The Dialectic of the Environment and Chronic Diseases: Toward a Philosophical Approach to Environmental Education

Rachid djeloud [1*], Mohamed boumana

University of Djelfa, Laboratory of Historical and Human Studies, Algeria.
[2 1] University of Djelfa, Algeria
r.djelloud@univ-djelfa.dz
m.boumana@univ-djelfa.dz

Date of transmission: 10/03/ 2026 date of acceptance: 10/04/ 2026

****

Abstract:

Chronic diseases account for nearly three quarters of global mortality, making them one of the most pressing health challenges of the contemporary world. These diseases—such as cardiovascular diseases, diabetes, cancer, and respiratory illnesses—are no longer understood solely as the result of biological or genetic factors. Rather, they are increasingly recognized as being closely linked to the natural and social environments in which individuals live. Environmental degradation, modern lifestyles, and social inequalities together constitute a structural set of factors that contribute to the spread and aggravation of chronic diseases.

From this perspective, this study seeks to reconceptualize health as an environmental, ethical, and educational issue rather than a purely therapeutic one. It emphasizes the importance of environmental education as both a theoretical and practical framework for developing a comprehensive preventive approach aimed at rebuilding a responsible and sustainable relationship between humans and their environment

key words: Chronic diseases; environment; pollution; environmental education

*Rachid Djeloud

Introduction:

Noncommunicable diseases (NCDs) represent today one of the greatest health and development challenges worldwide. They are responsible for approximately 41 million deaths each year, accounting for 74% of total global mortality, including 17 million premature deaths occurring before the age of 70—equivalent to one death every two seconds—most of which are preventable. The greatest burden falls on low- and middle-income countries, which account for 86% of these premature deaths, reflecting a profound structural health inequality and a direct link to the social and economic environments of the most vulnerable populThis reality demonstrates that the spread of chronic diseases cannot be understood in isolation from environmental and social factors, and that health is not merely a medical issue but rather a reflection of the relationship between humans and their natural and social environments. From this perspective, environmental education emerges as a strategic tool for rebuilding awareness, strengthening prevention, and promoting sustainable health behaviors, by integrating health, environmental justice, and sustainable development into a comprehensive vision. Investment in environmental education goes beyond the transmission of knowledge; it seeks to transform everyday practices and behavioral choices that limit the spread of noncommunicable diseases and protect the most vulnerable communitiesations.

1. A Conceptual Framework for Chronic Diseases

First: Definition and Philosophy of Chronic Diseases

In contemporary health literature, chronic diseases are defined as long-term pathological conditions, often progressive in nature, that may limit life expectancy or profoundly affect quality of life. However, the philosophical approach to chronic diseases goes beyond the biomedical definition that associates illness solely with functional or organic dysfunction.

From a philosophical standpoint, chronic diseases are understood as a continuous existential experience that reshapes the individual's relationship with their body, with time, with the self, and with others. The chronically ill patient does not experience illness as a transient event, but rather as a lasting condition that places life within a trajectory of ongoing adaptation…

a trajectory of continuous adaptation to pain, uncertainty, the loss of certain functional capacities, and increasing dependence on others. Thus, health is transformed from a stable condition into a fragile and fluctuating state, and everyday life becomes a space of constant negotiation between what is possible and what is limited **(Bacon; s.d., p. 4–5).**

Noncommunicable diseases, also referred to as chronic diseases, are conditions that typically persist over long periods and result from a combination of genetic, physiological, environmental, and behavioral factors. The main categories of these diseases include cardiovascular diseases (such as heart attacks and strokes), cancers, chronic respiratory diseases (such as chronic obstructive pulmonary disease and asthma), and diabetes **(WHO ;2025).**

This approach highlights that chronic illness is not merely a medical phenomenon, but also a social and ethical reality, as it imposes psychological, social, and spiritual challenges, including feelings of isolation, loss of autonomy, anxiety about the future, and the perception of being a burden on one's family. Chronic illness also reshapes the individual's social identity, redefines roles within the family and society, and affects perceptions of the meaning of life and death.

Sociologists have examined the ways in which people living with chronic illness adapt to their condition from both emotional and practical perspectives. Some illnesses require ongoing monitoring that profoundly affects daily routines, such as dialysis, insulin therapy, injections, and long-term medication use. Other conditions produce sudden and unpredictable effects that may cause embarrassment or discomfort for those surrounding the patient.

From another perspective, sociological research has explored how individuals with chronic illnesses manage their condition or interact with it within the context of their personal and social lives **(Giddens '2005' p. 243).**

From this standpoint, addressing chronic diseases requires moving beyond the traditional medical model focused on treatment and cure, toward a holistic approach that recognizes illness as a long-term life trajectory requiring continuous support and care that takes into account the human and existential dimensions of suffering.

Second: The Philosophy of Palliative Care and Its Relationship to Chronic Diseases

The philosophy of palliative care is grounded in a holistic understanding of health and illness. Its primary aim is to improve the quality of life of patients and their families who are facing life-threatening or chronic conditions that limit life expectancy. According to the World Health Organization, palliative care is an approach that seeks to prevent and relieve suffering through the early identification, assessment, and treatment of pain, while also addressing physical, psychological, social, and spiritual problems.

Within the conceptual framework of this study, palliative care is presented as a philosophy of care that is not limited to the end-of-life stage, but can—and indeed should—be integrated early in the course of chronic diseases, alongside treatments intended to slow disease progression. Chronic illnesses are characterized by long and unpredictable trajectories, during which patients' needs evolve over time, making palliative care a particularly appropriate framework for accompanying this complex process **(Bacon; s.d., pp. 4–5)**

This philosophy is based on a set of fundamental principles, including:

- recognition of life and respect for death as a natural process;
- refusal to hasten or postpone death;
- emphasis on the relief of pain and distressing symptoms;
- integration of psychological, spiritual, and social dimensions into care;
- support for patients to live as actively as possible until advanced stages of illness;
- support for families during illness and after death (bereavement).

From a sociological perspective, this approach reveals a profound shift in the understanding of chronic illness—from an individual medical problem to a public health issue that requires health policies, new care models, and professional practices based on coordination, communication, and respect for human dignity at all stages of illness.

2. Different Approaches to the Definition of Chronic Diseases

Depending on the definition adopted, chronic diseases affect between 8 and 28 million people and generate significant disabilities and difficulties at the personal, familial, and socio-professional levels.

The definition of the term "chronic disease" is not subject to consensus, and differences in definition may lead to important consequences in terms of impact assessment, identification of needs, and the development of programs aimed at improving patient care. Consequently, determining what is included under the category of chronic disease constitutes a fundamental preliminary condition for:

- measuring the epidemiological magnitude of the phenomenon in terms of prevalence, determinants, and outcomes;
- assessing impact in terms of costs, thereby enabling appropriate allocation of funding;
- ensuring optimal medical and economic care.

Accordingly, a precise definition of chronic disease makes it possible to identify the needs of affected populations and to provide appropriate responses.

Any chronic disease may be characterized by a set of attributes, including its causes, degree of severity or risk, duration and course over time, possibilities of cure or remission (temporary improvement), relapse, or episodic progression, as well as its consequences—particularly with regard to its impact on an individual's functional performance.

According to the World Health Organization, chronic diseases are responsible for more than 36 million deaths annually worldwide, including approximately 17.3 million deaths due to cardiovascular diseases, 7.6 million due to cancers, 4.2 million due to respiratory diseases, and 1.3 million due to diabetes.

3. Chronic Diseases: Major Risk Factors

In less than a single century, the dominant causes of mortality have changed profoundly, shifting from the predominance of infectious diseases to that of chronic diseases. Researchers describe this major transformation through the concept of the *epidemiological transition*, attributing its causes primarily to environmental factors.

Several environmental determinants play a central role in the emergence, development, and exacerbation of chronic diseases, including diet, lifestyle, the physical, biological, and chemical environment, as well as psychological, social, and medical factors.

Accordingly, regular tobacco use, excessive alcohol consumption, high-calorie diets rich in harmful fats, insufficient physical activity, sedentary lifestyles, and obesity significantly increase the risk of chronic diseases—particularly cardiovascular and respiratory diseases, cancers, and diabetes **(Fédération Française de Cardiologie; 2015).**

3. Environment as a Determinant of Chronic Diseases

Searching for the Social and Environmental Determinants of Health

Since the Second World War, and particularly since the 1970s, epidemiological evidence has clearly shown a global shift toward increased incidence and prevalence of noncommunicable and chronic diseases, which have surpassed infectious diseases in explaining morbidity, mortality, and disability in general populations. This conclusion is regularly updated, notably through data from the *Global Burden of Disease* (GBD), an unprecedented epidemiological dataset developed by the Institute for Health Metrics and Evaluation (IHME) in

Vancouver, in collaboration with international organizations (such as the World Health Organization) and private funders (such as the Bill & Melinda Gates Foundation).

Accompanying the growing role of noncommunicable chronic diseases in global epidemiological dynamics—as summarized by the epidemiological transition model—is the idea that the determinants of human health must be sought within the "environment." Alongside the descriptive (if not fully explanatory) framework provided by the epidemiological transition, the triad *agent–host–environment* has become a key reference in epidemiology. Consequently, medicine and epidemiology agree that many diseases—especially chronic ones—cannot be reduced to a single specific cause. The model based on the presence of a single infectious agent that is necessary and sufficient to explain a given disease has been replaced by the concept of multicausality. Cancers, in particular, constituted an early field for studying the interaction between genetic, behavioral, and environmental dimensions, especially in relation to tobacco and alcohol use **(Cavalin; 2020).**

The Environment as a Conceptual Framework

This model has often been interpreted in epidemiology as an environmental approach—that is, as a break with the Pasteurian form of "reductionism," commonly summarized by the formula "one infectious agent, one disease." However, historical studies over the past twenty years have shown that this contrast between two causal models is partially overstated, as it underestimates the longstanding attention given to environmental factors in explaining health conditions—whether in early public health thinking, occupational medicine in the seventeenth and eighteenth centuries, the founding stages of epidemiology in the first half of the nineteenth century, or even within bacteriological laboratories since the end of that century.

Within this historical context, a new theoretical approach has recently emerged, known as the *exposome*, which offers an innovative perspective. As defined by Christopher P. Wild, the exposome represents a systemic approach to the totality of exposures experienced by the human body, complementing genomic explanations of the onset and development of chronic diseases. More precisely, the exposome encompasses three dimensions of the environment in explaining chronic diseases at the population level:

1. **Specific external factors**, such as potentially toxic physical or chemical agents.
2. **General external factors**, including social, cultural, economic, and environmental characteristics, measurable through indicators such as educational level, standard of living, and type of residence (urban or rural).
3. **Internal or host-related factors**, such as hormones, metabolism, oxidative stress, as well as microorganisms—bacteria, viruses, and fungi—that constitute the *microbiota*.

4. Searching for the Social and Environmental Determinants of Health

This approach to the environment enables cooperation between the life sciences and the social sciences, as many specific external environmental factors—and even more so general external factors—constitute appropriate objects for social or historical analysis, with the aim of producing a form of *social epidemiology* of the diseases concerned. In this sense, the social environment emerges as an autonomous field of research, rather than merely the "non-genetic" or residual component of chronic diseases.

However, despite repeated calls for interdisciplinarity, the relationship between the environment and chronic diseases is still rarely examined through research that connects molecular epidemiology—the main representative of exposome-based approaches—with quantitative and qualitative social field investigations.

Some of these difficulties can be illustrated through two main points:

1. **The use of big data** sometimes leads to disappointing results. Although, according to the World Health Organization, a substantial share of mortality and morbidity is attributable to "modifiable environmental risks" (22% of years of life lost due to disease, disability, or premature death), less than 10% of the variation in this indicator for cardiovascular diseases, chronic respiratory diseases, or diabetes can be explained by individuals' sociodemographic status. In other words, translating "the environment" into social characteristics remains rudimentary when it comes to explaining the chronic diseases that contribute most to global mortality and morbidity.
2. **The dominant epidemiological model** relies instrumentally on variables such as sex/gender and race, treating them as "black boxes" whose social and environmental content has yet to be unpacked. There is therefore a need for a more systematic exploration of occupational and non-occupational

exposure determinants, as well as income levels, among individuals living with chronic diseases.

Is Human Beings Made Ill by Their Environment?

Two major factors have profoundly altered the nature of diseases observed in developed countries over the past century. The first is the rise in life expectancy, associated with the decline of infectious diseases in these countries and with what can be described as an epidemic emergence of chronic diseases. As a result, it has become difficult to identify a single etiological factor responsible for the onset and progression of these chronic diseases, since their causes are, in most cases, multifactorial **(Aubier ;2006' 563-564).**

The second factor relates to the growing body of research highlighting the limits of modern medicine in explaining the increase in life expectancy recorded over the past century. Bunker and colleagues estimated that only one year out of the 35 years of life expectancy gained over a single century in the United States can be attributed to therapeutic advances or preventive medicine. The remaining thirty-four years are the result of improved nutrition and better hygienic conditions, which led to a decline in respiratory and waterborne infectious diseases.

The considerable progress achieved in individual and collective hygiene might have suggested that environmentally related diseases had significantly declined and no longer constituted a major public health concern. However, modern technological development, urbanization, and the adoption of what is commonly referred to as the "Western lifestyle" have, over the past twenty years, brought environmental health risks back to the forefront of concerns expressed by citizens in many developed countries.

Among these risks, those that have been extensively studied in recent years include infectious diseases associated with cooling towers, such as Legionnaires' disease, noise pollution, endocrine disruptors, the effects of air pollution on increased rates of asthma and allergic diseases, as well as cancers.

It is important to note that the contemporary conception of the environment differs significantly from that of the previous century. Today, it generates strong societal demand—widely relayed by the media—regarding its potential effects on health. In public opinion, human beings are perceived as having altered the conditions of their natural environment (often imagined in the collective imagination as originally pure) in favor of a world polluted by industrial activities, transportation systems, chemical compounds, urbanization, and related processes.

The effects of the environment on health are highly complex and difficult to demonstrate scientifically. This complexity stems from the fact that

environmental exposures are generally composed of multiple agents present at low doses—except in cases of accidental or occupational exposure—and that their effects are often delayed by many years. Moreover, establishing causal links between exposure and the potential pathologies that may result remains particularly challenging.

Air pollution provides a striking example of this difficulty. It has been the subject of intense debate for nearly fifteen years, a debate that has yet to be resolved. While short-term acute effects during pollution peaks have been demonstrated among vulnerable populations (such as asthma patients, individuals with respiratory failure, and the elderly) in terms of mortality or morbidity, these effects, although established, remain relatively limited **(Aubier ' 2006'564).**

5. Pollution: A Growing Risk for Cardiovascular Diseases

Air pollution constitutes a major public health issue. It is responsible for approximately 400,000 deaths each year in Europe alone. According to the European Environment Agency (EEA), cardiovascular diseases and myocardial infarctions account for the leading cause (80%) of premature deaths attributable to air pollution in Europe, ahead of lung diseases and cancer. The Agency's report further indicates that nearly nine out of ten European cities are exposed to air contaminated with pollutants considered hazardous. Air pollution—whether in the form of particulate matter or irritating and aggressive gases—not only exacerbates cardiovascular conditions among patients but also has harmful effects on the cardiovascular system of otherwise healthy individuals **(Fédération Française de Cardiologie; 2015).**

In France alone, 42,000 premature deaths were recorded in 2014 as a result of air pollution in urban environments. Moreover, life expectancy among urban residents in France is reduced by an average of 9.3 months, and an estimated 15% of deaths related to air pollution could have been prevented. Professor Claire Mounier-Véhier, First Vice-President of the French Federation of Cardiology, emphasizes:

"Improving air quality represents a major public health challenge. All measures taken to reduce air pollution are beneficial—and sometimes vital—for preserving everyone's health, particularly that of the most vulnerable populations."

As concentrations of airborne pollutants increase, so do the risks of cardiovascular disorders within the population. Long-term exposure is associated with the development of serious conditions such as myocardial infarction, angina pectoris, cardiac arrhythmias, stroke (CVA), and coronary artery disease. More generally, no medical test currently allows for the diagnosis of hypersensitivity to pollution.

However, indicative symptoms—such as respiratory or cardiac distress (shortness of breath, wheezing, or palpitations)—may appear during episodes of peak pollution.

The French Federation of Cardiology stresses that no one is fully protected from the risks posed by air pollutants:

- **Children:** up to the age of eight, the lungs are still developing, and alveolar formation is ongoing.
- **Older adults:** increased vulnerability due to weakened respiratory defenses and age-related tissue degeneration.
- **Individuals with chronic diseases:** reduced peripheral oxygenation, increased blood viscosity, and cardiac rhythm disorders make patients with heart failure or coronary artery disease particularly susceptible.
- **Smokers:** whose respiratory systems are already irritated by tobacco, rendering them more vulnerable to the harmful effects of pollution.
- **Low-income households:** residents of disadvantaged neighborhoods are often exposed to higher pollutant concentrations (up to 20% higher according to the French School of Public Health—EHESP), due to factors such as poor maintenance of filtration and heating systems, as well as reliance on older, more polluting vehicles and limited capacity to invest in environmentally compliant alternatives.

More specifically, while available epidemiological studies demonstrate statistical associations between exposure to one or several pollutants and health outcomes—such as increased asthma attacks, emergency room visits for asthma, or hospital admissions—they have not conclusively established a direct causal role of these pollutants in the onset of asthma. It is likely that the true health impacts of various pollutants will only be accurately assessed through long-term and complex epidemiological studies spanning 15 to 20 years.

Such studies may allow for the measurement of health effects among particularly vulnerable populations, such as individuals with asthma or older adults, without the confounding factors often present in epidemiological research. These investigations have convincingly demonstrated acute effects on respiratory function following exposure to different air pollutants; however, interactions among chemical or biological pollutants—such as allergens—remain highly complex.

Research conducted on animal models or through cellular studies provides valuable insights into the biological mechanisms underlying organismal responses

to pollutants. Nevertheless, their results cannot always be generalized to humans, notably because experimental exposure levels in animals are often far higher than those experienced by humans under real-world conditions.

Individual susceptibility to environmental "toxic substances" constitutes a crucial factor that must be taken into account. Genetic factors **(Backus-Hazzard '349–353' 2004)** clearly contribute to determining the body's response to environmental components, rendering certain population groups more vulnerable than others. Identifying biomarkers capable of early detection of at-risk individuals represents one of the major challenges to be addressed in the coming years.

One of the central challenges facing future environmental medicine lies in anticipation and risk prevention, both at the public health and individual levels. Achieving this objective requires cooperation and coordination among multiple disciplines—epidemiology, biology, toxicology, meteorology, among others—as well as genuine political commitment. Nevertheless, it would be unrealistic to assume that such research will lead to a completely risk-free society. Rather, it will contribute physiopathological explanations and preventive tools in areas that are currently characterized by a high degree of uncertainty.

Endocrine Disruptors

Endocrine disruptors (EDs) are molecules that interfere with hormonal metabolism, thereby disrupting normal bodily functions. They exert their effects through three principal mechanisms: by mimicking the action of natural hormones, by blocking hormonal activity, or by interfering with hormonal function through receptor saturation or disruption of hormone synthesis, transport, or metabolism.

Endocrine disruptors have harmful effects on individual health as well as on the health of offspring, as some molecules are capable of transmitting their effects across generations. They are believed to play a significant role in the marked increase observed over recent decades in cancers, autoimmune diseases of endocrine origin, thyroid disorders, immune and reproductive system dysfunctions, neurodegenerative diseases, chemical hypersensitivity, and other conditions.

Currently, the European Union identifies approximately 800 endocrine-disrupting substances, and most living organisms—both plant and animal—are contaminated by these pollutants. Endocrine disruptors are ubiquitous in the environment: they are found in food products, food additives, pesticides, fuels (air pollution), cosmetics, detergents and cleaning agents, plastics, certain medications, paints, and tobacco smoke.

This situation underscores the importance of public policies and health authorities adopting appropriate and effective measures—particularly in the fields of ecology and environmental protection—in order to reduce the prevalence of chronic diseases in France.

6. The Exposome: What Is It?

From intrauterine life onward, human beings are exposed to a wide range of environmental external factors that affect health throughout the life course. These exposures may contribute to the development of chronic diseases, a phenomenon referred to as the **exposome**.

In 2005, Dr. Christopher Wild, former Director of the International Agency for Research on Cancer (IARC), defined the exposome as the analysis of exposure to "external and environmental factors to which an organism is subjected from the moment of conception until the end of life."

In other words, the exposome represents an assessment of all non-genetic risk factors involved in the development of chronic diseases, such as pollutants, fine particulate matter, endocrine disruptors, water quality, noise and light pollution, radiation, dietary quality, pesticides, and ultraviolet radiation **(Mutuelle de France Unie ; 2025).**

7. Environmental Education as a Preventive Approach

The issue of health education arises within the context of profound transformations experienced by contemporary societies, marked by increasing health crises, the fragility of healthcare systems, and rising rates of chronic diseases linked to lifestyles and environmental conditions. In this context, the traditional medical approach—focused primarily on treatment—has revealed its limitations in addressing current health challenges, highlighting instead the need for a preventive, educational approach that positions individuals as active agents in their own health rather than passive recipients of care.

Health education is no longer limited to the transmission of medical knowledge or behavioral rules. It has become a complex social and educational process aimed at developing health awareness, fostering individual and collective responsibility, and strengthening psychosocial competencies that enable individuals to make informed health decisions. In this regard, it is essential to emphasize the close link between knowledge and awareness: changes in health-related behaviors cannot be

achieved through information alone but require long-term educational work grounded in critical thinking, dialogue, and the reconstruction of social representations related to health and illness.

Historically, health education evolved from hygiene instruction in the nineteenth century—associated with epidemic prevention—to the concept of education for health that became established after the Second World War, particularly under the influence of World Health Organization charters, foremost among them the Ottawa Charter (1986). This shift contributed to redefining health as the outcome of interactions among environmental, social, economic, and cultural factors, rather than as a purely individual biological state.

The central role of schools as strategic spaces for health education is widely recognized. However, several obstacles hinder the effective implementation of this role, including insufficient pedagogical training of teachers, fragmented curricula, and the predominance of procedural and short-term approaches in school health activities. Additionally, the lack of effective coordination among sectors—particularly between schools, healthcare systems, and social actors—remains a major challenge.

Health education is closely linked to the emergence of new forms of health and environmental citizenship. The promotion of healthy behaviors cannot be dissociated from environmental education, education for responsible consumption, and respect for future generations. From this perspective, health is no longer an individual matter but a collective and ethical concern tied to sustainable development and quality of life **(salmouni ;11-32 '2007).**

Conclusion:

Linking the environment to chronic diseases necessitates moving beyond the traditional medical approach toward a comprehensive vision that integrates education, environment, health, and public policy. Chronic diseases are not merely the result of biological or physical factors; they emerge from complex interactions among lifestyles, consumption patterns, environmental quality, and socio-economic living conditions. Consequently, their prevention constitutes a collective responsibility shared by educational institutions, health professionals, policymakers, and civil society.

In this context, environmental education emerges as a strategic cornerstone for building societies that are more aware of the dialectical relationship between humans and their environment, and more capable of adopting sustainable, prevention-oriented health behaviors rather than relying solely on treatment.

Accordingly, integrating environmental education into health and development policies represents a necessary pathway toward sustainable development that places human health at its core and calls for a rethinking of prevailing development models, as well as dominant patterns of production and consumption.

References :

1- Aubier, M. (2006). *Is humankind made ill by its environment?* Médecine/Sciences, 22(6–7), 563–564. https://doi.org/10.1051/medsci/20062267563
2- Backus-Hazzard, G. S., Howden, R., & Kleeberger, S. R. (2004). Genetic susceptibility to ozone-induced lung inflammation in animal models of asthma. *Current Opinion in Allergy and Clinical Immunology*, 4, 349–353.
3- Bacon, J. (n.d.). *Integrating the philosophy of palliative care into the management of chronic life-limiting diseases*. Ottawa: Canadian Hospice Palliative Care Association. https://www.integrationdessoinspalliatifs.ca
4- Cavalin, C. (2020). *Chronic diseases and the environment*. Digital Encyclopedia of European History. https://ehne.fr/fr/node/14142
5- Fédération Française de Cardiologie. (2015). *Air pollution: An aggravating risk factor for cardiovascular diseases* [Press release]. May 5, 2015.
6- Fédération Française de Cardiologie. (2021). *The role of the environment in chronic diseases*.
7- Giddens, A. (2005). *Sociology*. Beirut: Arab Organization for Translation & Center for Arab Unity Studies.
8- Marsollier, C. (2007). Health education: Issues and epistemological frameworks. *Expressions*, (32), 11–32.
9- Mutuelle de France Unie. (2025). *Environment and chronic diseases: Everything is connected*.
10- Salamouni, O. K. (2019). *Health awareness: A guide for healthcare professionals* (1st ed.). Kuwait: Arab Center for Health Sciences Authorship and Translation.
11- World Health Organization. (2025). *Noncommunicable diseases (NCDs*