the earlier \_\_\_\_\_ Compensation Act.

### 5.2.3 Regulatory enforcement and compliance challenges

Despite a reasonably comprehensive legislative framework on paper, **enforcement** of occupational health and safety regulation in Nigeria faces persistent practical challenges. The **Factory Inspectorate Division** of the Federal Ministry of Labour and Employment, responsible for conducting workplace inspections, is significantly understaffed relative to the number of registered and unregistered workplaces requiring oversight, limiting the frequency and thoroughness of inspections that can realistically be conducted.

Additional challenges include **inadequate penalties** for non-compliance that fail to deter violations among larger employers for whom fines represent a negligible operating cost, **limited technical capacity** among inspectors to assess increasingly complex industrial hazards, and the fundamental challenge that regulatory frameworks designed around formal-sector employment relationships have little practical reach into the informal sector, where the majority of Nigerian workers are employed and where regulatory presence is effectively absent.

Fill in the blank: Enforcement challenges in Nigeria include an understaffed Factory \_\_\_\_\_ Division, inadequate penalties for non-compliance, and limited regulatory reach into the informal sector.

| <u>Instrument</u>             | <u>Main Provision</u>                                                      |
|-------------------------------|----------------------------------------------------------------------------|
| <b>ILO Convention No. 155</b> | Sets minimum national occupational safety and health (OSH) policy standard |



|                                         |                                                                                |
|-----------------------------------------|--------------------------------------------------------------------------------|
| <b>ILO Convention No. 161</b>           | Establishes standards for occupational health services                         |
| <b>Factories Act 1987</b>               | Governs workplace inspection and safety requirements                           |
| <b>Labour Act</b>                       | Covers working hours and leave entitlements                                    |
| <b>Employees' Compensation Act 2010</b> | Establishes a no-fault compensation scheme for workplace injuries and diseases |

Table 5.1: Major national and international occupational health regulations affecting Nigeria

### Pilot questions 5.2

1. Name two ILO conventions relevant to occupational safety and health. (Linked to SLO 5.2)
2. Identify three pieces of Nigerian legislation relevant to occupational health. (Linked to SLO 5.2)
3. Explain why ratification of an ILO convention does not automatically guarantee domestic enforceability. (Linked to SLO 5.2)
4. Describe two challenges facing occupational health regulatory enforcement in Nigeria. (Linked to SLO 5.2)
5. Explain why regulatory frameworks have limited reach into the informal sector. (Linked to SLO 5.2)

## 5.3 The Workmen's Compensation Framework

### 5.3.1 Principles of workers' compensation

**Workers' compensation** systems are built on the principle of **no-fault liability**, meaning that an injured worker is entitled to compensation for a work-related injury or illness without needing to prove that the employer was negligent, in exchange for which the worker typically forfeits the right to sue the employer separately through the courts. This arrangement benefits both parties: workers receive more predictable and timely compensation without the cost, delay, and uncertainty of litigation, while employers gain protection from potentially unlimited civil liability claims.





Compensation typically covers several categories of loss, including **medical expenses** arising from treatment of the work-related condition, **income replacement** during periods of temporary or permanent disability, **disability benefits** calculated according to the degree of impairment, and **death benefits** payable to dependants in fatal cases. The underlying social purpose of workers' compensation is to ensure that the financial burden of occupational injury and disease is shared fairly between the employer whose enterprise generated the risk and society more broadly, rather than falling entirely on the individual worker and their family.

Fill in the blank: Workers' compensation operates on the principle of no-fault \_\_\_\_\_, allowing injured workers to receive compensation without needing to prove employer negligence.

### 5.3.2 The Employees' Compensation Act and its provisions

The **Employees' Compensation Act, 2010** replaced Nigeria's earlier Workmen's Compensation Act and established a more comprehensive, contributory scheme administered by the **Nigeria Social Insurance Trust Fund (NSITF)**. Under the Act, employers are required to make regular contributions to the **Employees' Compensation Fund**, calculated as a percentage of each employee's total monthly payroll, which then finances compensation payments to eligible workers without the need for individual litigation against the specific employer.

The Act covers compensation for **occupational injuries** arising from accidents in the course of employment, **occupational diseases** recognised under a schedule of conditions linked to specific occupations, and **death benefits** for dependants where a work-related injury or disease proves fatal. Importantly, the Act extends coverage to both the public and private sectors and, in principle, to all categories of employees, though in practice extending meaningful coverage to informal sector workers, who fall outside any formal employer-employee contribution relationship, remains a significant unresolved gap in the scheme's reach.

Fill in the blank: The Employees' Compensation Act of 2010 is administered by the NSITF and funded through employer contributions calculated as a percentage of total monthly \_\_\_\_\_, covering injuries, diseases, and death benefits.



### 5.3.3 The compensation claims process and ongoing challenges

The **compensation claims process** under the Employees' Compensation Act typically begins with the employer reporting the occupational injury or disease to the NSITF within a specified timeframe following the incident, accompanied by relevant medical documentation establishing the work-related nature of the condition. The NSITF then assesses the claim, which may involve medical examination by an approved practitioner, to determine eligibility and the appropriate level of compensation based on the nature and severity of the injury or disease.

Despite the formal availability of this process, several practical challenges limit its effectiveness in Nigeria, including **low awareness** among workers, particularly in smaller enterprises, of their entitlement to compensation, **delays** in claims processing and payment that can leave injured workers without income for extended periods, and the persistent **exclusion of informal sector workers** who, lacking a formal employer registered with the NSITF, have no practical access to the scheme at all. Strengthening worker awareness, streamlining claims administration, and exploring mechanisms to extend coverage to informal workers remain important priorities for improving the practical effectiveness of Nigeria's compensation framework.

Fill in the blank: Practical challenges facing the compensation claims process in Nigeria include low worker awareness, delays in claims processing, and the persistent exclusion of \_\_\_\_\_ sector workers from the scheme.



## The Employees' Compensation Claims Process

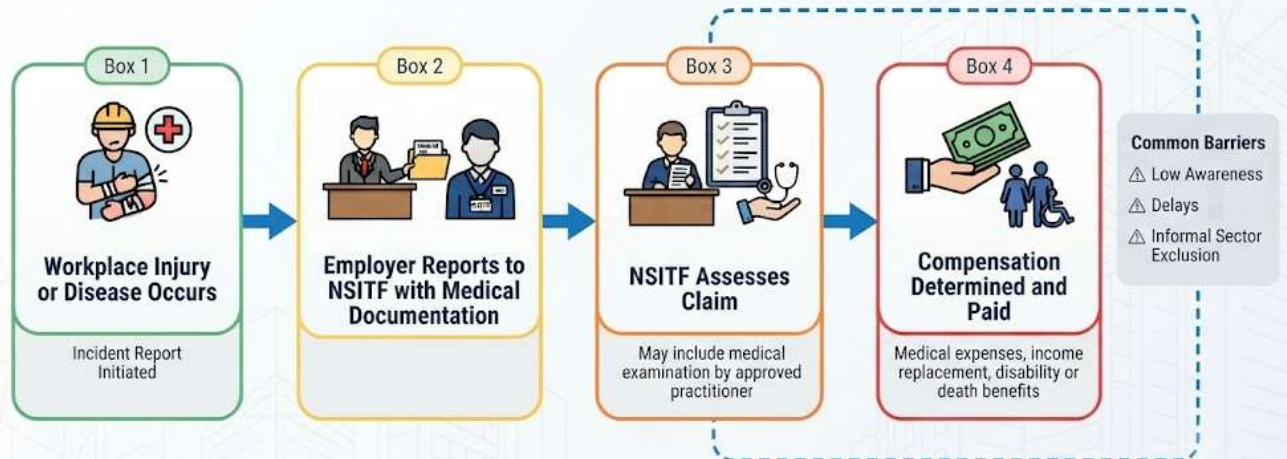


Figure 5.2: The Employees' Compensation claims process and common barriers to its effective use in Nigeria

### Pilot questions 5.3

1. Explain the principle of no-fault liability in workers' compensation. (Linked to SLO 5.3)
2. List three categories of compensation typically covered under a workers' compensation scheme. (Linked to SLO 5.3)
3. Describe how the Employees' Compensation Fund is financed under the 2010 Act. (Linked to SLO 5.3)
4. Outline the steps involved in the compensation claims process under the Employees' Compensation Act. (Linked to SLO 5.3)
5. Identify three challenges limiting the effectiveness of Nigeria's compensation framework in practice. (Linked to SLO 5.3)



## Series Summary

This Series examined the broader systems within which occupational health practice operates in Nigeria. Risk estimation provides the scientific foundation for occupational health decision-making, proceeding through hazard identification, exposure assessment, dose-response analysis, and risk characterisation, leading to the establishment of occupational exposure limits expressed as time-weighted averages and short-term exposure limits; these occupational risks frequently extend beyond the workplace to create environmental health consequences for surrounding communities, as illustrated by the overlapping occupational and environmental impacts of oil industry activity in the Niger Delta. The Series then examined the regulatory landscape, distinguishing international frameworks established through ILO conventions, which set minimum standards but require domestic legislation to become enforceable, from Nigeria's own national legislation, principally the Factories Act of 1987 and the Employees' Compensation Act of 2010, while highlighting persistent enforcement challenges including an understaffed inspectorate, inadequate penalties, and limited regulatory reach into the informal sector.

The Series concluded with a detailed examination of the Workmen's Compensation framework, now embodied in the Employees' Compensation Act, which operates on the principle of no-fault liability, allowing injured or ill workers to receive compensation for medical expenses, income replacement, disability, and death benefits without needing to prove employer negligence. The scheme is financed through employer contributions to a fund administered by the Nigeria Social Insurance Trust Fund and covers occupational injuries, recognised occupational diseases, and death benefits for dependants. Despite this formal framework, practical challenges, including low worker awareness, claims processing delays, and the exclusion of informal sector workers who lack a formal employer relationship, continue to limit the scheme's real-world effectiveness, underscoring that strong technical occupational health practice must be matched by equally strong regulatory and compensation systems to achieve meaningful protection for Nigerian workers.



## Glossary of Terms

1. **Risk estimation:** the systematic process of quantifying the likelihood and severity of harm arising from workplace exposures, used to prioritise control measures.
2. **Dose-response relationship:** the established relationship describing how the probability and severity of harm increases with the level of exposure to a hazard.
3. **Occupational exposure limit (OEL):** a reference value representing the maximum concentration of a hazardous substance to which a worker may be exposed without significant risk to health.
4. **Time-weighted average (TWA):** an occupational exposure limit expressed as the average permissible exposure level over a standard eight-hour working day.
5. **Short-term exposure limit (STEL):** an occupational exposure limit capping exposure over a brief period, typically fifteen minutes, to prevent acute effects from high-concentration bursts.
6. **International Labour Organization (ILO):** a United Nations agency responsible for setting international labour standards, including conventions relating to occupational safety and health.
7. **Factories Act:** Nigeria's primary occupational safety legislation, most recently revised in 1987, governing workplace inspection, registration, and safety requirements.
8. **No-fault liability:** the principle underlying workers' compensation systems whereby an injured worker is entitled to compensation without needing to prove employer negligence.
9. **Employees' Compensation Act:** Nigerian legislation enacted in 2010 establishing a contributory, no-fault compensation scheme administered by the NSITF for workers suffering occupational injury, disease, or death.
10. **Nigeria Social Insurance Trust Fund (NSITF):** the Nigerian government agency responsible for administering the Employees' Compensation Fund and processing worker compensation claims.



11. **Compensation claim:** a formal request submitted to the NSITF following an occupational injury or disease, supported by medical documentation, to determine eligibility and the level of compensation due.



## Concept Check Questions [Series 5]

### Objective Questions

- Risk estimation involves hazard identification, exposure assessment, dose-response analysis, and risk \_\_\_\_\_. (Linked to SLO 5.1)
- Occupational exposure limits are expressed as time-weighted averages over an eight-hour day and short-term exposure limits over \_\_\_\_\_-minute periods. (Linked to SLO 5.1)
- ILO Convention No. 155 requires ratifying states to formulate a coherent national policy on occupational safety and \_\_\_\_\_. (Linked to SLO 5.2)
- Nigeria's primary occupational safety legislation is the \_\_\_\_\_ Act of 1987. (Linked to SLO 5.2)
- Workers' compensation operates on the principle of \_\_\_\_\_ liability, allowing compensation without proving employer negligence. (Linked to SLO 5.3)
- The Employees' Compensation Act of 2010 is administered by the \_\_\_\_\_, which processes compensation claims. (Linked to SLO 5.3)

### Short-Answer Questions

- Distinguish between a time-weighted average and a short-term exposure limit. (Linked to SLO 5.1)
- Explain why ratification of an ILO convention does not automatically guarantee domestic enforceability in Nigeria. (Linked to SLO 5.2)
- List three categories of compensation typically covered under a workers' compensation scheme. (Linked to SLO 5.3)

### Long-Answer Questions

- Discuss the principles of estimating occupational and environmental health risks, including the role of exposure limits. (Linked to SLO 5.1)
- Evaluate the Employees' Compensation Act and the challenges facing its practical implementation in Nigeria. (Linked to SLO 5.3)



## Answers to Concept Check Questions [Series 5]

### Objective Questions

1. Characterisation.
2. Fifteen.
3. Health.
4. Factories.
5. No-fault.
6. Nigeria Social Insurance Trust Fund (NSITF).

### Short-Answer Questions

7. A time-weighted average is the average permissible exposure level over a standard eight-hour working day, reflecting cumulative exposure across a shift, while a short-term exposure limit caps exposure over a brief fifteen-minute period to prevent acute effects from short bursts of high concentration.
8. ILO conventions set minimum international standards, but they typically require corresponding national legislation to become legally enforceable within a country's own legal system; ratification alone signals commitment without automatically creating domestic legal obligations.
9. Three categories are medical expenses arising from treatment, income replacement during periods of disability, and death benefits payable to dependants in fatal cases.

### Long-Answer Questions

10. **Basic response:** Risk estimation process: hazard identification; exposure assessment (level, duration, frequency of contact); dose-response analysis (toxicological and epidemiological data); risk characterisation (integrates exposure and dose-response to estimate harm probability). Exposure limits: derived from this process; TWA (eight-hour average); STEL (fifteen-minute cap for acute effects); represent acceptable risk level, not guaranteed safety; periodically revised. Environmental extension: occupational hazards can affect surrounding communities (e.g. Niger Delta oil industry affecting fishing and farming communities).





**Value-added response:** Recognising that occupational and environmental health risks are frequently interconnected, rather than entirely separate domains, has important practical implications for how risk estimation should be conducted in Nigeria; assessments that focus narrowly on worker exposure within factory boundaries risk overlooking equally serious downstream effects on surrounding communities, suggesting that more integrated occupational-environmental risk assessment approaches, particularly in extractive and heavy industry settings, would better capture the full scope of harm requiring control.

11. **Basic response:** Employees' Compensation Act (2010): replaced Workmen's Compensation Act; administered by NSITF; financed by employer contributions as percentage of payroll; covers occupational injuries, recognised occupational diseases, death benefits for dependants; no-fault basis; covers public and private sectors in principle. Challenges: low worker awareness, particularly in smaller enterprises; delays in claims processing and payment; exclusion of informal sector workers lacking formal employer-employee relationships with NSITF registration.

**Value-added response:** The Employees' Compensation Act represents a significant legislative improvement over its predecessor in terms of scope and administrative structure, but its practical impact remains constrained by the same structural gap that limits Nigerian occupational health more broadly: a compensation scheme built around the formal employer-employee relationship simply cannot reach the majority of Nigerian workers who operate within the informal economy, meaning that meaningful expansion of worker protection in Nigeria will require either creative extension mechanisms for informal workers or broader formalisation of the economy itself, neither of which is likely to be achieved quickly.

## Answers to Pilot Questions [Series 5]

### Part 5.1

6. The four steps are hazard identification, exposure assessment (measuring level, duration, and frequency of contact), dose-response analysis (using toxicological and



epidemiological data), and risk characterisation (integrating exposure and dose-response data to estimate harm probability).

7. An occupational exposure limit is a reference value representing the maximum concentration of a hazardous substance to which a worker may be exposed without significant risk to health. One internationally recognised source is the Threshold Limit Values published by the American Conference of Governmental Industrial Hygienists.
8. A time-weighted average is the average permissible exposure level over a standard eight-hour working day, while a short-term exposure limit caps exposure over a brief fifteen-minute period to prevent acute effects from high-concentration bursts.
9. Exposure limits represent a level of acceptable risk rather than a guarantee of complete safety, and they are periodically revised as new toxicological evidence emerges, meaning some risk of harm may still exist even at or below the limit.
10. In the Niger Delta, occupational hazards faced by oil workers exist alongside broader environmental contamination, such as water and air pollution, that affects fishing and farming communities with no direct employment relationship to the oil industry, illustrating how occupational hazards can extend into wider environmental health risk.

## **Part 5.2**

11. Two relevant conventions are the Occupational Safety and Health Convention, 1981 (No. 155), and the Occupational Health Services Convention, 1985 (No. 161).
12. Three pieces of legislation are the Factories Act of 1987, the Labour Act, and the Employees' Compensation Act of 2010.
13. ILO conventions set minimum international standards, but they typically require corresponding national legislation to become enforceable within a country's domestic legal system; ratification signals commitment without automatically creating binding domestic legal obligations.
14. Two challenges are an understaffed Factory Inspectorate Division unable to conduct sufficiently frequent inspections, and inadequate penalties for non-compliance that fail to deter violations among larger employers.
15. Regulatory frameworks are designed around formal employer-employee relationships and registered workplaces, so they have little practical reach into the informal sector, where



the majority of Nigerian workers are employed and where regulatory presence is effectively absent.

### Part 5.3

1. No-fault liability means an injured worker is entitled to compensation for a work-related injury or illness without needing to prove that the employer was negligent, in exchange for forfeiting the right to separately sue the employer through the courts.
2. Three categories are medical expenses, income replacement during disability, and disability benefits calculated according to the degree of impairment (death benefits to dependants is also acceptable).
3. The Fund is financed through regular employer contributions, calculated as a percentage of each employee's total monthly payroll, which then finances compensation payments to eligible workers.
4. The process begins with the employer reporting the injury or disease to the NSITF within a specified timeframe, accompanied by medical documentation; the NSITF then assesses the claim, which may involve medical examination by an approved practitioner, to determine eligibility and compensation level.
5. Three challenges are low awareness among workers of their entitlement to compensation, delays in claims processing and payment, and the persistent exclusion of informal sector workers who lack a formal employer registered with the NSITF.



## References and Attributions [Series 5]

### Textual References

6. International Labour Organization. (1981). Occupational Safety and Health Convention, 1981 (No. 155). Geneva: ILO.
7. Federal Republic of Nigeria. (2010). Employees' Compensation Act. Abuja: National Assembly.
8. American Conference of Governmental Industrial Hygienists. (2021). Threshold Limit Values and Biological Exposure Indices. Cincinnati: ACGIH.
9. Nigeria Social Insurance Trust Fund. (2015). Guidelines on the Employees' Compensation Scheme. Abuja: NSITF.
10. Ana, G. R. (2011). Environmental risk factors and health outcomes in selected oil-producing communities in the Niger Delta. African Journal of Environmental Science and Technology, 5(1), 1 to 11.

### Figures, Plates, Tables, and Boxes

11. Figure 5.1: The risk estimation process, from hazard identification to exposure limit setting. AI generation prompt: "Create a clean four-step horizontal flow diagram titled From Risk Estimation to Exposure Limits, with boxes connected by arrows: Box 1 Hazard Identification; Box 2 Exposure Assessment (measuring level, duration, frequency of contact); Box 3 Dose-Response Analysis (toxicological and epidemiological data); Box 4 Risk Characterisation and Exposure Limit Setting (resulting in TWA and STEL values); add a branching arrow from the final box pointing down to an additional box labelled Environmental Spillover Effects on Surrounding Communities; use a clean professional infographic style." Suggested OER search string: "occupational risk assessment process exposure limits diagram".
12. Table 5.1: Major national and international occupational health regulations affecting Nigeria. AI generation prompt: "Create a clean two-column table titled National and International Occupational Health Regulations Affecting Nigeria; columns Instrument and Main Provision; five rows: ILO Convention No. 155 (sets minimum national OSH policy standard), ILO Convention No. 161 (sets standards for occupational health services), Factories Act 1987 (governs workplace inspection and safety requirements),



Labour Act (covers working hours and leave entitlements), Employees' Compensation Act 2010 (establishes no-fault compensation scheme); use a clean professional table design with alternating row shading." Suggested OER search string: "occupational health regulations Nigeria ILO conventions table".

13. Figure 5.2: The Employees' Compensation claims process and common barriers. AI generation prompt: "Create a clean four-step horizontal flow diagram titled The Employees' Compensation Claims Process, with boxes connected by arrows: Box 1 Workplace Injury or Disease Occurs; Box 2 Employer Reports to NSITF with Medical Documentation; Box 3 NSITF Assesses Claim (may include medical examination by approved practitioner); Box 4 Compensation Determined and Paid (medical expenses, income replacement, disability or death benefits); add a side note box connected by a dashed line labelled Common Barriers: Low Awareness, Delays, Informal Sector Exclusion; use a clean professional infographic style." Suggested OER search string: "workers compensation claims process flow diagram Nigeria".

